of ones, is multiplied by the adjacency matrix. The resulting result is converted using logistic function of the form (1) into a vector of values in the interval [0;1]:

$$C_j(x) = 1/(1 + exp(-c*x)), \quad (1)$$

where $C_j(x)$ - degree of concept activation N_j in the moment of time x;

This positive transformation allows us to better understand and imagine the level of activation of concepts and compare the final states of concepts. This procedure continues until a stable, unchanging state of concepts is achieved. This usually requires less than 30 steps. Theoretically, the system may not come to a fixed state, but to a cycle or a chaotic attractor [20].

3.2 Scenario Modelling

As a result of calculating the first scenario, corresponding to a stable state of the system, fairly close numerical characteristics were obtained.

Table 2: Results of three scenarios.

Results – no change (scenario 1)	Results – scenario 2	Results – Scenario 3
0,99887	1,00	0,9990309
0,0273243	0,5	0,02472257
0,9991667	0,9990398	0,99924687
0,9996941	0,9996638	0,99972348
0,9999797	0,9999824	0,5
0,9997978	0,9998245	0,99975292
0,9999184	0,9999386	0,99994246
0,999910	0,999939	0,99993981
0,999455	0,999589	0,99961538
0,999399	0,999568	0,99957601
0,999955	0,999969	0,999970
0,999836	0,999876	0,999890
0,999634	0,999711	0,999714
0,999799	0,999841	0,999843
0,999853	0,999904	0,999901
0,999879	0,999921	0,999919
0,999900	0,999925	0,999922
0,999890	0,999913	0,999910
0,999950	0,999961	0,999957
0,999890	0,999913	0,999914
0,999900	0,999925	0,999922
0,999989	0,999989	0,999990
0,999985	0,999987	0,999987
0,999963	0,999966	0,999968
0,999877	0,999882	0,999894
0,999818	0,999849	0,999835
0,998873	0,998638	0,999031

Table 2 is an example of the calculation of three scenarios for the cognitive map presented in Table 1. In the second scenario, the value of concept V2 (as the most different in value) is assumed to decrease by 2 times compared to the current state.

In the third scenario, it is assumed that the values of concepts V5, V25, V26 (as those most influencing the state of the system) will be reduced by 2 times compared to the current state.

The analysis of three scenarios allows us to conclude that when making strategic decisions, the main attention must be paid to adjusting the value of the V2 indicator, as well as preventing a decrease in indicators V5, V25, V26.

It is worth noting that reducing the value of V2 is a higher priority than maintaining the values of V5, V25, V26.

4 CONCLUSIONS

This paper describes an aproach for assessing the international activities of a university using fuzzy cognitive maps. As a result of the study, a cognitive model for managing the effectiveness of international activities of universities was built. To build this model, we took into account the quality criteria for formalizing experts' views on the international activities of universities, as well as statistical data. The main purpose of the model is to help the expert to develop the right decision. This model displays and organizes information about international activities of university, taken in account a large number of influencing factors, on different levels. The cognitive model not only allows to systematize and "clarify" the expert's knowledge, but also helps to identify the most advantageous points applications of control actions of the subject of management.

It is important here to foresee what the consequences will be have certain management strategies. To develop such forecasts, a scenario modelling is used within the framework of cognitive analysis. After the cognitive map was built, several scenarios simulated the situation using the FCMapper tool. Three scenarios for the development of the university's international activities were reviewed and analyzed based on a fuzzy contive map.

Future work is connected with development of the decision support system based on the developed congintive map, which will allow experts to set up the most important factors and to simulate the different scenarios.

REFERENCES

[1] T. Schubert, E. Baier, and C. Rammer, "A behavioural approach. Journal of International Business Studies," vol. 49(1), pp. 70-95, January 2018, doi: 10.1057/s41267-017-0101-0.

[2] H. de Wit and P. G. Altbach, "Internationalization in higher education: global trends and recommendations for its future," Policy Reviews in Higher Education, vol. 5(1), pp. 28-46, September 2020, doi: 10.1080/23322969.2020.1820898.

[3] A. Kolomiets, D. Grinchenkov, and K. Vodenko, "PEST- and SWOT-analysis of university internationalization factors," Journal of Physics: Conference Series, vol. 1415, p. 012003, October 2019, doi: 10.1088/1742-6596/1415/1/012003.

[4] G. Sivertsen, "Patterns of internationalization and criteria for research assessment in the social sciences and humanities," Scientometrics, vol. 107, pp. 357-368, May 2016, doi: 10.1007/s11192-016-1845-1.

[5] P. B. Keenan and P. Jankowski, "Spatial Decision Support Systems: Three decades on," Decision Support Systems, vol. 116, pp. 64-76, January 2019, doi: 10.1016/j.dss.2018.10.010.

[6] P. Morone, P. M. Falcone, and A. Lopolito, "How to promote a new and sustainable food consumption model: A fuzzy cognitive map study," Journal of Cleaner Production, vol. 208, pp. 563-574, Jan. 2019, [Online]. Available: https://doi.org/10.1016/j.jclepro.2018.10.075.

[7] E. Bakhtavar, M. Valipour, S. Yousefi, R. Sadiq, and K. Hewage, "Fuzzy cognitive maps in systems risk analysis: a comprehensive review," Complex & Intelligent Systems, vol. 10.1007/s40747-02000228-2, Nov. 2020, [Online]. Available: https://doi.org/10.1007/s40747-020-00228-2.

[8] G. Felix, G. Nápoles, R. Falcon, W. Froelich, K. Vanhoof, and R. Bello, "A review on methods and software for fuzzy cognitive maps," Artificial Intelligence Review, vol. 52, no. 3, pp. 1707-1737, Aug. 2017, [Online]. Available: https://doi.org/10.1007/s10462-017-9575-1.

[9] P. Szwed, "Classification and feature transformation with Fuzzy Cognitive Maps," Applied Soft Computing, vol. 105, p. 107271, Jul. 2021, [Online]. Available: https://doi.org/10.1016/j.asoc.2021.107271.

[10] István Harmati, M. F. Hatwágner, and L. T. Kóczy, "Global stability of fuzzy cognitive maps," Neural Computing and Applications, vol. 35, no. 10, pp. 7283-7295, Dec. 2021, [Online]. Available: https://doi.org/10.1007/s00521-021-06742-9.

[11] G. Sivertsen, "Patterns of internationalization and criteria for research assessment in the social sciences and humanities," Scientometrics, vol. 107, no. 2, pp. 357-368, Feb. 2016, [Online]. Available: https://doi.org/10.1007/s11192-016-1845-1.

[12] Jose A. Fernandez Leon and Gerardo G. Acosta. J. A. Fernández-León and G. Acosta, "Uncovering the Secrets of the Concept of Place in Cognitive Maps Aided by Artificial Intelligence," Cognitive Computation, Oct. 2022, [Online]. Available: https://doi.org/10.1007/s12559-022-10064-w.

[13] N. D. Pankratova, G. Gorelova, and Vladimir Pankratov, "Study of the Plot Suitability for Underground Construction: Cognitive Modelling," Advances in intelligent systems and computing, pp. 246-264, Jul. 2020, [Online]. Available: https://doi.org/10.1007/978-3-030-54215-3_16.

[14] P. Yang, "China in the global field of international student mobility: an analysis of economic, human and symbolic capitals," A Journal of Comparative and International Education, pp. 1-19, May 2020, [Online]. Available: https://doi.org/10.1080/03057925.2020.1764334.

[15] T. Schubert, E. Baier, and C. Rammer, "Firm capabilities, technological dynamism and the internationalisation of innovation: A behavioural approach," Journal of International Business Studies, vol. 49, no. 1, pp. 70-95, Sep. 2017, [Online]. Available: https://doi.org/10.1057/s41267-017-0101-0.

[16] S. Soliman, J. Anchor, and D. Taylor, "The international strategies of universities: deliberate or emergent?," Studies in Higher Education, vol. 44, no. 8, pp. 1-12, Mar. 2018, [Online]. Available: https://doi.org/10.1080/03075079.2018.1445985.

[17] J. Aguilar, "Multilayer Cognitive Maps in the Resolution of Problems using the FCM Designer Tool," Applied Artificial Intelligence, vol. 30, no. 7, pp. 720-743, Aug. 2016, [Online]. Available: https://doi.org/10.1080/08839514.2016.1214422.

[18] Holman Bolívar Barón, Rubén González Crespo, Jordán Pascual Espada, and Óscar Sanjuán Martínez, "Assessment of learning in environments interactive through fuzzy cognitive maps," Soft Computing, vol. 19, no. 4, pp. 1037-1050, May 2014, [Online]. Available: https://doi.org/10.1007/s00500-014-1313-x.

[19] Z. Kahvandi, E. Saghatforoush, A. ZareRavasan, and C. Preece, "Integrated Project Delivery Implementation Challenges in the Construction Industry," Civil Engineering Journal, vol. 5, no. 8, pp. 1672-1683, Aug. 2019, [Online]. Available: https://doi.org/10.28991/cej-2019-03091362.

[20] T. Mansouri, A. ZareRavasan, and A. Ashrafi, "A Learning Fuzzy Cognitive Map (LFCM) Approach to Predict Student Performance," Journal of Information Technology Education: Research, vol. 20, pp. 221-243, 2021, [Online]. Available: https://doi.org/10.28945/4760.