ISSN 2181-3187

INFORMATION IN SYSTEMS DECISION ACCEPTANCE TO DO MODELS APPLICATION AND THEIR CONSEQUENCES EVALUATION IMPROVED STRATEGY.

Kodirov Dilmurod Tokhtasinovich

Namangan Institute of Engineering and Technology

Djuraev Sherzod Sobirdzhonovich

Namangan Institute of Engineering and Technology

Toshpulatov Qobiljon Yaxyoxon ugli

Namangan Institute of Engineering and Technology

Abstract. This study explores the application of advanced decision-making models in information systems, focusing on enhancing efficiency under multi-criteria and uncertain conditions. The research examines methods like the Analytical Hierarchy Process (AHP) and the Technique for Order Preference by Similarity to Ideal Solution (TOPSIS) for determining hierarchical structures and assessing alternatives based on their proximity to ideal solutions. By integrating these models, the study demonstrates their effectiveness in addressing complex decision-making processes, emphasizing improved accuracy and consistency. Additionally, dynamic, static, and linear weight models are analyzed to compare their adaptability to real-time data. The findings highlight the superiority of dynamic models in reflecting environmental changes, while also discussing the limitations of static and linear models in dynamic systems. Future research directions include integrating fuzzy logic and probabilistic approaches for further enhancement.

Keywords. Decision-making models, Analytical Hierarchy Process (AHP), TOPSIS, hierarchical structures, multi-criteria optimization, dynamic weight models, information systems, uncertainty, fuzzy logic, real-time decision-making.

Introduction. Current time information systems decision acceptance to do in the process efficiency increase for complicated algorithms and mathematician models to apply This is article information in systems decision acceptance to do models importance and their consequences assessment according to improved strategies seeing comes out . Home attention many criterion decision acceptance to do (KMQQ) and uncertainty under the circumstances decision acceptance to do to the models focused .

Decision acceptance to do process following stages own inside takes :

- Data assembly and analysis to do ;
- Alternative options to determine ;
- Every one option grades calculation ;
- Optimal the decision choice .

Mathematician basis : Many criterion optimization in models decision function as follows is expressed as :

$$F(x) = \sum_{i=1}^{n} \omega_i \cdot f_i(x)$$

this on the ground :

- x — decision acceptance to do parameters represents ;
- $f_i(x)$for each criterion ;
- ω_i— criteria weight coefficients .

Analytical hierarchy process (AIJ) Decision acceptance to do hierarchical structure determination and criteria compare through done is increased .

$$\omega_i = \frac{\prod_{j=1}^{n} a_{ij}^{1/n}}{\sum_{i=1}^{n} \prod_{j=1}^{n} a_{ij}^{1/n}}$$

this on the ground $a_{ij}^{1/n}$— criteria between couple compare results .

Pairing compare schedule consistency check for **consistency ratio (CR)** is :

Consistency index (CI):

$$CI = \frac{\lambda_{max} - n}{n - 1}$$

this on the ground :

- λ_{max}— main own typical value ;
- n — table size (criteria) number).

Consistency ratio (CR):

$$CR = \frac{CI}{RI}$$

this RI on the ground — random index , table to size looking at in advance determined value .

If CR<0.1, then table consistent is considered ; reflection without , again assessment demand is being done .

Every one for an alternative option final The advantage (S_k) is as follows is :

$$S_k = \sum_{i=1}^{n} \omega_i \cdot v_{ik}$$

this on the ground :

- $S_k$for k-variant final advantage ;
- ω_i— weight of criterion i;
- v_{ik}— k- option i-criterion according to value .

If three criterion according to two option assessment necessary If (C_1 ,C_2 ,C_3) , the following couple compare schedule and assessment results is taken :

ISSN 2181-3187

Mezonlar	C_1	C_2	C_3
V_1	0.5	0.3	0.2
V_2	0.6	0.25	0.15

Pairing compare through $\omega_i$is determined and the preference of the options isS_k is considered .

improved AIJ model decision acceptance in doing more precisely and consistent the results provides . This mathematician expression , especially complex information in systems effective application possible .

Hierarchical in the structure criteria relative determining the importance (weights) possible . Given weights and alternative options price based on every one ideal and anti-ideal solution of the option proximity level to calculate mathematician expression create possible .

This approach criteria complicated hierarchical from the system starting from , they are used in the TOPSIS model options assessment for prepares .

Hierarchical structure and couple compare

- AIJ method through criteria hierarchical structure is determined .
- Every one criterion for couple compare schedule is compiled :

$$A = \begin{bmatrix} 1 & a_{12} & \dots & a_{1n} \\ \frac{1}{a_{12}} & 1 & \dots & a_{2n} \\ \vdots & \vdots & \ddots & \vdots \\ \frac{1}{a_{1n}} & \frac{1}{a_{2n}} & \dots & 1 \end{bmatrix}$$

Through AIJ criteria The weight (ω_i) is :

$$\omega_i = \frac{\prod_{j=1}^{n} a_{ij}{}^{1/n}}{\sum_{i=1}^{n} \prod_{j=1}^{n} a_{ij}{}^{1/n}}$$

ISSN 2181-3187

Options every one criterion according to is evaluated and for TOPSIS following matrix is formed :

$$X = \begin{bmatrix} x_{11} & x_{12} & \cdots & x_{1n} \\ x_{21} & x_{22} & \cdots & x_{2n} \\ \vdots & \vdots & \ddots & \vdots \\ x_{m1} & x_{m2} & \cdots & x_{mn} \end{bmatrix}$$

this on the ground :

- x_{ij}— i -variant and j- criterion for value ;
- m — options number ;
- n — criteria number .

Normalized decision matrix calculation following expression using is defined as :

$$\boldsymbol{r_{ij}} = \frac{\boldsymbol{x_{ij}}}{\sqrt{\sum_{k=1}^{m} \boldsymbol{x_{kj}^2}}}$$

Weight with multiplied normalized matrix following in appearance will be :

$$\boldsymbol{v_{ij}} = \boldsymbol{\omega_j} \cdot \boldsymbol{r_{ij}}$$

Ideal and anti-ideal points definition :

Ideal point (A $^+$):

$$A^+ = \{v_1^+, v_2^+, v_3^+, \ldots, v_n^+\},$$

$$v_j^+ = \max(v_{ij}) \text{ (maksimizatsiya uchun) } yoki \ \min(v_{ij}) \text{ (minimizatsiya uchun)}$$

Anti-ideal point (A $^-$):

$$A^- = \{v_1^-, v_2^-, v_3^-, \ldots, v_n^-\},$$

$$v_j^- = \max(v_{ij}) \text{ (maksimizatsiya uchun) } yoki \ \min(v_{ij}) \text{ (minimizatsiya uchun)}$$

ISSN 2181-3187

Ideal distance (D_i^+):

$$D_i^+ = \sqrt{\sum_{j=1}^{n} (v_{ij} - v_j^+)^2}$$

Anti-ideal distance (D_i^-):

$$D_i^- = \sqrt{\sum_{j=1}^{n} (v_{ij} - v_j^-)^2}$$

Every to the ideal solution for one option proximity The coefficient (C_i) is :

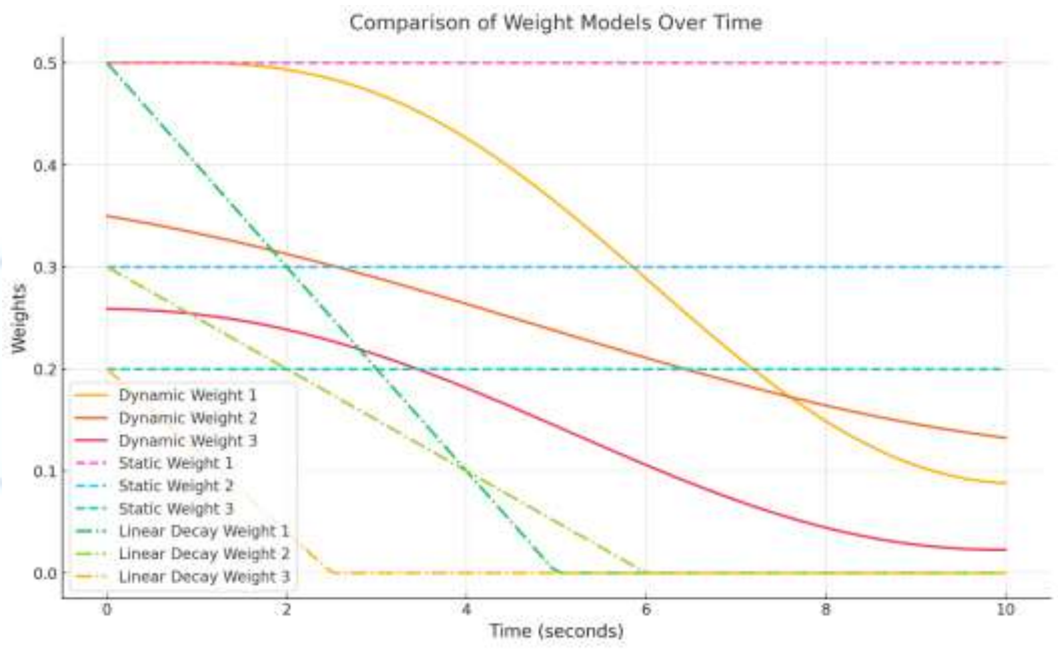
$$C_i = \frac{D_i^-}{D_i^+ - D_i^-}, \qquad 0 \leq C_i \leq 1$$

Options C_i to the values looking at is sorted . Most high to value The option with the most optimal solution as is selected .

This models via AIJ complex hierarchical structures determination and criteria clear weight opportunity gives . Through TOPSIS options to the ideal solution proximity to the level looking at assessment possible . Usgbu approach every kind kind of to systems flexible is used .

AIJ + TOPSIS model complicated hierarchical in systems decision acceptance to do in optimization effective tool This is approach unclear and many criterion under the circumstances accuracy and flexibility increases . Next improvements for Fuzzy or probability approaches add possible .

This the model other decision acceptance systems with comparison possible . Figure 1.



1- Graphic Analysis : Dynamic , Static , and Linear Weight Models Comparison

Above graphic three kind weight model one time between compares :

1. **Dynamic Model:** Weights in real time factors and exponential decrease with changes .
2. **Static Model:** Weights time during permanent to be remains .
3. **Linear Decline Model :** Weights time passing with linear accordingly decreases .

Analysis and Comparison

1. Dynamic Model

- **Features :**
  - Weights exponential decreases , but external factors (a(t)\ alpha (t) a (t)) sinusoidal vibrations through to them impact does .
  - Dynamic model variable to the environment flexible and real time information into account takes .

- **Advantages :**
  - Weights in the environment changes reflection it makes , this decision acceptance in doing accuracy increases .
  - Real to time flexible divided , complex under the circumstances effective .

2. Static Model

- **Features :**
  - Weights time during does not change and permanent the value save stands .
  - Real time information or changes into account can't .
- **Limitations :**
  - Variable under the circumstances decision acceptance to do accuracy reduces .
  - Speaker to systems suitable not because time passing with significant information is lost .

3. Linear Decline Model

- **Features :**
  - The weights decrease at the same rate over time ($w_i = w_i(0) - \lambda \cdot t$).
  - Variable to the conditions limited at the level suitable is coming .
- **Advantages :**
  - Simplicity because of some static under the circumstances effective .
- **Limitations :**
  - Real time factors or nonlinear changes into account can't .
  - Decline one kind at a pace it will be , this dynamic in systems enough it's not .

Conclusion

In this research, the application of advanced decision-making models, including the Analytical Hierarchy Process (AHP) and the Technique for Order Preference by Similarity to Ideal Solution (TOPSIS), has been thoroughly investigated within the context of information systems. The integration of these models provides a robust framework for handling multi-criteria decision-making processes under uncertain conditions, offering enhanced precision and adaptability.

The comparison of dynamic, static, and linear weight models demonstrates that dynamic models are highly effective in real-time environments due to their flexibility and responsiveness to changing conditions. Conversely, static and linear models, while simpler, are less effective in capturing the nuances of dynamic systems and real-time factors.

This study underscores the importance of selecting appropriate decision-making tools based on the complexity and nature of the problem at hand. The combination of AHP and TOPSIS models proves to be a powerful approach for hierarchical structure determination and option evaluation, enabling decision-makers to achieve optimal solutions with greater accuracy.

Future research should focus on incorporating fuzzy logic and probabilistic methodologies to further enhance the adaptability and efficiency of these decision-making frameworks. By addressing these advancements, decision-making systems can achieve even greater reliability and precision in diverse applications.

REFERENCES

1. Chen, C. T., Lin, C. T., & Huang, S. F. (2006). A fuzzy approach for supplier evaluation and selection in supply chain management. *International Journal of Production Economics*, *102*(2), 289–301.
2. Rao, R. V. (2007). *Decision Making in the Manufacturing Environment: Using Graph Theory and Fuzzy Multiple Attribute Decision Making Methods*. Springer.
3. Saaty, T. L., & Vargas, L. G. (2001). *Models, Methods, Concepts & Applications of the Analytic Hierarchy Process*. Springer.

4. Yoon, K. P., & Hwang, C. L. (1995). *Multiple Attribute Decision Making: An Introduction*. Sage Publications.
5. Bellman, R. E., & Zadeh, L. A. (1970). Decision-making in a fuzzy environment. *Management Science, 17*(4), 141-164.
6. Chen, M., & Wang, Z. (2009). A hierarchical decision model for evaluating multiple criteria in uncertainty environments. *Expert Systems with Applications, 36*(4), 6946–6955.
7. Triantaphyllou, E., Shu, B., Sanchez, S. N., & Ray, T. (1998). Multi-criteria decision making: An operations research approach. *Encyclopedia of Electrical and Electronics Engineering, 15*, 175–186.
8. Ross, T. J. (2010). *Fuzzy Logic with Engineering Applications* (3rd ed.). Wiley.
9. Zopounidis, C., & Doumpos, M. (2002). Multi-criteria decision aid in financial decision making: Methodologies and literature review. *Journal of Multi-Criteria Decision Analysis, 11*(4-5), 167–186.
10. Roy, B. (1996). *Multicriteria Methodology for Decision Aiding*. Kluwer Academic Publishers.
11. Bender, D. J., & Simonovic, S. P. (2000). A fuzzy compromise approach to water resource systems planning under uncertainty. *Fuzzy Sets and Systems, 115*(1), 35–44.