International Journal of Combinatorial Optimization Problems and Informatics, 16(4), Sep-Dec 2025, 122-130. ISSN: 2007-1558.
https://doi.org/10.61467/2007.1558.2025.v16i4.959

www.editada.org

On the prediction of the labor welfare by using Markov chain approach

Rosa Irene Rojas Rauda[1], Omar Jacobo Santos Sánchez[2], Elisa Monterrubio Cabrera[1], Evangelina Rojas Rauda[3]

[1] Tecnológico Nacional de México, Instituto Tecnológico de Pachuca, Blvd. Felipe Ángeles Km. 84.5, Venta Prieta, C.P. 42083, Pachuca de Soto, Hidalgo, México.

[2]Universidad Autónoma del Estado de Hidalgo, Área Académica de Computación y Electrónica, Ciudad del Conocimiento, Kilómetro 4.5 carretera Pachuca - Tulancingo en la Colonia Carboneras de Mineral de la Reforma, C.P. 42184, Hidalgo, México.

[3] Tecnológico Nacional de México, Instituto Tecnológico de Minatitlán, Blvd. Instituto Tecnológico, Buena Vista Nte, C.P. 96848 Minatitlán, Ver, México

E-mails: rosa.rr@pachuca.tecnm.mx, elisa.mc@pachuca.tecnm.mx, omarj@uaeh.edu.mx, eva_rauda@hotmail.com

Abstract. In this contribution, the Markov chain approach is used to predict the job satisfaction of employees in a telecommunications company in Mexico. Under certain assumptions, the Chapman–Kolmogorov equation is applied to estimate the probabilities that: employees remain satisfied if they are satisfied; if they are not satisfied, the probability that they remain unsatisfied; if they are satisfied, the probability that they will become unsatisfied; and finally, if they are unsatisfied, the probability that they will become satisfied, within a one-year prediction horizon. Our proposal could be applied to support decision-making in human capital management strategies.

Keywords: Markov chain models, labor welfare, prediction.

Article Info
Received March 9, 2025
Accepted May 9, 2025

1 Introduction

In recent years, the main interest has been placed on human capital management (Torres, 2023; Eraso, 2022; Kaliannan et al., 2023, Echeverria et al., 2009) due to the changes faced by the business sector and the participation and influence of the human factor in the sustainability of the business in the market. Therefore, new resource management models are required (Da Silva, 2020), which allow the updating of processes, the capacity for innovation will improve in the performance of personnel (Rahimic, 2013).

Small and medium-sized enterprises (MSMEs) are an essential component within the business fabric in Latin America (Rivera, 2023), in Mexico MSMEs represent more than 99% of all companies and generate a significant part of formal employment (INEGI, 2020). However, despite their relevance, many of these companies face significant limitations in the implementation of advanced technology, such as data analytics and business intelligence (Ramírez, 2024).

On the other hand, the productivity and performance of the labor force in Mexico as in other countries has a negative influence due to the job insecurity in which they find themselves, that is, instability in employment, low salaries and long hours (Mafud, 2017), due to which work life and the satisfaction or dissatisfaction that it generates is highly relevant. Strengthening them is key to sustainable economic growth, which maximizes labor well-being, the retention of qualified employees that leads to the establishment of a long-term commitment among employees to maintain a stable labor relationship (Kadiresan, 2015).

To understand people in the workplace, it must be taken into account that well-being is subjective and that it is composed of two basic facets: one focused on affective-emotional aspects (referring to the subject's moods) and another focused on evaluative cognitive aspects (referring to the subject's evaluation of satisfaction with his or her own life) (Cuadra, 2003). It is important to point out the importance of workplace well-being, satisfaction and its relationship with the competitiveness of the organization, theoretical models have been generated for their analysis and recommendations are made to generate healthy workplace well-being (Oleas, 2024; Rueda et al., 2024; Osuna, 2024; Riyanto, 2021; Putra, 2024).

In recent years, quantitative methodologies, such as Markov chains, have emerged as promising tools for modeling and predicting patterns related to worker well-being in private companies. Markovia models are considered as a quintessential example of conditional modeling (Bernardo & Smith, 2009), Markov chain models have been applied in areas as an analysis method to predict the change in the labor market in each region in Korea (Park & Lee, 2016), in the prediction of menu items when using interfaces, with the intention of improving the performance of human-computer interaction tasks and reducing browsing time (Lin, 2013), use of the Markov chain to model and predict over time the evolving behavior of the safety culture of the health personnel of a hospital in Mexico (Velázquez-Martínez, 2016), as well as in works where the Markov chain model is very useful for the prediction of behavior future of labor systems in which personnel movements are not specifically controlled (Okaekwu, 2016), In the area of Human Resources, Markov chains can represent a probability mapping of the transition from one state to another of the different components of the system as a function of time (Alrashedi, 2024); Therefore, the use of this probabilistic method will be able to show the expected results in a period of time where, based on these results, the company can make decisions according to the sustained state of the well-being of the employees. However, the Markov model in predicting job satisfaction has not been used.

This proposal addresses the use of the Markov chain in the prediction of job satisfaction in a telephone company in Hidalgo, Mexico. The research contributions are listed below:

1.- The Markov chain model was applied and predicted job well-being in a telephone company in Hidalgo, Mexico.
2.- A survey was designed and applied to measure aspects of labor well-being based on NOM 35 established by the Ministry of Labor and Social Welfare (STPS) in Mexico (2018) and (Meliá 1998).
3.- The prediction of occupational well-being using a Markov model allows decision-making regarding the planning of human capital management.

The paper is organized as follows: Section 2 is dedicated to some basic concepts of stochastic processes, in Section 3 the methodology used in the field research is described. Section 4 is devoted to the main results of the paper and its discussion. Finally in Section 5 the final comments and future work are exposed.

2 Preliminaries

In this section we recall briefly some basic concepts of the Markov processes. Consider a stochastic process X_n : $n=0,1,2,..$ in the discrete time domain.

Definition 1. (Lefebvre, 2007) *A Markov chain is a stochastic process in discrete time domain X_n : $n=0,1,2,..$ which any state $x_0, x_1, \ldots, x_{n+1}$ satisfies:*

$$P(x_{n+1}/\ x_0, \ldots, x_n) = P(x_{n+1}/\ x_n) \tag{2.1}$$

This definition implies the very well property of a Markov chain that the probability of a future state x_{n+1} only depends on the present state.

In a stationary Markov chain (it means that the time does not affect its probability, or it does not affect its probability in an important way), the transition probability of the state i in the time n to the state j in the time $n+1$, is denoted by

$$P(x_{n+1} = j/x_n = i) = P_{ij} \tag{2.2}$$

If the stationary Markov chain has two states, the transition probabilities can be grouped in a matrix (Stochastic matrix) $\boldsymbol{P_{st}}$ as follows

$$\boldsymbol{P_{st}} = \begin{bmatrix} P(x_{n+1} = 0 \,/\, x_n = 0) & P(x_{n+1} = 0 \,/\, x_n = 1) \\ P(x_{n+1} = 1 \,/\, x_n = 0) & P(x_{n+1} = 1 \,/\, x_n = 1) \end{bmatrix} = \begin{bmatrix} \boldsymbol{p}_{00} & \boldsymbol{p}_{01} \\ \boldsymbol{p}_{10} & \boldsymbol{p}_{11} \end{bmatrix} \tag{2.3}$$

Assume that $\boldsymbol{p_{00}} = a$, and $\boldsymbol{p_{11}} = b$, then, according to the properties of the Stochastic matrix follows that

$$\boldsymbol{P_{st}} = \begin{bmatrix} \boldsymbol{p}_{00} & \boldsymbol{p}_{01} \\ \boldsymbol{p}_{10} & \boldsymbol{p}_{11} \end{bmatrix} = \begin{bmatrix} a & 1-a \\ 1-b & b \end{bmatrix} \tag{2.4}$$

Then, the transition state diagram is depicted in Figure 1.

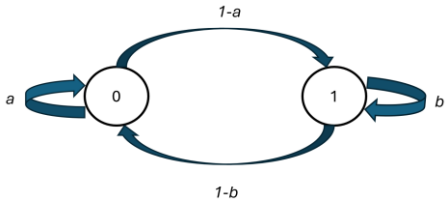

Figure 1. Transition satete diagram for a Markov chain of two states.

According to the Chapman-Kolmogorov equation (Lefebvre, 2007) the transition probability in n steps, $p_{ij}(n)$ for the states i and j can be calculated as a power of the matrix $\boldsymbol{P_{st}}$

$$\boldsymbol{p_{ij}(n) = (P_{st}{}^{n})_{ij}} \tag{2.5}$$

These basic results are used to calculate the probability of the answers of applied cuestionaries to a entreprise to estimate the satisfaction level of the company collaborators. The methodology used for to construct th questionary of workplace well-being is exposed in the following section.

3. Methodology

The research is quantitative of a cross-sectional type and based on the Markov model, the population under study was made up of personnel who work on the company in the State of Hidalgo, Mexico, which is made up of human resources managers, social welfare managers, traffic and store employees, being a total of 25 employees, which represents the total number of employees in the company, and a survey was applied to measure aspects of staff satisfaction, which was applied at fourth times, where data were collected in the months of March of 2021 to 2024. The results of the applied survey made it possible to validate the prediction results of the Markov model.

The questionary is composed of thirty-one questions. This questionary covers fourteen subjects, Table 1 shows each question classified in the fourteen categories.

Table 1. The thirty-one question of the applied questionnaire**.**

1. Health and safety conditions	The space where I work allows me to carry out my activities in a safe and hygienic way
	I consider that the occupational safety and health rules apply to my work
	Working conditions of lighting, ventilation, noise, and temperature are good
2. Motivation	The salary I receive is motivational
	The system of commissions, financial rewards and incentives I receive motivate me
	The social security benefits I receive and/or other insurance benefits are in my favor
3. Amount of work	Due to the amount of work, I have, I should not spend extra time on my shift
4. Mental effort required by work	At work I don't have to make hard decisions very quickly
	At work I am not required to deal with several matters at the same time
5. Activities and responsibilities at work	At work I don't get conflicting orders
	They provide me with sufficient resources to carry out my tasks effectively
6. Working day	At work I am not required to work on days off, holidays or weekends
	Time at work is not considered to be detrimental to my family or personal activities
7. Decisions at work	During the working day I can take breaks when I need them
	The ability to decide autonomously on work-related aspects benefits the firm
8. Changes in work	Changes in work do not make my job any harder
	When changes are made to my work, my ideas or contributions are considered
9. Training and information provided at	They inform me with whom I can solve problems or work issues
	I receive useful training to do my job
10. Relationship with your boss	My boss takes my views and opinions into account
	My boss helps to solve problems at work
	My boss oversees my activities and guides me to do them properly
11. Relationship between colleagues	I can trust my coworkers
	When we have to work together, the partners collaborate
12. Recognition at work	The way my work is evaluated at my workplace helps me improve my performance
	If I get the expected results in my work, I am rewarded or recognized
13. Acts of workplace violence	My presence is ignored or excluded from working meetings and decision-making

	They block or prevent me from having opportunities to get promoted or improved in my job
	I am the subject of abuse of authority by the company
14. Opportunities provided by the firm	In my job I am given the opportunity to do activities in which I excel
	The company offers training opportunities

For each question, employees could provide one of the following five responses: Always, Almost Always, Sometimes, Rarely, or Never, based on to the norm NOM 35 (scale Liker) of the Mexican Department of Labor and Social Welfare (STPS of the acronyms in Spanish) (STPS, 2019) and the approach exposed on (Meliá, 1989). The questionary was applied to 25 employees. (the total number of employees), which represents the totality of the employees of the enterprise. This set of questions was applied to the employees for four years (2021 to 2024). With the obtained answers of the applied survey, and the basic results given in the Section Preliminaries, the probabilities were calculated in the next section.

4. Results and Discussion

The results shown in the section Preliminaries can be used to calculate the probability of different answers obtained through the applied questionary to company employees. To consider the stochastic process of answering each interrogation of the set of questions as a Markov chain, only the responses *Always* and *Never*. These answers represent totally satisfied employees (Always), and the totally unsatisfied employees (Never) on the fourteen categories listed above, so the first property to consider that this process is a Markov chain with two states is fulfilled. Now, according to the results obtained, the probability for each category does not significantly change over the four years. In fact, we calculate the probability to each answer and then the average of these probabilities was calculated. This average does not vary in a significant way in the four years considered. Figure 2 shows the probability to answer "always" for the first category for the four years.

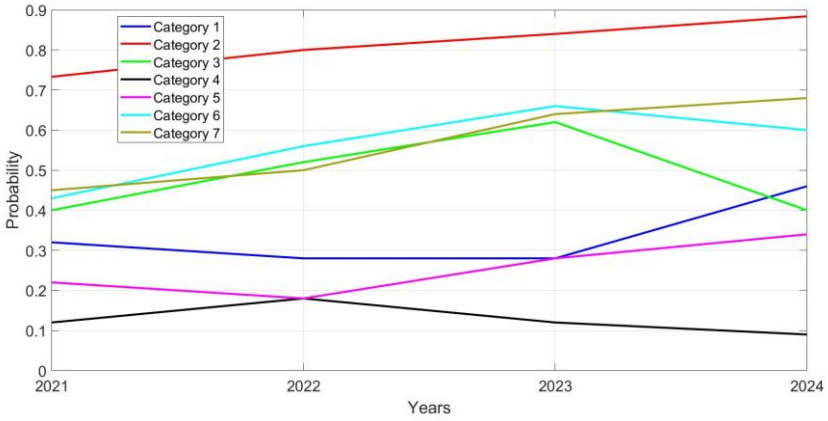

Figure 2. The averages of the categories one to seven for the four years, answer "always".

Despite there existing some variation in each year, this variation is not important and then could be considered an average for all years. The rest of the categories are shown in Figure 3.

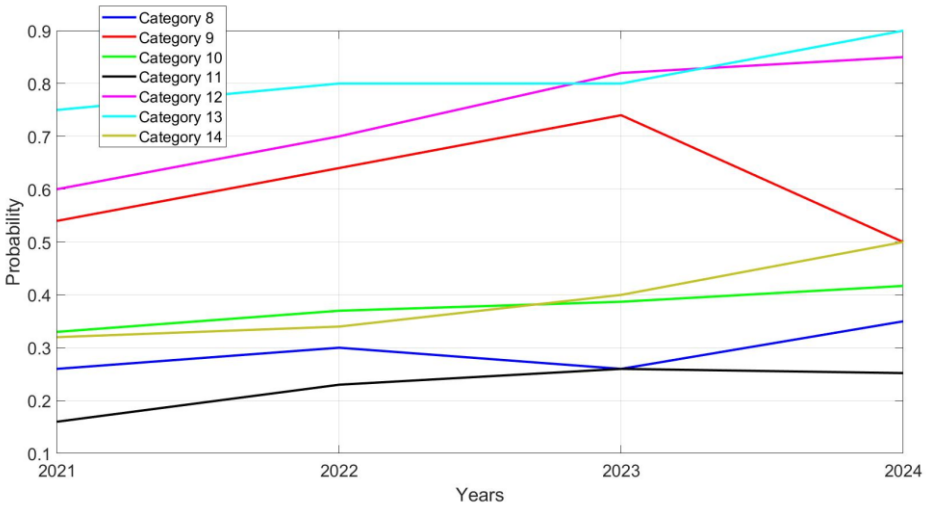

Figure 3. The averages of the categories 8 to 14 for the four years, answer "always".

Again, the probabilities present some variations, however they are not significant. According to these results, we consider this process satisfied one condition to be a Markov chain. The probabilities of the answers "never" are shown in the Figure 4, for the categories 1 to 7, and in the Figure 5 for the categories 8 to 14.

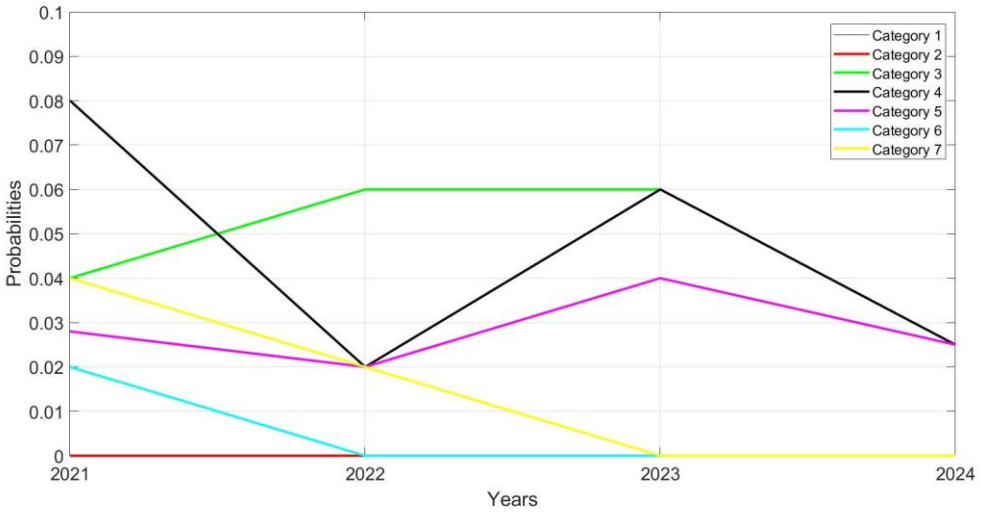

Figure 4. The probabilities of the categories 1 to 7 for the four years, answer "never".

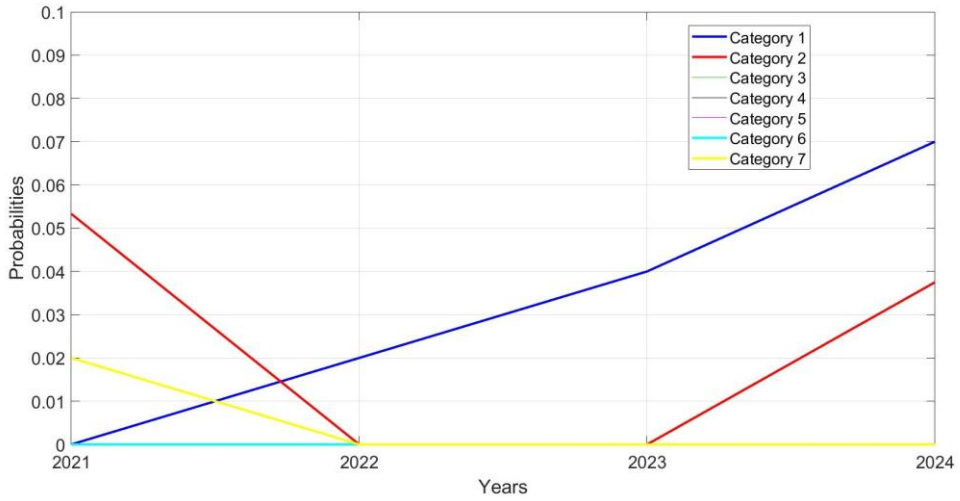

Figure 5. The probabilities of the categories 8 to 14 for the four years, answer "never".

As the case of the answer "Always", not important changes in each year are shown in the probabilities for each category, we consider that this process satisfies one condition to be a Markov chain. Now, the probability that an employe is totally satisfied (assign x_1 to this stochastic event) or totally unsatisfied (assign x_0 to his event) in a specific year, depends weakly on the satisfaction that this employe had two years ago, please see (Robbins & Judge, 2013; Penagos et al, 2028)), so we can assume that the condition given by the expression (2.2) is satisfied for the process to answer "Always" or "Never'. Then these stochastic processes can be assumed as Markov chains, please see Definition 1. Under this consideration, one can calculated for each category (answer "always" and "never") the probability $\boldsymbol{p_{00}}$, and $\boldsymbol{p_{11}}$, (here the state 0 means unsatisfied and 1 means satisfied) it means, the conditional probabilities that if one employe is unsatisfied, continues unsatisfied ($\boldsymbol{p_{00}}$) and if one employe is satisfied continues satisfied ($\boldsymbol{p_{11}}$). These probabilities can be calculated for each category, for both answers: "always" and "never", and consequently, to calculate the stochastic matrix $\boldsymbol{P_{st}}$ given by the equation (2.4) and to obtain for each category the transition state diagram (see Figure 1). Figures 6 and 7 show the transition state diagrams are shown for each category.

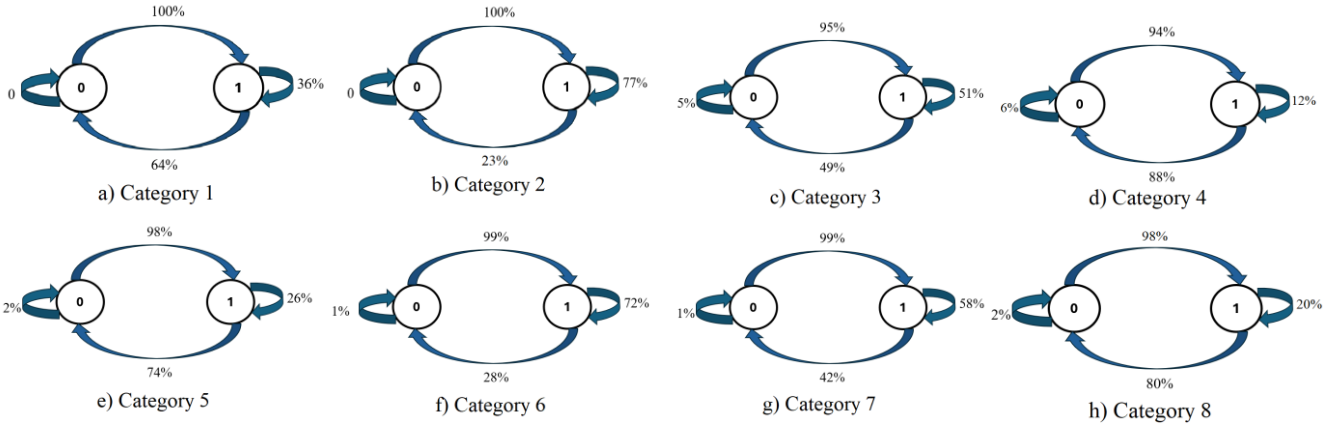

Figure 6. The transition state diagrams for categories 1 to 8.

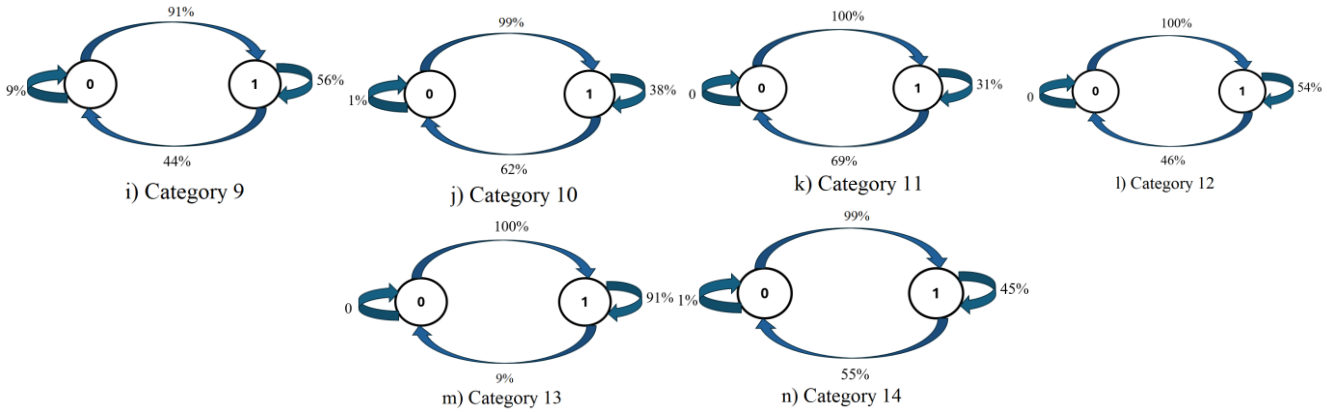

Figure 7. The transition state diagrams for categories 9 to 14.

The stochastic matrices for each category can be constructed for each category:$(\boldsymbol{P_{st}})_i$, *i=1,…,14.* Now, according with the equation 2.5, the prediction for the next period could be calculated as a power of the stochastic matrices: $(\boldsymbol{P_{st}})_i^n$. So, in five periods ($n=5$), it means the year 2025, the predictions for each category are displayed in Table 2.

Table 2. The prediction of each category by using of Chapman-Kolmogorov Theorem.

	Stochastic Matrix $(\boldsymbol{P_{st}})_i$	Prediction $(\boldsymbol{P_{st}})_i^5$		Stochastic Matrix $(\boldsymbol{P_{st}})$	Prediction $(\boldsymbol{P_{st}})_i^5$
Category 1	$\begin{bmatrix} 0 & 1 \\ 0.64 & 0.36 \end{bmatrix}$	$\begin{bmatrix} 0.32477 & 0.6752 \\ 0.4321 & 0.5678 \end{bmatrix}$	**Category 2**	$\begin{bmatrix} 0 & 1 \\ 0.23 & 0.77 \end{bmatrix}$	$\begin{bmatrix} 0.1864 & 0.8135 \\ 0.1871 & 0.8128 \end{bmatrix}$
Category 3	$\begin{bmatrix} 0.05 & 0.95 \\ 0.49 & 0.51 \end{bmatrix}$	$\begin{bmatrix} 0.3293 & 0.6706 \\ 0.3458 & 0.6541 \end{bmatrix}$	**Category 4**	$\begin{bmatrix} 0.06 & 0.94 \\ 0.88 & 0.12 \end{bmatrix}$	$\begin{bmatrix} 0.2920 & 0.7079 \\ 0.6627 & 0.3372 \end{bmatrix}$
Category 5	$\begin{bmatrix} 0.02 & 0.98 \\ 0.74 & 0.26 \end{bmatrix}$	$\begin{bmatrix} 0.3199 & 0.6800 \\ 0.5134 & 0.4865 \end{bmatrix}$	**Category 6**	$\begin{bmatrix} 0.01 & 0.99 \\ 0.28 & 0.72 \end{bmatrix}$	$\begin{bmatrix} 0.2193 & 0.7806 \\ 0.2207 & 0.7792 \end{bmatrix}$
Category 7	$\begin{bmatrix} 0.01 & 0.99 \\ 0.42 & 0.58 \end{bmatrix}$	$\begin{bmatrix} 0.2897 & 0.7102 \\ 0.3013 & 0.6986 \end{bmatrix}$	**Category 8**	$\begin{bmatrix} 0.02 & 0.98 \\ 0.80 & 0.20 \end{bmatrix}$	$\begin{bmatrix} 0.2904 & 0.7095 \\ 0.5791 & 0.4208 \end{bmatrix}$
Category 9	$\begin{bmatrix} 0.09 & 0.91 \\ 0.44 & 0.56 \end{bmatrix}$	$\begin{bmatrix} 0.3223 & 0.6776 \\ 0.3276 & 0.6723 \end{bmatrix}$	**Category 10**	$\begin{bmatrix} 0.01 & 0.99 \\ 0.62 & 0.38 \end{bmatrix}$	$\begin{bmatrix} 0.3331 & 0.6668 \\ 0.4176 & 0.5823 \end{bmatrix}$
Category 11	$\begin{bmatrix} 0 & 1 \\ 0.69 & 0.31 \end{bmatrix}$	$\begin{bmatrix} 0.3157 & 0.6842 \\ 0.4721 & 0.5278 \end{bmatrix}$	**Category 12**	$\begin{bmatrix} 0 & 1 \\ 0.46 & 0.54 \end{bmatrix}$	$\begin{bmatrix} 0.3009 & 0.6990 \\ 0.3215 & 0.6784 \end{bmatrix}$
Category 13	$\begin{bmatrix} 0 & 1 \\ 0.09 & 0.91 \end{bmatrix}$	$\begin{bmatrix} 0.0825 & 0.9175 \\ 0.0826 & 0.9174 \end{bmatrix}$	**Category 14**	$\begin{bmatrix} 0.01 & 0.99 \\ 0.55 & 0.45 \end{bmatrix}$	$\begin{bmatrix} 0.3276 & 0.6723 \\ 0.3735 & 0.6264 \end{bmatrix}$

In all the categories the prediction indicates that if an employee is fully unsatisfied, the most probable outcome is that he/she remains fully unsatisfied. Additionally, if an employee is fully satisfied, the most probable outcome is that he/she remains fully satisfied. The last fact is observed in almost all categories except in categories 1, 10, 11 and 14, where the probability $\boldsymbol{p_{10}}$ is greater than 60%, or the probabilities $\boldsymbol{p_{10}}$ and $\boldsymbol{p_{11}}$ are closer (category 14). This phenomenon is known as *Probability inversion over successive iterations* and in this case is observed: *In a two-state Markov chain, if the transition probability from state 1 to state 0 ($\boldsymbol{p_{10}}$) is significantly high, the steady-state probability distribution will shift in favor of state 0. This leads to an inversion in the expected occupancy over successive iterations, altering the long-term equilibrium of the system*, please see (Norris, 1998). However, this expectation of change, not necessarily is a bad perspective, because the probabilities $\boldsymbol{p_{11}}$ are greater than the previous probabilities. Nevertheless, the rest of the categories, which are the most of them, present the same trend as in previous years.

Notice that with the calculation of the probabilities one cannot perceive some change in the future of the present situation, but with the prediction could give some probabilistic evidence about a change of the equilibrium of the system. It could be used to take some administrative decisions about human capital management. In fact, some of them are cited as follows:

By using tools such as Markov chains, which contribute to data analysis and knowledge generation, predictive models can be developed to help forecast the likelihood of an employee resigning, their level of dissatisfaction or satisfaction with their working conditions, enabling the company to design strategies to retain its employees in order to boost competitiveness and sustained growth.

The ability to collect and analyze relevant information allows companies to make informed decisions that directly impact the satisfaction and productivity of their employees; which will allow the Human Resources area the possibility of identifying trends and patterns that affect the well-being of employees; According to the results obtained, trends in the well-being of employees can be identified from the stability of the conditions that have prevailed in the organization, this prediction applies to categories 1, 10, 11 and 14.

By using tools such as Markov chains, which contribute to data analysis and knowledge generation, predictive models can be developed that help predict the probability that an employee will quit, their level of dissatisfaction or satisfaction with their working conditions, allowing the company to design strategies to retain its employees to boost the competitiveness and sustained growth of the company.

5 Conclusions

According to the results obtained, the Markov chains approach is useful to predict and analyze the workplace well-being of the staff and the factors, classified into different categories of a questionnaire, that influence staff satisfaction over four years were analyzed. Under certain assumptions, the studied process was considered a two-state Markov chain, which allowed for an estimation of workplace well-being predictions for a fifth year. The results indicate that most of the factors studied will remain in the same state, highlighting the need to propose planning actions to improve satisfaction levels. This prediction also makes it possible to identify which factors could yield better results if working conditions remain unchanged. Future work includes validation over at least two years.

References

Alrashedi, A. K. (2024). Optimising human resources management process on organizational success: Integrating Markov chain and fuzzy TOPSIS. *Journal of Human Resource and Sustainability Studies, 12*(3), 669–685.

Bernardo, J. M., & Smith, A. F. (2009). *Bayesian theory* (Vol. 405). John Wiley & Sons.

Cuadra, H., & Florenzano, R. (2003). *El bienestar subjetivo: hacia una psicología positiva*.

Da Silva Vicente, S. C., Rafael, D. N., Serra, F. A. R., & Almeida, L. R. T. (2020). Um estudo bibliométrico sobre CEOs nas estratégias empresariais. *Revista Eletrônica de Estratégia & Negócios, 13*(2), 214–238.

Eraso Espinosa, Y. M., & Salazar Muñoz, L. F. (2022). Beneficios de la gestión del capital humano empresarial y global. *Revista de Economía del Caribe, (30)*, 10–33.

Instituto Nacional de Estadística y Geografía. (2020). *Censo económico 2019: Resultados definitivos*. INEGI. https://www.inegi.org.mx/programas/ce/2019/

Kadiresan, V., Selamat, M. H., Selladurai, S., Ramendran, C. S., & Mohamed, R. K. M. H. (2015). Evaluación del desempeño y capacitación y desarrollo de prácticas de gestión de recursos humanos (HRM) sobre compromiso organizacional e intención de rotación. *Ciencias Sociales Asiáticas, 11*(24), 162.

Kaliannan, M., Darmalinggam, D., Dorasamy, M., & Abraham, M. (2023). Inclusive talent development as a key talent management approach: A systematic literature review. *Human Resource Management Review, 33*(1), 100926.

Lefebvre, M. (2007). *Applied stochastic processes*. Springer.

Lin, T., Xie, T. T., Mou, Y., & Tang, N. J. (2013). Markov chain models for menu item prediction. *International Journal of Technology and Human Interaction, 9*(4), 75–94.

Mafud, J. L. C., Arocena, F. L., & Moreno, M. P. (2017). La autoeficacia como mediador entre el estrés laboral y el bienestar. *Psicología y Salud, 27*(1), 71–78.

Meliá, J. L., & Peiró, J. M. (1989). La medida de la satisfacción laboral en contextos organizacionales: El Cuestionario de Satisfacción S20/23. *Psicologemas, 5*, 59–74.

Norris, J. R. (1998). *Markov chains*. Cambridge University Press.

Okaekwu, E. D. (2016). *A manpower planning model to predict future workforce behaviour and retention: A Markov chain approach* (Tesis doctoral, University of Johannesburg). http://hdl.handle.net/10210/233637

Oleas, J. P. P., & Sánchez, F. M. (2024). Análisis del bienestar laboral, la productividad y la retención del talento humano en las pequeñas y medianas empresas (PYMES). *Revista Científica Multidisciplinar G-ner@ndo, 5*(1), 4.

Osuna, A. A. H. (2024). Análisis de las políticas de bienestar laboral y su impacto en la comunidad universitaria en el Rosario, Sinaloa, México. *Revista Científica Profundidad Construyendo Futuro, 21*(21), 140–149.

Park, S. H., & Lee, K. (2016). Prediction for the spatial distribution of occupational employment by applying Markov chain model. *Journal of the Korean Geographical Society, 51*(4), 525–539.

Penagos, C. O. P., Albarracín, J. A. B., & Gómez, T. P. S. (2018). Vigencia conceptual de los factores de la motivación: Una perspectiva desde la teoría bifactorial propuesta por Herzberg. *Cuadernos Latinoamericanos de Administración, 14*(27), 25–52.

Putra, A. S. B., Kusumawati, E. D., & Kartikasari, D. (2024). Unpacking the roots and impact of workplace well-being: A literature review. *International Journal of Multidisciplinary Approach Research and Science, 2*(01), 312–321.

Putra, A. S. B., Kusumawati, E. D., & Kartikasari, D. (2024). Unpacking the roots and impact of workplace well-being: A literature review. *International Journal of Multidisciplinary Approach Research and Science, 2*(01), 312–321.

Rahimic, Z. (2013). Influence of organizational climate on job satisfaction in Bosnia and Herzegovina companies. *International Business Research, 6*(3), 129.

Ramírez, U. (2024, 21 de agosto). *La importancia del análisis de datos y la inteligencia de negocios para mipymes*. *Forbes*. https://forbes.com.mx/la-importancia-del-analisis-de-datos-y-la-inteligencia-de-negocios-para-mipymes/

Rivera, M. C., & Vega, M. C. (2023). Estrategias de marketing digital adaptadas a pequeñas y medianas empresas en Latinoamérica. *Boletín de Coyuntura, (38)*, 7–17.

Riyanto, S., Endri, E., & Herlisha, N. (2021). Effect of work motivation and job satisfaction on employee performance: Mediating role of employee engagement. *Problems and Perspectives in Management, 19*(3), 162.

Robbins, S. P., & Judge, T. A. (2013). *Comportamiento organizacional* (15.ª ed.). Pearson.

Rueda-López, R., Aja-Valle, J., García-García, L., & Vázquez-García, M. J. (2024). La influencia del liderazgo inclusivo sobre el bienestar laboral de las personas trabajadoras. *Revista Galega de Economía, 33*(1), 1–25.

Secretaría del Trabajo y Previsión Social. (2019, 22 de octubre). *Norma Oficial Mexicana NOM-035-STPS-2018, factores de riesgo psicosocial en el trabajo: Identificación, análisis y prevención*. Gobierno de México. https://www.gob.mx/stps/articulos/norma-oficial-mexicana-nom-035-stps-2018-factores-de-riesgo-psicosocial-en-el-trabajo-identificacion-analisis-y-prevencion

Torres, W. E. R. (2023). Análisis de la gestión del talento humano en el contexto empresarial actual: Una revisión bibliográfica. *INNOVA Research Journal, 8*(2), 83–106.

Velázquez-Martínez, J. D., Cruz-Suárez, H., & Santos-Reyes, J. (2016). Analysis and modelling of safety culture in a Mexican hospital by Markov chains. *Revista de Calidad Asistencial: Órgano de la Sociedad Española de Calidad Asistencial, 31*(5), 309–314.