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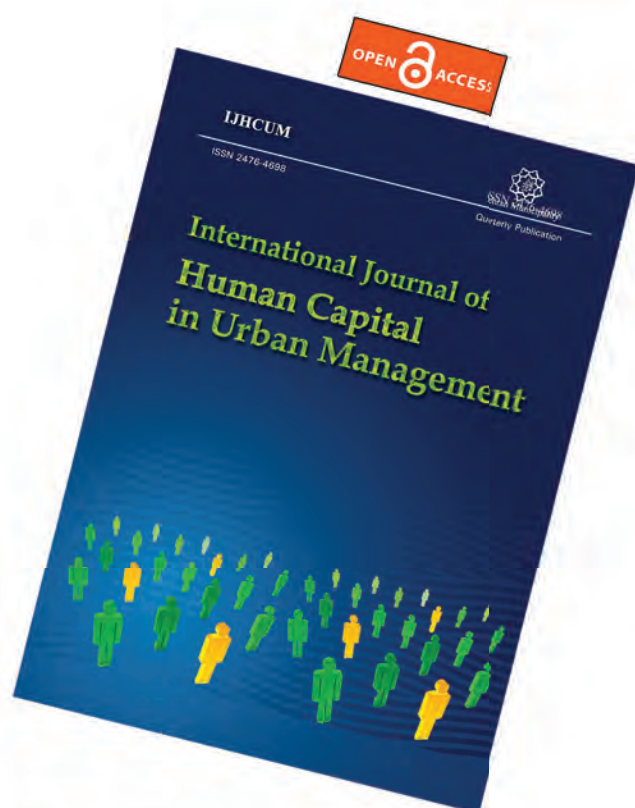
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ORIGINAL RESEARCH PAPER

Social content as a key factor for the efficiency of digital tourism systems

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ABSTRACT

BACKGROUND AND OBJECTIVES: Due to the development of Information and communication technologies, data clouds produced by several sources containing vital information about cities, give more opportunities to tourists to access more information and services. Tourists can overcome challenges such as movement and finding information and services by improving the digital Tourism System's efficiency. Digital tourism system can help tourists to move and to live in unfamiliar destinations, know different cultures, and buy services and productions more easily and independently. Therefore, digital tourism systems and their efficiency are a significant concern, which this research aims to address by evaluating the position of digital tourism systems and identifying the dimensions and influential factors affecting their efficiency.

METHODS: This study was a quantitative research and its target population consists of tourists or residents of the city of Mashhad use digital tourism systems. Due to the large population size, encompassing nearly 3 million residents and 20 million tourists annually, and considering the methods for determining the sample size for this study due to limitations arising from COVID-19, online questionnaires were utilized for data collection. Out of a total of 778 distributed questionnaires, 389 questionnaires were fully and accurately completed. The collected data was analysed using SPSS data analysis software to assess the analysis and relationships between the factors affecting the efficiency of digital tourism systems in Mashhad.

FINDINGS: The results showed that more than 82% of respondents are using digital tourism system for managing their travels and three main functions of digital tourism system mentioned by tourists are "reservation services" (41%), "take information" (31%), "moving, find destination" (28%). Additionally, in brightness of this study, it demonstrated that digital tourism system usually uses smart recommender systems to personalise its recommendations, which need tourists' information. However, many of tourists (56%) are unwilling to share their personal information. one of the most important finding of this research is that receiving social content significantly correlates with users' confidence in digital tourism system for sharing their personal information.

CONCLUSION: The findings showed that digital tourism system can optimise its personalisation process by using social content. It can ameliorate the users' confidence in digital tourism system for sharing their personal information, which will increase the efficiency of digital tourism system. This finding cannot only be a solution to overcome tourists' challenges but also is a key factor for tourism companies that are the beneficiaries of digital tourism system to achieve their business goals. Moreover, it is a wake-up alert for the public sector to accept its responsibility for legislating, monitoring and producing social content in digital tourism systems.

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INTRODUCTION

The increasing use of new information and communication technologies, such as Artificial Intelligent (AI), the Internet of Things (IoT), and block chain technology, is speeding up the global technological and industrial revolution (Zhang and Lu, 2021). Information and Communication Technologies (ICT) has transformed tourism globally and offers a range of new opportunities for development (Muneta et al., 2013). Governments, industries, and academia have all given artificial intelligence much attention. The internet and digital technology have substantially impacted our lives throughout the past two decades. tourists book trips online, talk to friends back home, and travelers can visualize distant locations in images, texts, or virtual realities, all of which have had a significant impact on the tourism industry. The ubiquity of internet-enabled devices has also significantly impacted infrastructure and communication (Zhang and Lu, 2021), which have made possible using Digital Tourism Systems (DTS). DTS (including websites, applications, etc.) allows tourists or tourism management to access mass information produced by three sources: (1) Users (e.g., online reviews); (2) Devices (e.g., mobile and GPS data); and (3) Operations (e.g., website traffic, Google Trends, and online booking data) (Li et al., 2018). However, the quantity of data in the current world is enormous, and big data analysis has gained popularity recently. Many organizations from a wide range of industries depend more on users and more on the knowledge produced from massive volumes of data created over the course of their operations. However, traditional data approaches and platforms are not well suited for big data analytics to analyses the tremendous amounts of structured and unstructured data to create correlations and predict trends across datasets (Gavighan et al., 2019). When it comes to real-world situations where customer engagement and customer service are at the heart of decision-making, these restrictions are more difficult to overcome (So et al., 2021). The tourism and hospitality sectors are not an exception. The interpretation and analysis of massive amounts of data, including multimodal datasets (numerical, categorical, time-series, picture, and text), is becoming increasingly important to the hospitality and tourism industries (Samara et al., 2020). The vast volume of data accessible makes information

extraction more difficult and necessitates the use of sophisticated analytical tools (Doborjeh et al., 2021). Thereby, personalization is essential to DTS to find the best information tourists request according to time and location. To achieve this goal, DTSs use AI in their Smart Recommender Systems (SRS) to "identify desires", "cloud processing", "find useful information", and "offer personalized information" to tourists (Rana and Deeba, 2019). However, while DTS needs tourists' personal information to improve the efficiency of its Smart Recommender System, a study revealed that tourists are not willing to share their personal information (Oliveira et al., 2020). This is one of the significant challenges in the data personalization process to improve the efficiency of DTS's functions. The lack of user involvement in improving the efficiency of digital systems is a major challenge that cannot be overcome solely by technical solutions. The theoretical foundations of this research indicate that most studies in the field of digital systems focus on improving their technical performance and programming (Rana and Deeba, 2019; Mohamed et al., 2019; Ghazanfar and Prugel-Bennett, 2010). However, in this study, an attempt was made to address the improvement of DTS performance by emphasizing the user's contribution. The findings of this research demonstrate that alongside the use of innovative technical methods, user feedback is indispensable in improving the efficiency of DTSs. This research, concentrating on DTSs' function, and tries to find the main challenges against DTSs' efficiency in Mashhad. Therefore, an online survey was conducted among 389 respondents (tourists and inhabitants who use DTS). Results confirmed the importance of DTS among respondents in Mashhad as the first priority in travel tools for managing their travel. Analyzing the DTSs given suggestions to tourists draw out that the main challenge of DTSs is the lack of trust of tourists in DTSs. However, variables correlation analyzing demonstrated a direct and significant correlation between "receiving social information" and "Willingness to share personal information". The findings of this study can be helpful for commercial sectors that have more shares of DTSs' productions to improve commercial benefits and efficiency of their contents. In addition, it can open new fields of research in future about the social effects of the digital tourism era and the new social demand related to the public sector to be more active in content creation,

observation and legislation in DTSs. This research has been conducted in 2020 in Mashhad.

Theoretical framework

Regarding scientific study and practice in tourism, information is crucial to the tourism industry, as has been well-demonstrated (Buhalis, 1998; Gretzel, 2011). As a result, it was reasonable to anticipate that ICTs would be widely adopted in the tourism sector (Koo et al., 2015; Law et al., 2014). The adoption of ICTs resulted in significant changes (Buhalis and Law, 2008; Xiang et al., 2015) and a wide range of new risks and possibilities for tourism businesses and organizations. The information about tourist destinations and their associated resources, such as accommodations, restaurants, museums or events, among others, is commonly searched by tourists in order to plan a trip. Thus, in this way, Digital Tourism Systems (DTS) (like websites, applications, etc.) have vital roles. The "informatization" of the entire tourism value chain (Werthner and Ricci, 2004) and the creation of the concept of Travel 2.0 (Oklobdžija and Popescu, 2017; Schmallegger and Carson, 2008), that is, websites that permit visitors to express their opinions about any travel-related content publicly, have been made possible by the evolution of Internet websites into applications known as Web

2.0 applications. These applications, which have long dominated how travelers use the internet, are opening the way for employing even more advanced intelligent systems in the tourism sector (Fotis et al., 2012; Gretzel, 2011). However, the list of possibilities offered by Web search engines (or even specialized tourism sites) may be overwhelming, and the evaluation of this long list of options is very complex and time-consuming for tourists in order to select the one that fits better with their needs (Borrás, Moreno, and Valls, 2014). DTSs make it simple for travelers to locate, personalize, and buy tourism-related goods. They also help tourism businesses become global by supplying tools for creating, administering, and distributing tourism services globally (Buhalis and O'Connor, 2005). Thus, aided by the exponential increase of online information, travelers' tendency to search for recommendations online is now a constant and growing reality (Xiang and Gretzel, 2010). The interest in this area is high because it constitutes a problem-rich research area and because of the abundance of practical applications that help users to deal with information (Lakshmi and Lakshmi, 2014). DTSs try to find the best information according to time and location, by creating Intelligence Monitoring, Analyzing and Recommender Systems for their users (Fig. 1).

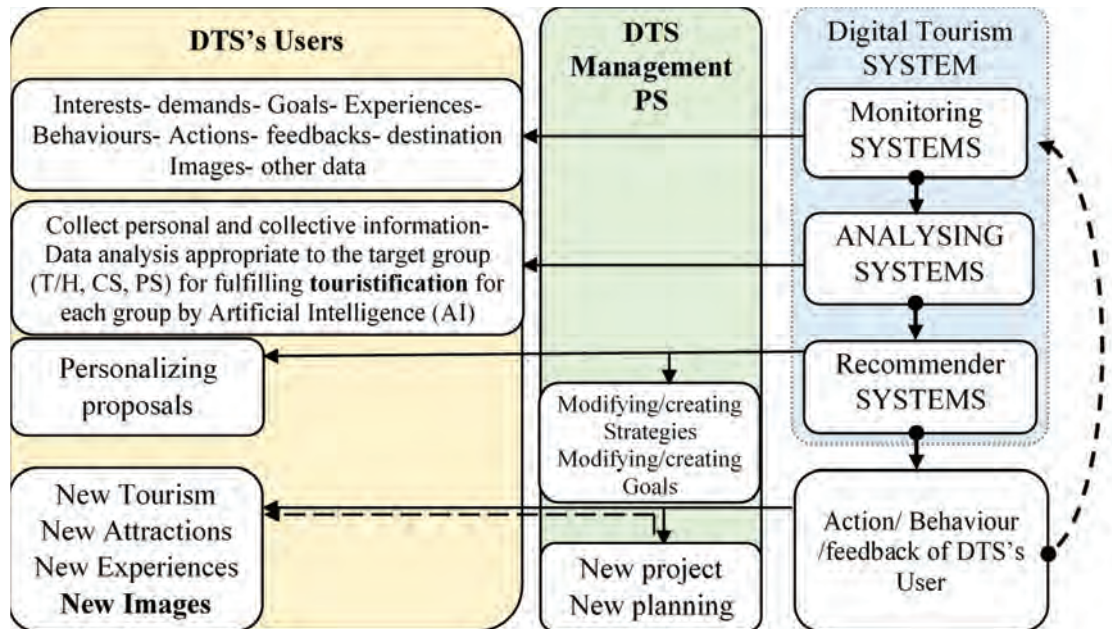


Fig. 1: The functional process of the Digital Tourism System

However, the high volume of data poses a significant challenge in terms of monitoring, analysis, and presenting personalized proposals. In this regard, AI has proven to be a great help to learn human skills, including learning, judgment, and decision-making and uses computers to simulate intelligent human behavior (Da Xu *et al.*, 2021). The main objective has been the exploitation of this accumulated information: integration of information from a broad spectrum of suppliers; development of customer databases; matching of information for the delivery of personalized services, and cost and time savings (Stamboulis and Skayannis, 2003). AI as a knowledge project that uses knowledge as its target, obtains information, analyses and investigates knowledge's modes of expression, and then applies these techniques to simulate human intellectual activity (L. Duan and Da Xu, 2012); combines computer science, logic, biology, psychology, philosophy, and many other fields which is essential to the advancement of society and has produced ground-breaking improvements in labor productivity, labor cost reduction, human resource structure optimization, and employment demand creation (N. Duan *et al.*, 2019). The growth of artificial intelligence has tremendously boosted humankind's economic well-being, and improved all facets of life while also significantly advancing social development and ushering in a new age of social development (Lu and Xu, 2019). The two essential characteristics of intelligent systems are the ability to detect the environment and the capability to learn from experiences to optimize performance in attaining specific goals (Gretzel, 2011). Thus, DTSs progressively adopt artificial intelligence (Riccio *et al.*, 2016) to comprehend the situation, learn and store information, recommend conclusions based on past experiences, and act rapidly and effectively in response to a new circumstance, which sets them apart from non-intelligent systems (Rudas and Fodor, 2008).

Consequently, Smart Recommender Systems (SRS) has an important role in DTS's efficiency. (Lakshmi and Lakshmi, 2014; Zhang and Lu, 2021). One of the distinctive characteristics of recommender systems is personalization, and Recommender systems are typically evaluated on their ability to provide items that satisfy the needs and interests of the end user. Many studies have proved that users would not use recommender systems if they believed such systems

were not providing items that matched their interests (Abdollahpouri, 2019). The recommender system examines massive data of objects and compiles a list of those objects that would fulfil the tourists' requirements (Rana and Deeba, 2019). Thereby, knowing more about the user can improve the quality of recommendations, while Digital Tourism Systems (DTSs) face challenges in filtering, prioritizing, and providing accurate recommendations (Adomavicius and Tuzhilin, 2005; Lakshmi and Lakshmi, 2014). Based on the literature, a complete SRS contains three main parts: user resource, item resource and the recommendation algorithm. In the user model, the consumers' interests are analyzed; similarly, the item model analyses the items' features. Then, the characteristics of the consumer are matched with the item characteristics to estimate which items to recommend using the recommendation algorithm. This algorithm's performance affects the whole system's performance (Rana and Deeba, 2019). Generally, recommender systems use three models to improve their accuracy: content-based filtering, collaborative filtering, and demographic filtering. Ghazanfar and Prugel-Bennett (2010) propose the fourth model, the Cascading Hybrid recommender system that uses and combines all recommender system techniques and has all advantages of the three last techniques: content-based filtering, collaborative filtering and demographic filtering. It is applied to eliminate redundant records problems with the recommendation system (Ghazanfar and Prugel-Bennett, 2010). However, there are still many challenges to improving the accuracy of recommendations. Most of the research conducted to overcome these challenges has focused on technical solutions to enhance the functions of algorithms or models used to forecast user preferences (Mohamed *et al.*, 2019; Rana and Deeba, 2019), sometimes overlooking the role of user participation. The paper by Hariri *et al.* (2013) suggests learning context information through explicit user queries as well as implicit learning. Another crucial factor in enhancing the efficiency of recommender systems is "context-awareness," which aids in better understanding user behavior and consequently improves recommendations (Hariri *et al.*, 2013; Hu and Ester, 2013; Saranya and Sadhasivam, 2012; Tang *et al.*, 2013). Thus, in any kind of recommender system, it is essential to have precise information about the

user's interests stored in her profile (Borrás *et al.*, 2014). While, the main empirical findings indicate that tourism demand forecasting based on tourists' online review data can substantially improve the forecasting performance of tourism demand models (M. Hu *et al.*, 2022), many tourists are unwilling to share their personal information or accept cookies (Oliveira *et al.*, 2020). Tourists need to know which information is required to recommend items to them preferentially and how it is applied (Mahmoud *et al.*, 2018). Many studies have shown that privacy and security are one of the most significant deterrents to sharing personal information (Gunn, 2017; Preece *et al.*, 2004; Sun *et al.*, 2014; Yoo and Gretzel, 2011) and it is a big challenge for a recommender system. To overcome this challenge, DTS need to connect directly with tourist as a (person) and gain trust to improve the personalizing process (Fig. 2). Therefore, Dialogue in pseudo-modernism has been replaced with a monologue in modernism by DTSs, like applications, websites, etc. That way, tourists receive their personalized proposals from these recommender systems. Moreover, it can provide feedback on the suggestions offered. This dialogue can enhance the system's understanding of the user and improve the efficiency of the recommender system, thus enhancing the efficiency of the DTS (M. Hu *et al.*, 2022; Song and Li, 2008).

Pseudo modern as a practical approach by using new ICT innovations like AI, Big Data, Clouds and Analyzing Systems (for enhancing the smartness of tourism), tries to fulfil the maximum individualism and personalism. By learning from the data, AI algorithms can discover in-depth patterns that may be utilized to forecast and detect occurrences. For this reason, the monologue approach in modernism was replaced with a dialogue approach that respects variety and personality (Fig. 2). As a result, anyone

can go anywhere they like at any time, can do any experience they like, and can choose between many options. Therefore, tourist behavior, interests, needs and demands are observed all time by new technology like smart wearables, smartphones, Social Media, and cookies, and finally, smart recommender systems by AI propose many alternatives every moment for everyone, uniquely and quickly. Currently, DTS utilizes AI technology that simulates human cognitive functions like learning and problem-solving (Michalski *et al.*, 1985). This has had a significant impact on various industries including psychology, space exploration, healthcare, finance, tourism, and marketing (Doborjeh *et al.*, 2021; Sanders *et al.*, 2021). All in all, more precise personalized recommendations can increase the user's willingness to share more personal information (Abdollahpouri, 2019). This means that if the suggestions provided align with the demands and interests of tourists, it can contribute to building confidence in DTSs. This chain of sharing personal data will lead to the enhancement of the efficiency of DTS (Fig. 3).

In this study, efforts have been made to identify the challenges facing the efficiency enhancement of DTSs by understanding their position in Mashhad. Additionally, key factors for enhancing the efficiency of DTSs are identified. Given that results may vary due to differences in target communities, this research has focused on Mashhad as a case study.

The spatial context of the case study: Mashhad (Iran)

Mashhad is the second biggest city in Iran. It has more than 3 million habitants and more than 20 million arriving tourists yearly. The extensive presence of this volume of tourists has presented significant challenges for tourism management in Mashhad (Kalantari *et al.*, 2014; Amirfakhrian and Mobini, 2018). Therefore, tourism is the city's most essential

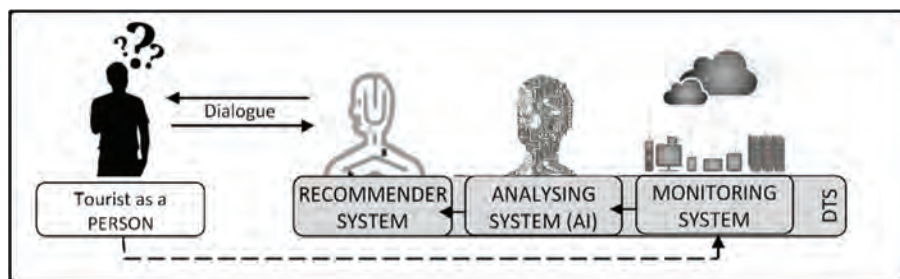


Fig. 2: The Dialogue between tourists and the Digital Tourism System by recommender systems

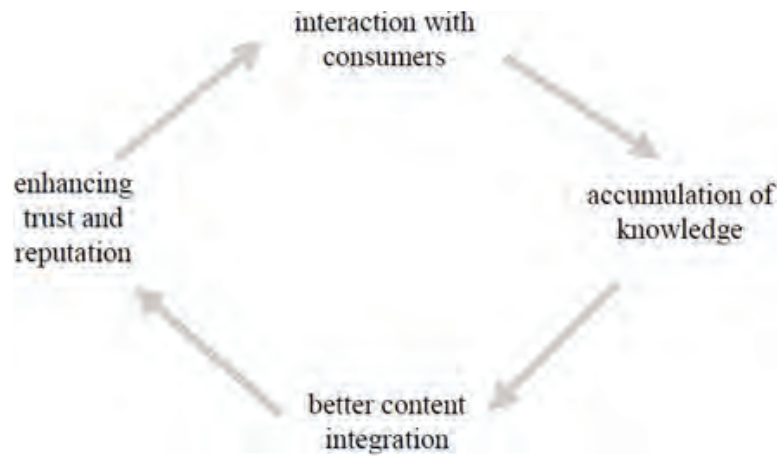


Fig. 3: The virtuous cycle of user-based interactive learning (Stamboulis and Skayannis, 2003)

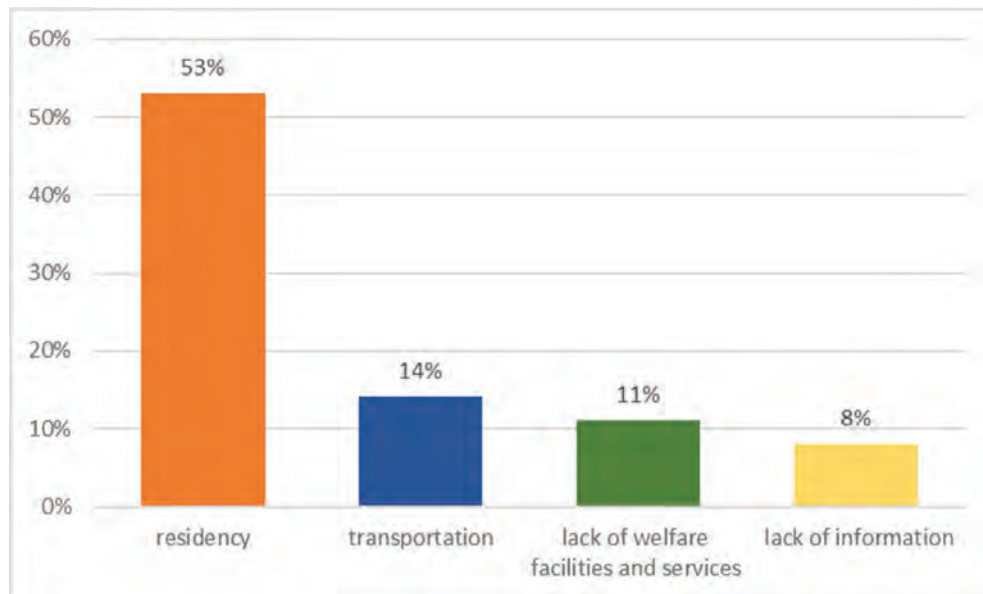


Fig. 4: The share tourists' problems in Mashhad (Jadroudi, 2014)

characteristic, and there are many accommodations and services in Mashhad. In 2014, Jadroudi (2014) questioned 100 tourists about the most critical problems for tourists in Mashhad. This study showed that "residency" is the main challenge for (53%) of tourists in Mashhad. Moreover, transportation (14%), lack of welfare facilities and services (11%) and lack of information (8%) were other main challenges against tourists in Mashhad (Fig. 4). However, by leveraging the potential of DTSs and enhancing their efficiency, it is possible to mitigate these challenges.

MATERIALS AND METHODS

This study aims to improve the efficiency of DTS and find the challenges ahead to help tourists in Mashhad to overcome challenges in Mashhad. For this purpose, this study used quantitative methodology. Therefore, to achieve this goal, this study utilized a questionnaire-based approach to directly inquire about users' interactions with DTSs for data collection. Since different local and regional dimensions are affected by tourism and make it challenging to generalize the results, to increase the

accuracy of obtained data and the applicability of the results to provide operational solutions, Mashhad was selected as a case study and the questionnaire was based on those reported in the literature and adapted for case study's context and tourists' challenges in Mashhad.

Determining variables and preparing survey:

In the first step of this research, using existing research literature, the variables of DTS efficiency were determined. In the next step, based on the extracted variables, the survey was prepared. The objective of this survey was to evaluate the position and effectiveness of DTS among users (tourists/inhabitants) and identify future challenges. Therefore, a questionnaire was prepared to clarify the "priority of DTS as travel tools," "the functions of DTS in tourism," "the level of trust of tourists in DTS for sharing personal data," and to determine "the level of trust in the information provided by DTS". This questionnaire consisted of 16 questions, and all elements of each question were measured on a five-point scale, ranging from "very low" (1) to "extremely high" (5).

To test the survey, a pilot test was first conducted with a group of five users. This initial test aimed to improve the questions and eliminate any unclear and/or ambiguous elements in order to refine the content and structure of the survey. The initial evidence presented reliable and valid questions. However, a questionnaire is, by definition, a standardized method with all the advantages and disadvantages that entails. The major advantage is that it provides a measure allowing for comparisons across space and time. However, this method is often criticized for truncating and biasing information (Goeldner *et al.*, 2010).

Research community and sample size:

The target population for this research included both tourists and residents of Mashhad who used DTSs for their tourist activities, constituting a population of over 23 million individuals. This includes 3 million residents and 20 million tourists annually. Therefore, according to Cochran's sample size determination method, a minimum sample size of 385 individuals was determined to achieve statistically meaningful results with a margin of error less than 0.05 (Samimi, 2024).

Conditions and Procedure for Completing the Questionnaire

The online survey was conducted during the pandemic (COVID 19) because it was tough to do face-to-face interviews. Thus, we gathered the data using an online survey. The questionnaire link was sent through social networks, SMS and emails. In order to ensure the universality of the answers, an attempt was made to include the equality of age, gender, and education groups in the statistical population. We submitted our survey through "Porsline.ir" between April 2020 and May 2020. Due to the difficulty of fixing the sampling frame, there was no systematic sampling.

Statistical Information of Respondents:

The online survey was released and ultimately viewed by 778 individuals randomly, and finally, we had 389 valid responses that accounting for 48% of them (185 respondents) were male, and 52% of them (204 respondents) were female (Fig. 5). Moreover, 31% of respondents were tourists in Mashhad, and 69% lived in Mashhad but used DTS. All in all, more than 82% of respondents were using DTS. Since

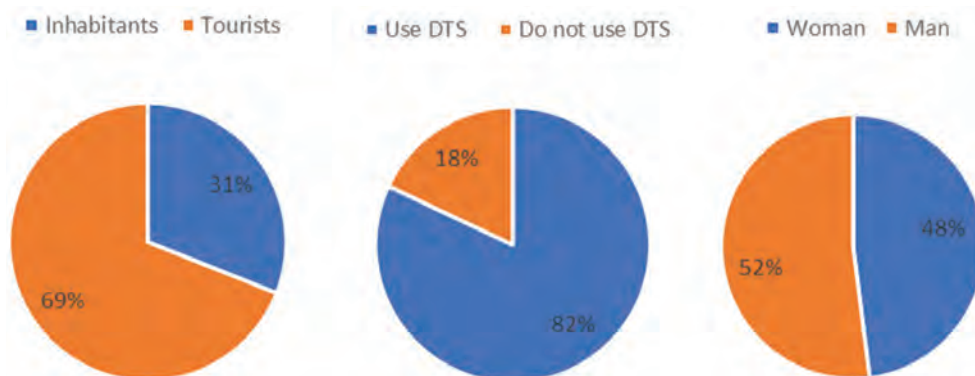


Fig. 5: Statistical Information of Respondents

the universe of interest is users of DTS, one of the questions was to separate respondents who use any DTSs (e.g. websites, applications, etc.) in their travels and those who do not use DTS but know it (Fig. 5).

This study used Harman's single-factor test proposed by Podsakoff *et al.* (2003) to assess common method bias. The first factor explains 26 /93% of the covariance amongst all constructs. This is less than 50%, which means that common method bias does not affect our data (Podsakoff *et al.*, 2003; Podsakoff and MacKenzie, 2012). Nevertheless, this study entails all the common shortcomings of using an open-access sampling methodology (e.g., self-selection bias, lack of information about non-respondents, and unknown response rate) (Kuss *et al.*, 2014).

Data Collection and Analysis Tools

In this research, two types of data were collected. The first category consists of data gathered from the theoretical foundation study, which involved extracting key variables and factors by examining documents and existing studies in the field of DTSs. For this data, the exploratory approach had been used to identify the variables. The other category consisted of data gathered through questionnaires in the case study. As we have quantitative data,

we use the correlation analysis method to identify the relationship, patterns, significant connections, and relationships between variables. All in all, the quantitative and statistical analyses, supported by the theoretical studies, aided in achieving the research objectives.

RESULTS AND DISCUSSION

In bright of this study could answer our research questions about the knowledge of tourists in Mashhad about DTS, Priorities of travel tools and the most popular DTSs functions used by tourists in Mashhad. The result demonstrates clearly that 82% of tourists in Mashhad use digital services. Moreover, the range of usage of DTS is precisely the same between men and women (Fig. 5).

This study also demonstrates that travelers prefer to use websites as their priority and applications as their second priority. However, the Tourism maps are in third priority by average ranking, but it is close to applications (Table 1). According to the results, the tourism agency is located as the sixth priority. The results show that the websites have the first priority and applications have the second. However, the paper plans are in third priority by average ranking (Table 1). In addition, paper plans were indicated as a first priority more than Applications, but totally,

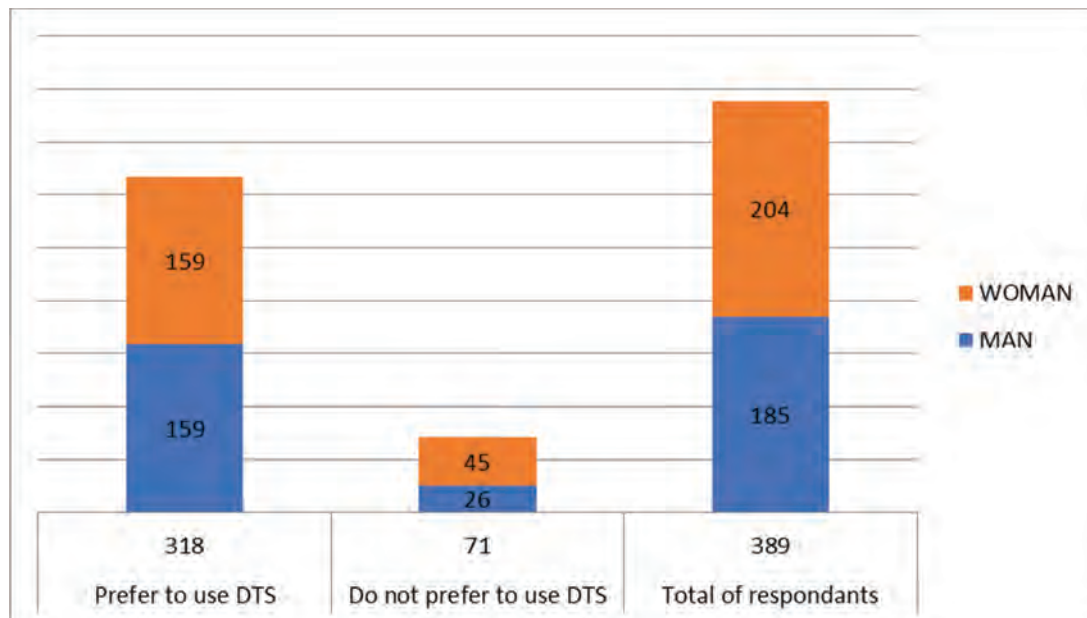


Fig. 5: The number of DTS's users among respondents in Mashhad

Table 1: The priorities of travel tools for respondents in Mashhad

Travel tools	1st	2nd	3rd	4th	5th	6th	7th	Total answer
Websites	128	87	134	15	8	5	1	389
Applications	78	69	38	133	30	18	11	389
Tourism map	112	19	33	64	60	41	49	389
Asking friends	1	117	31	57	85	64	22	389
Booklets	48	62	83	30	18	14	123	389
Tourism Agency	13	19	47	44	34	145	75	389
Telephone guides	0	4	11	34	142	90	96	389

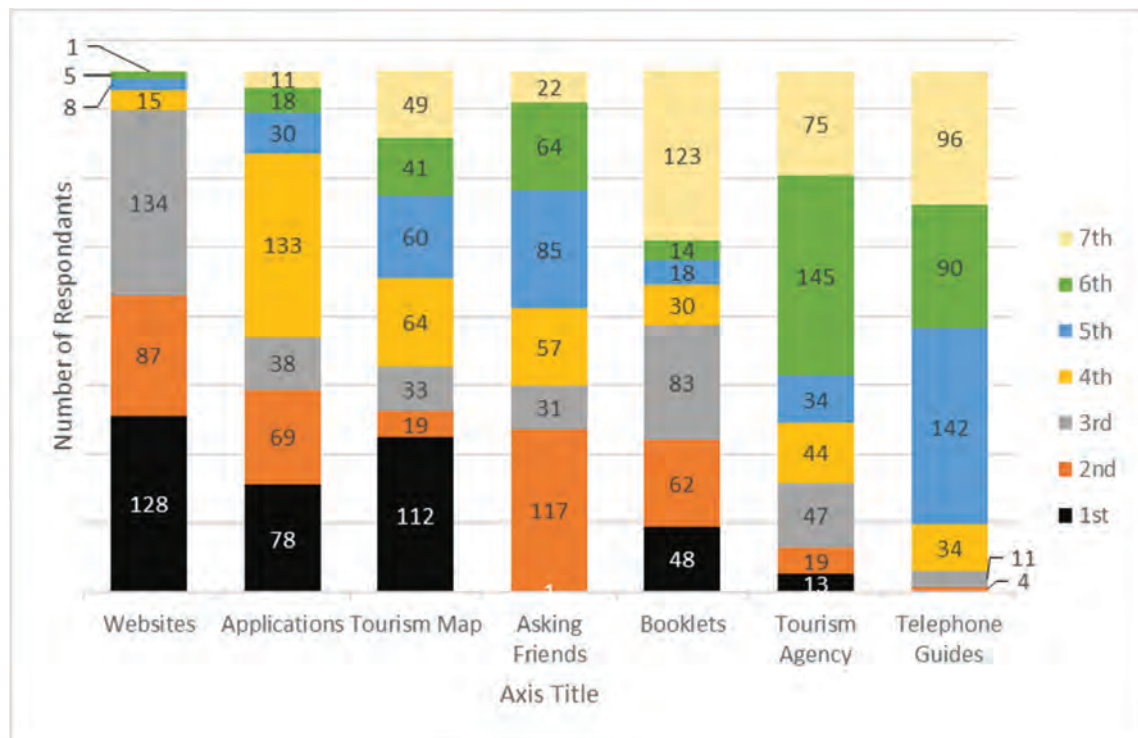


Fig. 6: The priority of travel tools for tourists and habitants in Mashhad

it was placed as a third priority. According to the results, the tourism agency is located as the sixth priority. The other priorities have shown in Table 1. Moreover, figure 6 revealed that “website” as the most important tool for travelers has a strong priority for tourists in Mashhad. It means that “websites” have gained more quantity as the second and third priority of travel tools among tourists in this city. However, application and paper plans are close to each other. Additionally, while the average rank of “asking friends” is slightly higher than “booklets”, we can say that they almost have the same priority.

Thus, it can be said that digital services, as pseudo-

modern tools are more acceptable for tourists and habitants in Mashhad.

Furthermore, this study has highlighted three main functions of DTSs in Mashhad: 1- moving through destinations and finding the best way (41%), 2-booking flights, hotels, restaurants, etc. (31), and finally 3- searching for information to make the best decision (28%) (Fig. 7).

Another important thing which followed in this research was the efficiency of DTSs information for tourists in Mashhad, their confidence in DTSs and the range of tendency to share personal information with DTSs. In bright of this study, today we know that



Fig. 7: Main functions of DTS which prefer to be used by travelers

Table 2: The Range of the efficiency, Reliability and personalization in DTSs used by tourists in Mashhad

Range	The efficiency of DTS's information		Confidence in receiving information		Confidence in giving personal information	
Very little	3.59 %		2.48 %		12.39 %	
Low	1.80 %		5.50 %		7.25 %	
Medium	27.25 %		33.33 %		35.95 %	
Much	29.64 %	67.37 %	37.92 %	58.72 %	29.91 %	44.41 %
Very much	37.72 %		20.80 %		14.50 %	
Total	100 %		100 %		100 %	

for 67.37% of respondents, the efficiency of DTS's information they have used is "much" and "very much". Moreover, more than 58 % of them have "much" and "very much" confidence in the received information (Table 2). However, digital services for their functions need personal user data. But the study showed that tourists' confidence in sharing personal data with DTS in Mashhad is not great. Just 44.41 % of travelers do not have a problem sharing their personal information with DTS, and it will be the biggest challenge for recommender systems to personalize the proposals efficiently.

This research has tried to investigate the position of DTS among Mashhad tourists and habitants to improve the efficiency of DTS in solving the problems of Mashhad tourism. This study showed that more than 67% of re- respondents believe that DTSs are efficient and more than 80% use DTS to manage their travels. This tendency to use DTSs is the fact that DTSs permit them to maintain their personalities and individualities in making and taking decisions. Travelers can find the best information everywhere and every time individually. DTSs work 24 hours and

every day. Moreover, three main functions of DTS (Fig. 7) correspond to the problems of tourists in Mashhad (Fig. 3). Thus, DTS will be useful in overcoming tourists' problems in Mashhad. To achieve this aim, we must find factors affecting DTS's efficiency. The correlation analyzing table of variables revealed key factors of DTS's efficiency. Efficiency of DTS's information has a significant correlation with "personalization rate" (.401**), "sharing personal information" (.269**), "confidence in DTS's received information" (.496**) and "receiving social information" (.106*) (Table 3). According to the correlation table of variables, we found that "received economic proposals" do not have a significant correlation with "efficiency of DTS's information" while receiving "social contents Proposals" (such as historical information, culture, rules, customs of societies) have a significant and direct correlation with "efficiency of DTS's information". It can also confirm tourism's primary goal: learning more about cultures and histories and generally doing new experiences.

Another key finding is that willingness to share personal information has a strange correlation with

Table 3: Correlation of personalized Information with other variables

Kendall's Correlation		Social proposal	Confidence for give Personal Data	Confidence to System Information	Economical Proposal	Efficiency of DTS' s information	Personalized Information
Social proposal	Correlation Coefficient	1.000					
	Sig. (2-tailed)	.					
	N	327					
Confidence for give Personal Data	Correlation Coefficient	.122**	1.000				
	Sig. (2-tailed)	.008	.				
	N	322	331				
Confidence to System Information	Correlation Coefficient	.168**	.443**	1.000			
	Sig. (2-tailed)	.000	.000	.			
	N	319	326	327			
Economical Proposal	Correlation Coefficient	.340**	.171**	.055	1.000		
	Sig. (2-tailed)	.000	.000	.237	.		
	N	321	327	325	328		
Efficiency of DTS's information	Correlation Coefficient	.106*	.269**	.496**	.037	1.000	
	Sig. (2-tailed)	.024	.000	.000	.431	.	
	N	325	329	325	326	334	
Personalized Information	Correlation Coefficient	.213**	.352**	.345**	.178**	.401**	1.000
	Sig. (2-tailed)	.000	.000	.000	.000	.000	.
	N	321	328	325	326	328	330

** . Correlation is significant at the 0.01 level (2-tailed).
 * . Correlation is significant at the 0.05 level (2-tailed).

receiving social content. Based on Table 2, just 44.41% of tourists in Mashhad have had “much” and “so much” confidence in DTS for sharing personal information. It is a big challenge for DTS to ameliorate its efficiency. The low willingness to share personal information with DTS can explain the low personalization rate of DTS in Mashhad. Just 39 % of tourists believed that the range of personalization of DTS in Mashhad is “much” or “so much” (Table 2). Correlation analysis showed that sharing social content with tourists can increase trust in DTS. As mentioned in other studies, “The ability to build and sustain trust-based relations with customers and to gain reputation and credibility is critical in the new power relationships. Intermediaries embark on a virtuous spiral, where interaction with consumers results in the accumulation of knowledge, which materializes in better content integration (as opposed to information processing), further enhancing trust and reputation (Fig. 8). Consequently, gaining

trust will increase the tendency to share personal information (Table 3). All in all, despite the complexity of the correlation between the variables in Table 3, a process can be formed to achieve the main goal of this research (Fig. 8), which is “improve the efficiency of DTS information”. In this process, DTS uses a smart recommender system to improve its efficiency, so the “personalization” of recommendations is an important key. Based on the variables’ correlations, by giving more “Social content” to tourists, DTS would gain tourists’ trust and consequently encourage them to share more personal information. This process can increase the personalization rate of DTSs; thus, the efficiency of DTS’s information will increase

Current findings support this claim that there is strong correlation between the implication of AI, customer satisfaction, and engagement (Kong *et al.*, 2021; Mariani and Borghi, 2021; Prentice *et al.*, 2020). To the best of our knowledge, this is the first empirical research that investigates the relationship

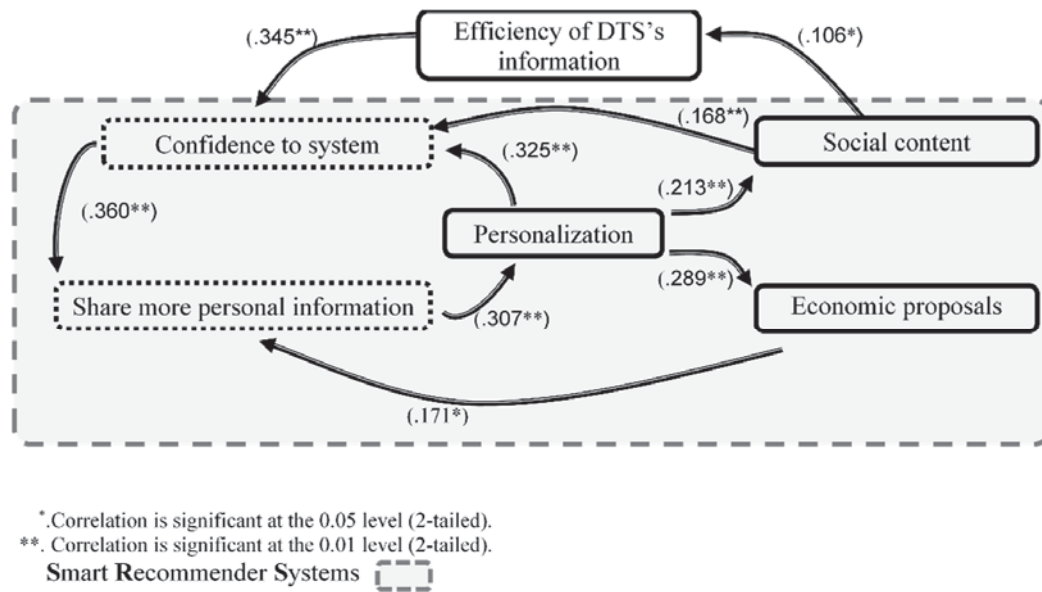


Fig. 9: The variable relationships in personalization's process to increase the efficiency of DTS's information in Mashhad

combining received social content, the confidence in DTS to share personal information, and increasing the efficiency of DTS's information, especially in Mashhad (Iran).

CONCLUSION

In this era, ICT innovations have had unbelievable effects on all fields, especially tourism. Accessibility to the internet all over the world and a huge amount of information, besides smart tools like smartphones, create a new phenomenon called Digital tourism systems, which help tourists manage their travel personally and individually. This study revealed that using the DTS is the first priority in managing travels in Mashhad. Most of the respondents (82%) in Mashhad use DTS and the most important functions of DTS from the respondents' perspective include these aspects: «moving between destinations», «buying or reserving services», and «receiving information». Looking at challenges faced by tourists in Mashhad (Fig. 4), it can be seen that the main functions of DTS effectively address these challenges. This highlights the need for further attention to the expansion of DTSs and enhancing their efficiency. The findings of this research indicate that DTSs, in order to enhance their efficiency, seek to increase the accuracy of personalizing data and recommendations provided to

users. In this regard, they utilize smart recommender systems to make an efficient connection between demands and huge amounts of information. Thus, two-way communication and receiving feedback and user opinions can assist DTSs in gaining a better understanding of users and providing more accurately personalized recommendations. However, based on the results obtained from theoretical studies and asking tourists, it is evident that the most significant challenge facing DTSs is gaining users' trust. When users have low trust in the system, they provide less feedback, which hinders the DTSs from improving their performance. This finding indicates that alongside technical and programming aspects, the interaction between the system and the user can play a crucial role in improving system efficiency. The questionnaire responses indicate that while the DTS's performance has been beneficial for users, more than half of the respondents (55.59%) are unwilling to share their personal information with the DTS. This reluctance is directly related to the level of trust in the DTS. As a result, it can be identified two major challenges facing the DTS in Mashhad: low user confidence and reluctance to share personal data with the system. The examination of relationships between research variables demonstrates that receiving «social content» has a direct and significant

correlation with increased trust in the system. This implies that digital tourist systems that convey more social content to their audience garnered greater trust among their recipients. Considering the direct and meaningful correlation between the personal data sharing rate and trust in the DTS, this result indicates that providing social content can be the key to solving the efficiency challenge facing DTSs in Mashhad. This finding can serve as a crucial guide for the tourism industry sectors that produce and manage a significant portion of digital tourism systems. It enables them to enhance their business growth while simultaneously improving the quality of tourism activities. Furthermore, the significance of DTSs among tourists and its prominent position among all travel tools in Mashhad demonstrates that by enhancing the efficiency of DTS, these systems can play a significant role in promoting tourism in Mashhad and alleviating challenges faced by tourists in Mashhad. Moreover, it underscores the responsibility of the city's tourism management to increase participation in supporting user rights in DTSs. Therefore, it is imperative for the tourism management of Mashhad to ensure user's security in DTSs through legislation, supervision, content production, and providing suitable infrastructure. However, with the rapid progress of DTSs, a privacy concern has appeared which requires more research. Furthermore, it is essential to consider topics such as the role of legislation, control, supervision, and content production in digital tourism systems in future researches in order to enhance user security and increase the efficiency of these systems.

Research limitation

This study encounters several noteworthy limitations. Firstly, the reliance on open-access sampling introduces potential sources of bias, including self-selection bias, a lack of data on non-respondents, and an unknown response rate. Secondly, despite the extensive literature on recommender systems and new technology in tourism, empirical research addressing the correlation between tourist confidence in DTS and the efficiency of these systems is notably scarce. Previous studies have primarily focused on technical methods to enhance the efficacy of intelligent recommender systems. Thirdly, the research model omits age as

a moderator variable, potentially overlooking a significant aspect. Future studies may benefit from conducting a multi-group analysis to explore variations between different demographic groups. Moreover, the research was conducted during the COVID-19 pandemic, which posed challenges in accessing and surveying tourists. The use of an online survey and quantitative methodology was employed to mitigate these challenges, limiting the respondent pool to those who were able to participate via digital means. Lastly, the study's scope is confined to Mashhad and its unique characteristics. Consequently, the findings may not be directly applicable to other cities. The distinct religious character of Mashhad could potentially influence respondent attitudes and behaviors. To broaden the applicability of the results, future studies could encompass a wider array of cities, countries, and demographics.

AUTHOR CONTRIBUTIONS

H. Mobini, performed the literature review, experimental design, analyzed and interpreted the data, prepared the manuscript text, and manuscript edition. Professor D. Crozat has been the supervisor and academic advisor throughout the stages of this research, playing a significant role in the analysis, research methodology, and achievement of research objectives. B. Shabani, helped in the literature review and manuscript preparation. M. Haghi, helped in the literature review and manuscript preparation.

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CONFLICT OF INTEREST

The authors declare no potential conflict of interest regarding the publication of this work. In addition, the ethical issues including plagiarism, informed consent, misconduct, data fabrication and, or falsification, double publication and, or submission, and redundancy have been completely witnessed by the authors

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ABBREVIATIONS

ACECR	Academic Center for Education, Culture and Research
AI	Artificial Intelligent
DTS	Digital tourism system
ICT	Information and Communication Technology
IoT	Internet of Things
SRS	Smart recommender system

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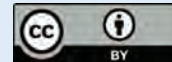
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ORIGINAL RESEARCH PAPER

The effect of digital leadership on the performance of businesses: the mediating role of organizational entrepreneurship

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ABSTRACT

BACKGROUND AND OBJECTIVES: The digital age has led to significant changes in all aspects of human life, including the way businesses operate. It is expected that the digitalization process of this type of business will accelerate in the coming years, therefore the results of this research can have a great impact on increasing their productivity and economic growth. In this context, the current study aims to investigate the impact of digital leadership on the performance of businesses, with a particular focus on the mediating role of organizational entrepreneurship.

METHODS: This research is applied in terms of research purpose and descriptive-survey method. The statistical population of this study consists of 601 employees and managers working in the printing and publishing industry in Tehran province. The sample size was determined using Cochran's formula, and a total of 235 individuals were selected using available sampling techniques. Data was collected using standard questionnaires, and SmartPLS4 software and structural equation modeling were utilized to analyze the data. This approach allows for the examination of the complex relationships between digital leadership, organizational entrepreneurship, and business performance in the publishing industry.

FINDINGS: This research examines the fit of a model at three levels of measurement: structural, general, and combined reliability. The R² (equal path squared) values for organizational entrepreneurship and the performance of printing and publishing businesses are 0.739 and 0.653, respectively, indicating a strong level of fit for the structural model. The t-statistic was used to check the assumed relationships between the variables, with seven sub-hypotheses used to measure the main hypothesis. The t-coefficients relevant to the seven existing relationships have been confirmed, supporting the main hypothesis.

CONCLUSION: Businesses that adopt digital leadership strategies are more likely to develop new digital facilities and make significant changes in their strategy-making processes and organizational culture. These findings emphasize the importance of digital leadership in the publishing industry and suggest that businesses that embrace digital leadership strategies are more likely to succeed in the digital age. The insights gained from this study can be used to develop effective digital leadership strategies to help publishing businesses thrive in an increasingly digital world.

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INTRODUCTION

Theoretical framework and research background

Digital transformation and emerging technologies including mobile phones, cloud memory, data analysis systems are applied to develop new business models and improve business performance (Vicere, 2021). During the digital age, the changes has increased rapidly, extensive access to data has become feasible, and geographical boundaries and limitations have been eliminated. This digital revolution can be an opportunity for the entrepreneurial ecosystem to proceed to the following stage of development (McAdam, 2022). Nevertheless, leaders of organizations should be concerned about the way technology transforms the business environment, since any change provokes chain reactions in the entrepreneurial environment (Rainer and Prince, 2022). Digital transformation has globalized the entrepreneurship and this revolution has continuously developed (McAdam, 2022). Due to the development of such transformation, organizations and companies in all industries are rapidly becoming digital and transforming to a new form of organization (Harto et al., 2022). Through applying technology to all aspects of business, digital leaders perfectly transform business operations and subsequently improve business efficiency. Technology can enhance the process of education so that intellectual talent and ability becomes more important for the purpose of producing something unique in order to create wealth for future generations (Vayrynen et al., 2023). Today, various studies in the field of digital transformation have examined the fundamental effects of digital transformation on businesses, societies and people's lives. The technology development and new design of activities have resulted in the change in nature of work and the resources required for success. Westerman et al. in their study in 2014, showed that companies which have problems in the digitalization process present a poor performance in the leadership process required to create a prospect. On the other hand, this study also stated that successful digital companies have been able to develop leadership capabilities effectively (Westerman et al., 2014). Leadership capabilities mean the solutions through which managers and leaders develop digital changes (Yunus and Ernawati, 2018). There are numerous references relevant to the importance of leadership capabilities in digital transformation and success in digital organization. It is worth noting that digital

leadership is known as an emerging and growing concept. Accordingly, there are still no instruments and concepts approved by the academic community for a better understanding of the situation (Kolasa et al., 2023). Therefore, digital transformation is not simply a higher level of application and development of information and communication technology (ICT); it is also a strategy for information and digital technology to adjust the model, process, product, as well as the profit of production and business processes in the organization. Secondly, strategy is a key factor to determine the success of the digital transformation process in a business (Hosseini et al., 2020; Ziyae et al., 2019). The traditional strategy is no longer appropriate for nowadays business requirements. However, an efficient digital strategy creates initial experiences and integrates those experiences into the strategic process. Thirdly, digital transformation is not only an activity to optimize workflow but improving productivity and making profit is considered as the cultural foundation of a business, and this culture should be designed and performed through a long and sustainable strategy (Vayrynen et al., 2023). The principal beneficiaries of the present study include small and large organizations working in the industry of publishing and still use traditional mechanisms in leadership. Policy makers of such organizations apparently understand the variables and their interrelationships and take them into account for the development of transformational leadership. This type of information may help them prioritize their efforts and select proper strategies to focus on the most important variables in order to develop transformational leaders that eventually lead to business success (Avidov-Ungar et al., 2022). The digitalization of the printing and publishing industry brings about an important challenge to the existing companies dealing with new technologies (Tajpour et al., 2023). A large number of companies in this industry have been obliged to seek new markets through digital technologies for their survival (Kolasa et al., 2023). Analysis achieved from large data saved in digitally enabled organizations in the literature has indicated that, during global crises (combating the covid-19 pandemic), when employees worked from home in virtual teams, leaders were compelled to express different behaviors and reactions regarding the issue of digital and observe it through the eyes of organizational innovation. The process of these changes is expected to change direction (Ramdani et al., 2022). Despite the

fact that entrepreneurs are increasingly use Facebook, LinkedIn, Instagram, and other social networking sites (SNSs), including Twitter, how entrepreneurs create social capital online less is still unknown (Smith *et al.*, 2017; Mobaraki *et al.*, 2021). Digital innovation in SMEs is directed by a set of four factors (individual, technological, organizational and environmental). The four factors will pass a four-step process (i.e., intention, adoption, implementation, and use), and result in two outcomes (organizational performance and commercialization). Moreover, digital innovation in small and medium-sized companies includes a number of results, such as profitability, competitiveness and internationalization. Lastly, this analysis indicates that a limited number of studies have been carried out in low-income economies and more empirical studies are required for a higher level of understanding relevant to the role of digital innovation for development (Al-Kurdi *et al.*, 2020). Accordingly, digital leadership indexes (mental framework, social capital and virtual team leadership) have been considered as independent variables, organizational entrepreneurship as a mediating variable, and business performance in the field of publishing as a dependent variable. Finally, according to what mentioned above, the hypotheses of the study are as follows:

H1: The digital mental framework has a significant effect on the performance of businesses in the field of printing and publishing.

H2: The digital mental framework has a significant effect on the performance of publishing businesses with the mediating role of organizational entrepreneurship.

H3: Social capital has a significant effect on the performance of businesses in the field of publishing.

H4: Social capital has a significant effect on the performance of publishing businesses with the mediating role of organizational entrepreneurship.

H5: The leadership of virtual teams has a significant effect on the performance of businesses in the field of printing and publishing.

H6: The leadership of virtual teams has a significant effect on the performance of businesses in the field of publishing with the mediating role of organizational entrepreneurship.

H7: Organizational entrepreneurship has a significant effect on the performance of businesses in the field of printing and publishing.

The current study has been carried out in Tehran

in 2023.

MATERIALS AND METHODS

The present study is classified as a descriptive-correlational research that aims to explore and analyses the relationships between variables. The statistical population of the study includes all employees and managers working in the printing and publishing industry in Tehran province, which amounts to 601 individuals based on data from 70 companies active in this industry in March 2023. Data was collected through a questionnaire developed by the researcher. The sample size of 235 individuals was determined using available sampling and Cochran's formula for a limited population, with an error level of 5% at a confidence level of 95%. The questionnaire consisted of 25 items rated on a 5-point Likert scale ranging from 1 (completely disagree) to 5 (completely agree). The study utilized SmartPLS4 software and structural equation modelling to analyze the data, which is a statistical method used to investigate the relationship between latent and manifest variables. By applying these methods, the study provides valuable insights into the relationships between digital leadership, organizational entrepreneurship, and business performance in the publishing industry.

RESULTS AND DISCUSSION

Descriptive statistics

Demographic characteristics showed that the statistical population included 52% male and 48% female. 17% were between 20 and 30 years old in terms of age, 23% were between 30 and 40 years old, 49% were between 50 and 40 years old, and 9% were over 50 years old. In terms of education level, 10% of the population have an associate degree, 32% have a bachelor's degree, 41% have a master's degree, and 16% have a PhD degree.

Inferential statistics

Model fit (measurement, structural and general)

To investigate the fit of the model in three levels of measurement, structural and general in the present study, the technical characteristics of the questionnaire were evaluated in two sections, validity and reliability using different criteria. Construct and content validity were applied to evaluate the validity of the questionnaire, and Cronbach's alpha coefficient and composite reliability

Table1: The relationship between variables and questionnaire

Row	Variable	questions	Cronbach's alpha
1	Organizational Entrepreneurship	1-6	0.749
2	Social capital	7-12	0.705
3	Virtual team	13-17	0.928
4	Mental framework	18-21	0.733
5	Business performance	22-25	0.906

Table 2: Composite reliability, communality and convergent validity

Variable	communality	Confidence level	AVE	R2
Organizational Entrepreneurship	0.819	0.852	0.504	0.739
Social capital	0.759	0.781	0.738	---
Virtual team	0.933	0.946	0.777	---
mental framework	0.812	0.826	0.549	---
Business performance	0.907	0.935	0.781	0.653

Table 3: Divergent validity

Variables	Virtual teams	Social capital	Business performance	mental framework	Organizational Entrepreneurship
Virtual teams	0.882				
Social capital	0.186	0.615			
Business performance	0.599	0.212	0.884		
mental framework	0.321	0.044	0.365	0.741	
Organizational Entrepreneurship	0.711	0.194	0.796	0.582	0.781

index were applied to examine the reliability of the measuring instrument. The results indicated that the questionnaire has suitable reliability and Cronbach's alpha coefficients and the combined reliability of all variables are more than acceptable. As can be observed in [Table 1](#), Cronbach's alpha coefficients and the combined reliability of all variables are more than the acceptable minimum, i.e. 0.7; therefore, it can be concluded that the variable measurement instrument has suitable reliability.

To verify the reliability of the questionnaire partial least squares method criteria have been applied. In this method, reliability is measured using two criteria of factor loadings and composite reliability. According to the results, all the coefficients of factor loadings are greater than the minimum acceptable value of 0.4 and the value of Cronbach's alpha coefficients and the combined reliability of all constructs are greater than the minimum acceptable value of 0.7. Furthermore, the investigation of Average Variance Extracted (AVE) from the acceptable minimum of 0.5 and shared reliability shows that the value of all

constructs is greater than the acceptable minimum of 0.7. Therefore, the questionnaire has reliability and convergent validity ([Tables 1 and 2](#)).

The average variance extracted was applied to evaluate the convergent validity, the square root of AVE was used to examine divergent measurement. The results indicated that the value of average variance extracted is greater than the minimum acceptable value of 0.5. Therefore, the research variables have convergent validity. Furthermore, since the square root values of the average variance extracted are greater than the correlation of the considered variable with other variables, divergent validity is acceptable if the numbers included in the main diameter are greater than their underlying values. Therefore, the variables have validity and their divergent validity is also confirmed.

Considering what mentioned earlier and the results achieved from the SmartPLS4 software output in [Tables 2 and 3](#), the validity (convergent and divergent) and reliability (factor loading, composite reliability coefficient and Cronbach's alpha)

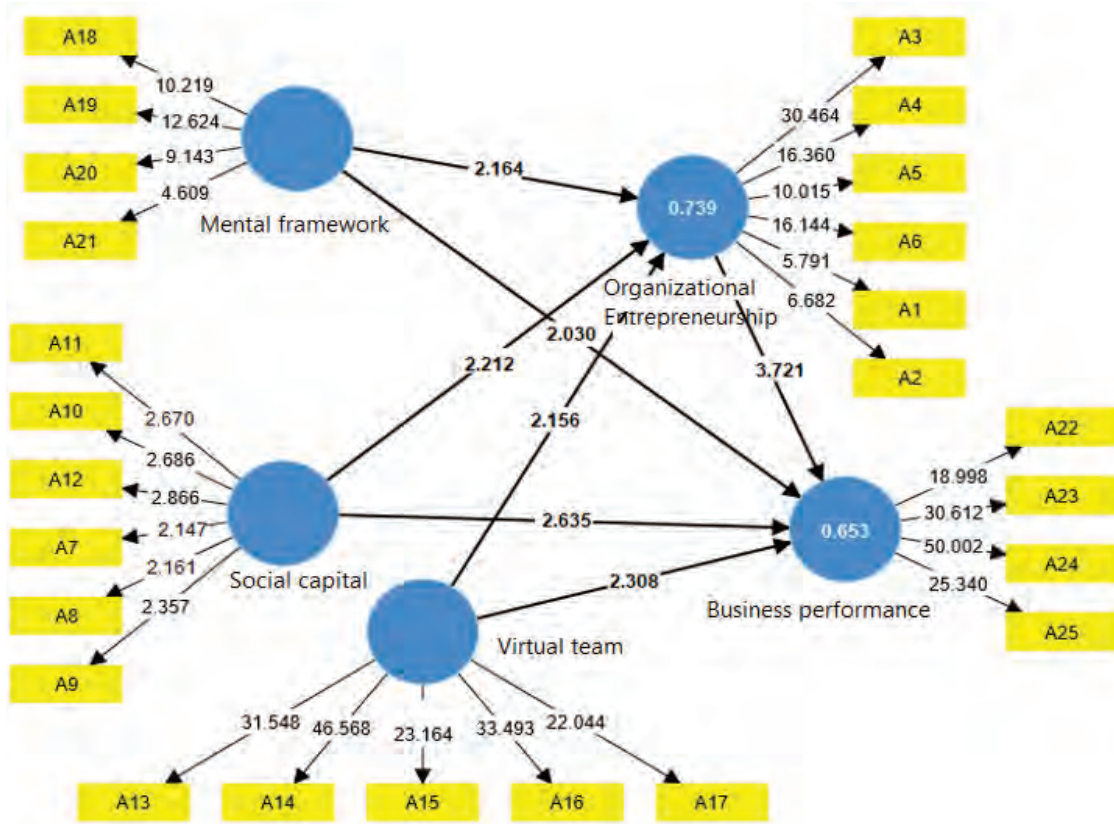


Fig. 1: t-statistic values

measurement models are fit and suitable. Several criteria have been applied to investigate the fit of the structural model of the research using the partial least squares method. The first and most fundamental criterion is the significance coefficients or the values of t-statistic. In order to confirm the fit of the structural model using t-coefficients, the coefficients must be greater than 1.96 in order to confirm their significance at the 95% confidence level. Accordingly, Fig.1 shows that 7 out of 7 hypotheses have been confirmed, so the fit of the structural model in the present study is suitable and acceptable.

The second criterion for investigating the fit of the structural model in a study is the R^2 coefficients relevant to the endogenous hidden variables of the model (Samimi and Nouri, 2023). R^2 is a criterion that presents the influence of exogenous variables on an endogenous variable and three values of 0.19, 0.33 and 0.67 are considered for weak, medium and strong values of R^2 .

This criterion is shown in the circles relevant to the structural model of the study, and in the case of the structural model of the present study, considering that there are three endogenous variables, the number inside another circle is naturally equal to zero. In the present study, the mentioned criterion for organizational entrepreneurship is 0.739 and the performance of printing and publishing businesses is 0.653, therefore the structural model from the view of this criterion has a suitable fit at a strong level. Fig. 2 indicates that the structural model has a suitable fit considering this criterion. In the present study, the general model including the measurement and structural sections was investigated, and when the fit was confirmed, it was also examined in a general model. The fit of general model was conducted using the GOF goodness of fit criterion and the value of 0.767 shows the accepted fit of the general research model. Sobel's test was used to investigate the mediating role of Organizational Entrepreneurship

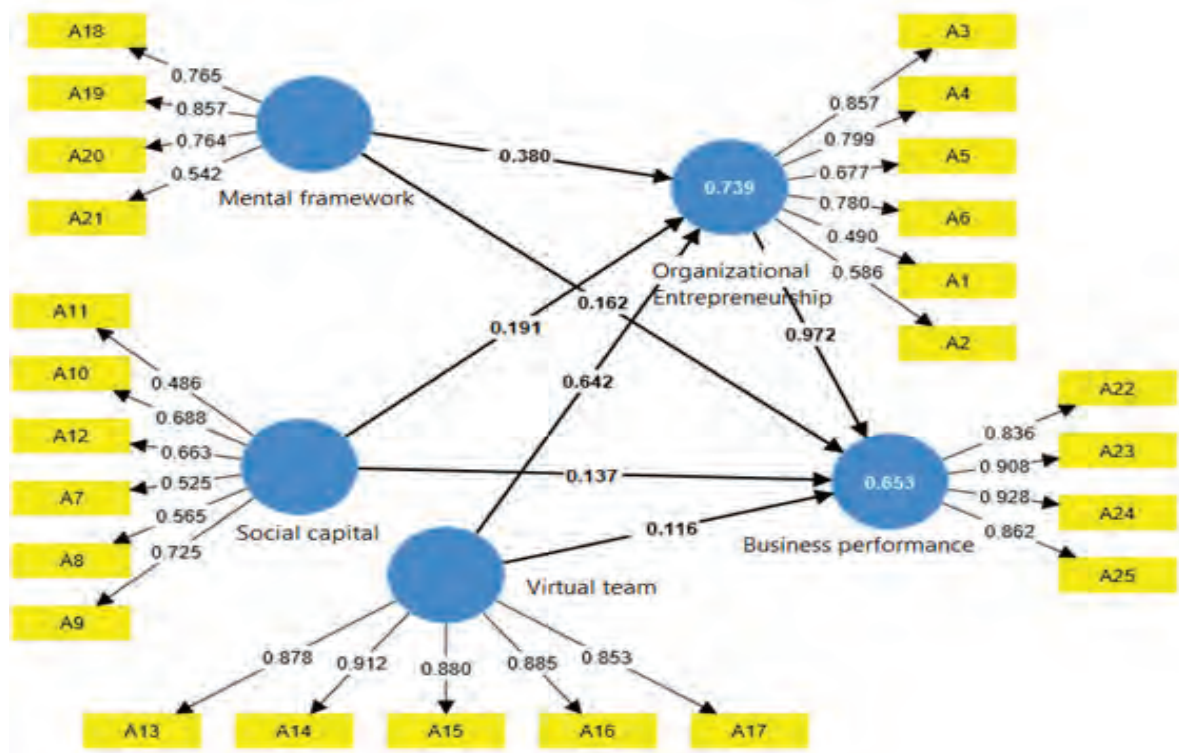


Fig. 2: The model in the state of standard factor loading coefficients

in businesses in the field of printing and publishing. The path coefficients and standard errors of the paths were investigated, and the Variance Accounted for (VAF) value was calculated to investigate the mediating effect of organizational entrepreneurship on printing and publishing businesses.

(a) The value of coefficient of independent and mediator variable=0.404

(b) The value of coefficient of dependent and mediator variable=0.972

(c) The value of coefficient of dependent and independent variable=0.138

(Sa) The standard error of the independent and mediator variable=0.078

(Sb) The standard error of the dependent and mediator variable=0.069

$VAF = (a \times b) / (a \times b) + c$

The value of 4.861 achieved in this test, is more than the base value of 1.96 showing the role of mediator for the construct of organizational entrepreneurship. The VAF statistic shows that the

mediation value of organizational entrepreneurship is 0.739 meaning that the mediation effect is slight. According to the results, the fit of the model is confirmed in both sections of measurement and structure.

Hypotheses test

In this stage, the t-statistic was applied to check the assumed relationships between the variables. Seven sub-hypotheses were used to measure the main hypothesis, and based on the Table 4: T-coefficients relevant to seven existing relationships have been confirmed. The standardized factor loading coefficients related to the paths of each of the hypotheses have been investigated to determine the impact of the predictor variables on the dependent variables. These coefficients show what percentage of the changes in the dependent variables are described by the independent variables.

Considering the analysis of the hypotheses, the results showed that according to the first hypothesis i.e. the mental framework has a positive

Table 4. T-statistics and research impact coefficients

Path	t-statistics	Impact coefficient	test
Mental framework -performance of printing and publishing businesses	2.030	0.162	confirmed
Mental framework - organizational entrepreneurship-performance of printing and publishing businesses	2.164	0.380	confirmed
Social capital- performance of printing and publishing businesses	2.635	0.137	confirmed
Social capital- organizational entrepreneurship-performance of printing and publishing businesses	2.212	0.191	confirmed
Virtual teams-performance of printing and publishing businesses	2.308	0.116	confirmed
Virtual teams- organizational entrepreneurship-performance of printing and publishing businesses	2.158	0.642	confirmed
Organizational entrepreneurship-performance of printing and publishing businesses	3.721	0.972	confirmed

effect on the performance of printing and publishing businesses, it can be stated that digital leadership with regard to the requirements and motivation of employees and enhancing personal and group needs provides new opportunities for the organization (Hensellek, 2020). Digital leadership uses motivational instruments to move the organization towards digitization and improve business performance by applying technology. Digital leadership anticipates environmental changes, and in order to achieve success in a more dynamic environment, changing the leadership process is essential. By confirming the second hypothesis i.e. the mental framework has a positive effect on the performance of printing and publishing businesses through the mediation role of organizational entrepreneurship, it can be concluded that digitalization requires decision makers who have a digital mental framework to be able to recognize and evaluate digital the opportunities and challenges associated with transformation of digital in time and properly (Hensellek, 2020). Accordingly, the presence of leaders who manage the organizational strategy, describe the culture and express an evident vision and plan for their employees is an undeniable necessity (Meffert and Swaminathan, 2018). Furthermore, it is clear that the digital environment of business is basically different from its traditional form. Businesses manage to achieve digital maturity if they recognize differences and seek to make changes on how to learn and lead in order to adapt and perform better in a rapidly changing world (Kane et al., 2018). Thus, the digital leader, due to their role which is formed by the necessity

of environments established by transformative technologies, apply an appropriate combination of resources and leadership skills and media and digital capabilities to develop compatibility between the strategy of Information technology and business strategy in order to turn the uncertainty caused by the technology into opportunity and finally turn the digital opportunities into reality. Therefore, the survival and development of industries in the age of digital transformation depends upon this issue. According to the third hypothesis i.e. social capital has a positive effect on the performance of printing and publishing businesses, it can be stated that social capital promotes organizational performance by providing the possibility of access to key resources and information (Johnson et al., 2013). Also, social capital can influence the efficiency of organizations by knowledge sharing and innovation (Tsai and Ghoshal, 1998). Structural social capital facilitates access to various sides to transfer and share knowledge and improves the opportunity for exchange knowledge (Ansari et al., 2012). It also enables people to contact their peers for sharing knowledge and expertise (Andrews, 2010). Relational social capital is known as the most emotional component of social capital and it determines networks in respect of shared norms, interpersonal trust, and relationships with other people (Cabrera and Cabrera, 2005). This aspect of social capital is directed to the quality and nature of relationships and it can be established through history of interaction with one another or others (Lefebvre et al., 2016) and in several behavioral traits including commitments, trust, shared norms

and group identification (Davenport and Daellenbach, 2011). Therefore, digital environments are established by trust, which can be reached through knowledge sharing and transactional behavior (Ridings *et al.*, 2002). Finally, the third component is cognitive social capital, which includes the values, prospect, and shared objectives of the organization's members. Social cognitive capital includes resources that provide systems of meaning, interpretations, and shared representations between parties (Nahapiet and Ghoshal, 1998). It is a common code and language that displays the principal components of communication (Gooderham, 2007). Nahapiet and Ghoshal (1998) have connected social cognitive capital to shared narratives and shared language, while other authors have described it through shared culture, shared prospect, and shared goals. These three dimensions of social capital perform a significant function in the entrepreneurship development of any organization (Ganguly *et al.*, 2019) and this innovative potential eventually indicates the enhancement and development of organizational performance (Sheen and Yang, 2018). Researchers state that less developed economies are dependent upon industrialized economies for smart digital technologies (Shamim *et al.*, 2019). Khan *et al.* (2019) also asserted that companies in less developed economies seek knowledge and support from external sources. Social capital is one of the most established instruments in this regard in respect of knowledge extraction. Social capital influences the dynamics of the organization's performance and enhances the application of knowledge for the organization's entrepreneurship. According to the fourth hypothesis i.e. social capital has a positive effect on the performance of printing and publishing businesses through the mediation of organizational entrepreneurship, it can be stated that the globalization of markets provides opportunities for companies to collaborate in various activities. Such collaborations can be a source of social capital for companies to achieve sustainable competition. Social capital can enhance production performance (Ul zia *et al.*, 2022; Escobar *et al.*, 2023). Social capital has a close relationship with the level at which people share information and other resources provided in the network of relationships

(Wang and Ho, 2017). Furthermore, it is possible to prompt resources in the organizational structure to accept and improve new technology (Parellada *et al.*, 2011). Social capital performs an important function in organizational innovation and entrepreneurship (Sánchez *et al.*, 2015). Social capital theory shows that socialization is an essential and vital requirement for valuable resources. Moreover, researchers suggest that all relationships between organization members and external actors are necessary for innovation, knowledge development, and information sharing, and subsequently may influence the organization's performance. The fifth hypothesis indicated that virtual teams have a positive effect on the performance of printing and publishing businesses. Therefore, virtual teams are new organizational structures that are becoming extensively developed, and knowledge-based organizations are exclusively focused on them due to the increasing dependence of large parts of the organization on information technology. The dependence and need for this type of teams is more required in research and development departments and in organizational structures with a dispersed feature (Mesmer-Magnus *et al.*, 2011). When the prerequisites for the virtualization of activities are provided, team members can share information in various organizational structures and departments with no to face-to-face interaction. Employees can have an electronical collaboration with people from inside or outside their organization (Turel and Zhang, 2010). With multiple teams and employees participating in virtual activities in most organizations today, and with organizational processes existing in both virtual and traditional forms, teams can exhibit a degree of virtuality depending on the level of tool or information technology usage. Therefore, instead of examining virtual teams, the degree of virtuality of teams should be examined. Furthermore, despite the widespread use of virtual teams, sound and logical insights into the characteristics and functions, processes and output variables of these teams are not satisfactory (Bierly *et al.*, 2009). Due to the enhanced virtuality of teams and the decrease of face-to-face communication, one of the affected dimensions is the method and the amount of interaction. An

essential feature of teamwork is the interaction and communication of team members and such interactions are followed by many consequences. Accordingly, the researchers stated that working relationships based on trust reduce conflict and increase cooperation; therefore, when members have a temporary interaction (or they are members of dispersed and virtual teams), the type of their communication changes, and conflict and trust in the group, as well as the extent of their role on team cooperation will be different compared to when members have long-term interaction. The sixth hypothesis showed the positive effect of virtual teams on the performance of printing and publishing businesses through the mediation role of organizational entrepreneurship. Therefore, it can be stated that strategic digital leadership can enhance innovation in the organization. Due to the technological progress, organizations have experienced many changes in work structure and leadership. These significant changes have developed a large network of labor, objects, and computers and has made everything connectable (Harto *et al.*, 2022; Tajpour *et al.*, 2023). Analysis achieved from large data saved in digitally enabled organizations in the literature has indicated that, during global crises (combating the covid-19 pandemic), when employees worked from home in virtual teams, leaders were compelled to express different behaviors and reactions regarding the issue of digital and observe it through the eyes of organizational innovation. The process of these changes is expected to change direction (Avidov-Ungar *et al.*, 2022). The seventh hypothesis showed that organizational entrepreneurship has a positive effect on the performance of printing and publishing businesses. Therefore, it can be said that today, countries that tend to value economic and social development and support the development of a work environment based on knowledge technology, has increased their success to a remarkable rate. The world is now moving towards an entrepreneurial economy and development. Entrepreneurs become heroes in economic and commercial development. Entrepreneurship is described as a multidimensional phenomenon that consists of profitable opportunities, risky person, etc. Entrepreneurship is a dynamic process of creating wealth and value

in the society, which is earned by the understanding and suitable placement of resources and skills, and it includes personal, management, and technical skills of the entrepreneur.

CONCLUSION

Several components such as considering the advancement and development of personal aspects including looking to the future in life, personal independence in decision-making, etc. can be the foundation for the development of entrepreneurial skills that should be taken into consideration. Access to information sources, using public knowledge, improving information system to achieve information and technical knowledge on entrepreneurship are known as significant and influential topics on the development of entrepreneurial skills that can result in the optimization of the company's performance. It is also known as the process of identifying sources, recognizing, attaining and creating value from opportunities. Furthermore, entrepreneurial firms that are described by risk-taking, innovation and pioneering are more inclined to adapt their business and develop the essential capabilities to meet crucial requirements. At the level of supply chain, entrepreneurial orientation can enhance the efficiency of knowledge achievement to develop quality and strategies of efficiency. There are many obstacles and limitations in companies to advance towards entrepreneurship, while a number of these obstacles are unpredicted and they are considered as a consequence and feedback resulted from the use of traditional management. Organizations require suitable environmental and cultural conditions and an organizational entrepreneurship environment to motivate new ideas and experimental efforts, eliminate the restrictions of using opportunities and provide the necessary resources. It was also concluded that the variables of mental framework, social capital and virtual teams as well as the existence of organizational entrepreneurship as a mediating variable encourage digital leadership to pay attention to the needs and motivation of employees and meet personal and group needs and provide new opportunities for publishing businesses in order to identify effective methods for a better performance. A digital leader entirely transforms the business operations and then

improves the performance of the businesses in the relevant area by applying technology in all aspects of the business.

Research suggestions

According to what mentioned in the present study, the businesses in the industry of printing and publishing are possibly suggested to:

1. Managers in companies should seek to facilitate collaboration with foreign business partners to develop their social capital.
2. Managers should provide opportunities for employees to have a frequent interaction with each other and authorize employees to acquire valuable information, resources, and knowledge, particularly tacit knowledge that is hard to analyze.
3. Managers are suggested to develop and maintain trust with their business partners, so knowledge can be shared in business transactions without formal contracts.

AUTHOR CONTRIBUTIONS

A. Arabiun, M. Tajpour and M.R. Zahedi performed the conceptualization and literature review, manuscript preparation and editing references. M. Tajpour and M.R. Zahedi performed the Methodology, compiled the data, analyzed and prepared the manuscript text.

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CONFLICT OF INTEREST

The authors declare no potential conflict of interest regarding the publication of this work. In addition, the ethical issues including plagiarism, informed consent, misconduct, data fabrication and, or falsification, double publication and, or submission, and redundancy have been completely witnessed by the authors.

ABBREVIATIONS (NOMENCLATURE)

AVE	average variance extracted
R ²	coefficient of determination

Q2	Predictive Relevance
GOF	The Goodness of Fit
SRMR	Standardized Root Mean Residual
NFI	Normed Fit Index
VAF	variance accounted for

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ORIGINAL RESEARCH PAPER

Adoption intention of artificial intelligence enabled smart city services from citizens' perspective

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ABSTRACT

BACKGROUND AND OBJECTIVES: Urban administrators of major cities in India are planning to deploy advanced information technologies such as artificial intelligence to deliver e-governance services. It is expected to enable citizens to acquire relevant information to their commonly asked question without significant technological expertise. With its text, speech, and image processing capabilities similar to human beings, artificial intelligence is predicted to have both positive and negative social impact. The objective of this paper was to develop a conceptual framework consisting of enablers and barriers in adopting artificial intelligence enabled service delivery in a smart city from citizens' perspectives. The study is novel in terms of empirically finding factors influencing adoption intention of artificial intelligence for availing citizen services in a nation like India which has a very large population and developing economy.

METHODS: The study utilized an extended unified theory of acceptance and use of technology framework and employed survey-based data collection technique. A structured survey was circulated as part of primary data collection. The responses were collected from 772 sample respondents from three upcoming smart cities in India and were further examined by deploying the structural equation modeling technique using IBM SPSS and AMOS tools.

FINDINGS: The proposed framework in this research study has social implications in terms of key factors that are critical when conceptualizing government services using artificial intelligence to avoid any harmful effects on society. The findings demonstrated six enablers and three barriers significantly affecting adoption intention ($p < 0.05$) and explained 81 percent of the variance (R^2) with the model's Goodness-of-fit index above 0.9. The quantitative results are also validated with the case studies from six smart cities across the globe for designing and deploying artificial intelligence-based services in the public sector.

CONCLUSION: The study highlights that the smart city management must make sufficient effort to ensure that artificial intelligence service delivery in a smart city is equitable for all socioeconomic levels of city residents. The study provides several policy recommendations for governments and technology service providers when deploying

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INTRODUCTION

India is one of the world's fastest-growing economies, with an estimated 35 percent (%) of its population living in cities (World Bank, 2022). However, unplanned urbanization has resulted in multiple issues from both government and residents point of views. Therefore, in 2015, the Indian government announced the ambitious Smart Cities Mission to improve quality of life and foster economic growth in top 100 cities across the country. This transformation is expected to be achieved by utilizing the latest breakthroughs in Information and Communication Technologies (ICTs) (Drobyazko et al., 2023; Praharaj et al., 2018). With the help of ICTs, the smart city initiative aims to move away from an unplanned urbanization to a planned urbanization (Zeng et al., 2016). As metropolitan areas expand and city resources become scarce, new problems arise, such as traffic congestion, waste disposal, safety, and the allocation of shared space, among others (Kuberkar and Singhal, 2020). Cities are therefore progressing toward becoming smarter. Across the globe, local councils, private businesses, and research institutes are launching several initiatives to modernize urban areas and build smart cities (Camero and Alba, 2019). Smart city is generally imagined by merging advanced ICTs with public administration processes (Bibri and Krogstie, 2018). In contrast to a traditional urban neighborhood, a smart city is expected to provide intelligent services that improve the quality of life and enable social sustainability (Marvi et al., 2023) and economic growth (Caragliu et al., 2011). Technology adoption in government, popularly known as e-governance, eases not only civic operations internally but also improves external service delivery to citizens (Yeh, 2017). However, in 2020, UN ranked India at 100th position in e-government development index and 29th position in e-participation index (UN, 2020) which is a cause of concern for a developing and large country like India.

Role of AI in smart cities

To create their own ideal smart city, common people are expected to participate in the urban reforms and monitor municipal governance (Bednarska-Olejniczak et al., 2019). There are various traditional and advanced ICTs that have the potential to be deployed in a smart city (Chatterjee and Kar, 2018; Nam and Pardo, 2011). From the

current set of emerging technologies, Artificial Intelligence (AI) is showing promise to completely overhaul services through automation, intelligent forecasting, and transparency. In AI, machines are programmed to learn, comprehend, and solve problems in the same manner as humans do (Minsky, 1961). Recent development in Generative AI, a subcategory of AI domain, has increased its awareness amongst population and expanded use cases many-fold. The National Institution for Transforming India (NITI) Aayog, a government of India policy think tank, anticipates that smart cities will be one of the most important application areas for AI, which, if applied correctly, will resolve several long-standing problems in civic operations (NITI Aayog, 2018). However, widespread adoption of innovative technology requires time and follows an adoption curve (Lee et al., 2013). It is important to note that AI is an emerging technology, and it differs from traditional technologies in terms of user experience, cost to deploy, and algorithmic complexities (Kuberkar et al., 2022). Also, data is the backbone to AI and India lacks data governance standards (Lnenicka and Saxena, 2021). Moreover, there are no widespread, long-term actual usage patterns of AI by ordinary people in India. In brief, there is a need for additional research on the possible application of such advanced technologies in e-governance (Ølnes and Jansen, 2017). Andrew Ng, a former leader of Google Brain and Baidu's AI business, compares AI to electricity, a century-old transformative technology (Ng, 2018). In the administration of municipal corporations, AI has begun to acquire traction. It can result in higher efficiencies in smart cities, such as better traffic management, energy, and water distribution, and ultimately make cities more sustainable (NITI Aayog, 2018). While AI offers many advantages to public-sector services, it also has a few disadvantages as pointed out by several researchers. The trade-off between the possible harm the AI system can do, and the potential benefit it can provide must be thoroughly examined (Siau and Wang, 2020; Zajko, 2021). There could be few AI solutions that are competent and efficient, but in practice, they could become biased and unexplainable (Nevala, 2017; Yang et al., 2022). This requires further studies to better understand AI's implications to city residents more holistically.

Theoretical foundation

As the purpose of this study is to examine the determinants of AI's adoption intention in a smart city, the theories pertaining to technology adoption by individuals are of relevance. More than 100 publications from reputable peer-reviewed journals were analyzed to determine the current state of AI technology and emerging technology adoption by individuals in a smart city. The theoretical literature review is performed on the following subtopics: (1) Smart City Literature; (2) AI Literature; and (3) Theories of Technology Adoption. Contemporary social scientists consider population density and spatial heterogeneity to define a city. The city could also be defined as a type of community-based on markets, specific laws, and political autonomy. Technological improvements have a substantial impact on the industrialization capability of cities, which in turn influences and is influenced by other social institutions such as family, social class, and politics (Sjoberg, 1955). Smart cities are the application of smart technologies such as AI to the social and economic operations of a city. Arthur Samuel Lee coined the term "machine learning" in his revolutionary work in computer games and artificial intelligence to describe the process of making computers function. Initially, AI was limited to imitating human intelligence, but it has now evolved into a much broader notion that may assist in a variety of occupations (Dwivedi *et al.*, 2021). Rapid advances in information technology have drawn a large number of scholars interested in examining the elements underlying adoption intent and actual usage of technology-led solutions. Ajzen introduced the theory of planned behavior (TPB) after Fishbein and Ajzen introduced the theory of reasoned actions (TRA). These theories serve as the basis for measuring the intent to accept technological solutions. Davis extended TRA and TPB to develop a basic yet powerful TAM theory for measuring adoption intention and subsequent use of technology solutions. Venkatesh *et al.* further evolved TAM into the Unified Theory of Acceptance and Use of Technology (UTAUT) theory (Venkatesh *et al.*, 2003).

Research gap

In recent years, research has been conducted on the determinants e-governance adoption in various countries (Almaiah and Nasereddin, 2020). AI has

a potential to significantly change the public sector service delivery. However, there are negligible studies in the domain of AI's adoption in public sector. Since India is on the path of building smart cities with a focus on using AI, it is appropriate to examine the determinants of AI technology adoption in civic service delivery from the citizens' perspective. Such a study would provide guidelines for the usage of AI in urban administration. Therefore, the following research question is addressed in this study: Which factors influence the adoption intention of AI in the delivery of municipal services within an India smart city? The study answers this research question by using an extended Unified Theory of Acceptance and Use of Technology (UTAUT) and performing quantitative analysis on the primary data collected through surveys in the Maharashtra state of India between February and May of 2023. Maharashtra is the most advanced state in India in terms of education and economy. Finally, the study is novel in terms of empirically finding factors influencing adoption intention of AI while availing municipal service in a nation like India which has a large population, limited resources, and a developing economy. The proposed framework in this study has social implications in terms of key factors that are critical when conceptualizing government services using AI to avoid any harmful effects on society.

MATERIALS AND METHODS

Conceptual Framework

The aforementioned concerns like technology novelty and its potential risks and benefits in e-governance falls under the broader umbrella of information systems research and studies have been conducted for incumbent technologies using various technology adoption theories (Lai, 2017). Studying adoption intention prior to actual usage for emerging technologies and designing products and services according to factors that influence adoption intention increases the likelihood that the technology will be utilized successfully in the future (Kupfer *et al.*, 2016). From the available technology adoption theories, the UTAUT model is chosen as the base theoretical foundation for this research. Prior meta-analyses have demonstrated that UTAUT is a credible model that reliably explains a substantial proportion of the intention to adopt novel technologies (Dwivedi *et al.*, 2019). In addition, it acquired robust

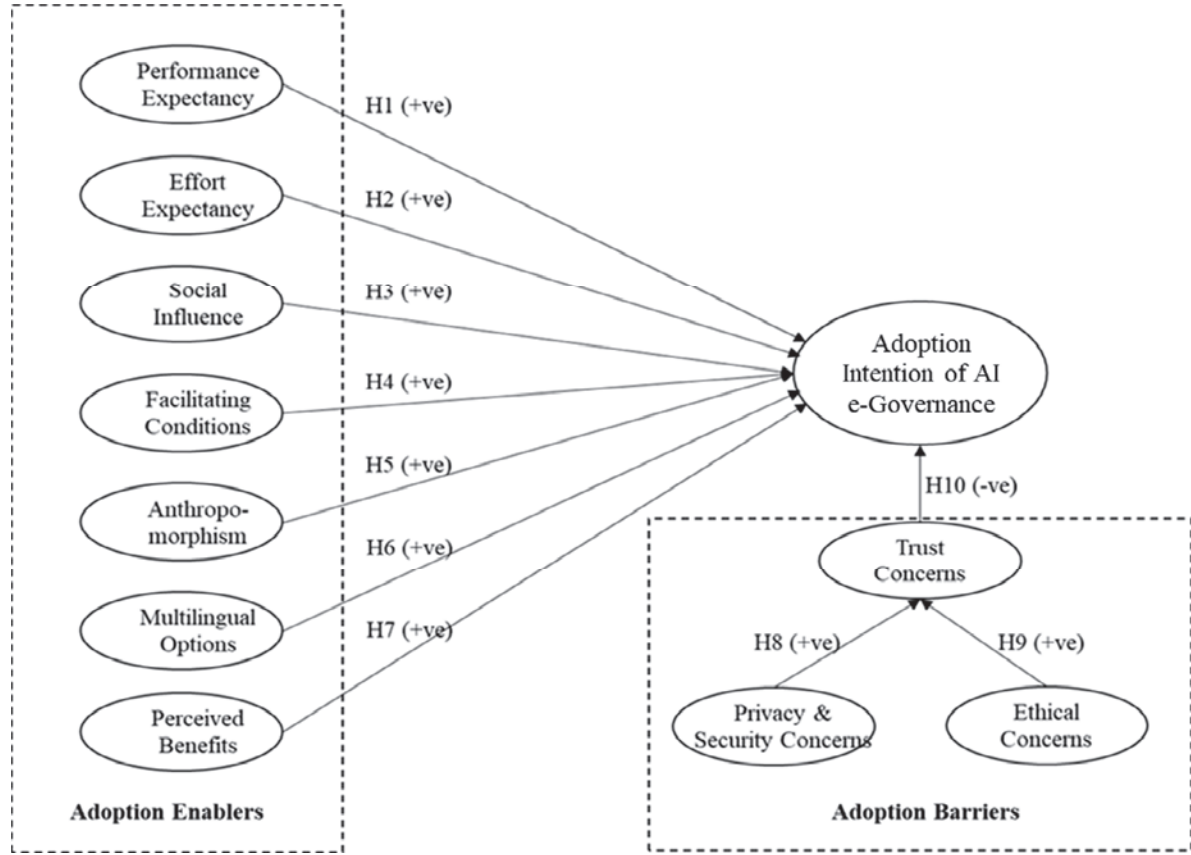


Fig. 1: Hypothesized AI4SC framework of the study

empirical evidence from global academics for its use in e-governance adoption by citizens (Pillai and Sivathanu, 2020). Based on the literature study, the researchers of this study have proposed an extended UTAUT model (Fig. 1) to identify enablers and barriers to AI adoption in a smart city, named as AI4SC framework. According to the UTAUT theory, technology adoption (ADIN) is contingent on Performance Expectancy (PEXP), Effort Expectancy (EEXP), Social Influence (SINF), and Facilitating Conditions (FCND) (Venkatesh et al., 2003).

It was found from literature studies that UTAUT alone is not sufficient to explain the variance in adoption intention and other technology and culture related factors also influence the desire to use the technology. Therefore, the researchers of this study have included additional factors such as Anthropomorphism (ANTH), Multilingual Option (MLOP), Perceived Benefits (PBEN), Privacy and

Security Concerns (PSEC), Ethical Concerns (ETHC), and Trust Concerns (TSTC) in the proposed AI4SC model based on AI's technological characteristics and potential social impact.

The hypotheses that make up the conceptual model are as follows:

Relationship between PEXP and ADIN: The PEXP is described as "the degree to which an individual believes that using the system will help him or her to attain gains in job performance" (Venkatesh et al., 2003). This means newer technological systems should be appropriate, efficient, and beneficial to access citizen services, just like any other new technology-enabled system. It has been noted that, even in cases when an online application is submitted, there are still some online municipal corporation services that are only partially available online and need residents to physically visit the office in order to receive the service. Hence, the suggested system

should offer all the features needed to access the service in its entirety. Several prior researchers have demonstrated that PEXP favorably impacts ADIN of online government services (Gupta *et al.*, 2016), and it is anticipated that this relationship will remain true for AI adoption in a smart city. Thus, the researchers of this study hypothesize that:

H1: PEXP positively affects ADIN

Relationship between EEXP and ADIN

The EEXP is described as “the degree of ease associated with the use of the system” (Venkatesh *et al.*, 2003). In the urban context of an Indian metropolis, it is commonly observed that a segment of the population possesses advanced qualifications and a high level of technological literacy, whilst another segment of society exhibits limited literacy skills and lacks familiarity with technology. Therefore, the proposed system is expected to be low complex, making it easily comprehensible and acquirable. The provision of unambiguous instructions by the system is crucial in mitigating the digital gap within society. Past research has indicated that EEXP is positively correlated with the use of online government services (Rana *et al.*, 2017), and it is anticipated that a similar relationship will exist between EEXP and the adoption of AI in a smart city. Hence, the researchers of this study hypothesized:

H2: EEXP positively affects ADIN

Relationship between SINF and ADIN

SINF is described as “the degree to which an individual perceives that important others believe he or she should use the new system” (Venkatesh *et al.*, 2003). As individuals witness the adoption of new technology by their acquaintances, family members, and other members of their social network in order to access municipal services, it is likely that they too will begin to embrace citizen services that are facilitated by novel technology solutions. SINF is believed to have had a positive impact on the ADIN of online public administration services in the past (Rana *et al.*, 2017), and it is anticipated that the same will be true for the adoption of AI in a smart city. Thus, the researchers of this study hypothesize that:

H3: SINF positively affects ADIN

Relationship between FCND and ADIN

The FCND is described as “the degree to which an individual believes that an organizational and technical infrastructure exists to support the use of the system” (Venkatesh *et al.*, 2003). In order to access online municipal services, it will be necessary for citizens to have continuous connectivity available to them at all times. Hence, it is believed that making a concerted efforts to ensure the provision of internet connectivity to all geographical regions encompassing the city to enable residents from every ward and socio-economic stratum to avail themselves of the many online services. FCND has been found to positively correlate with the adoption of online government services (Gupta *et al.*, 2016), and it is anticipated that the same will be true for the adoption of AI in a smart city. Hence, the researchers of this study hypothesized:

H4: FCND positively affects ADIN

Relationship between ANTH and ADIN

ANTH is defined as “assigning human characteristics to nonhuman objects such as learning and reasoning”. AI technology enables systems to exhibit human-like behavior. AI-based robots exist in both software and physical forms. The uncanny valley theory is frequently used to examine ANTH as it relates to the adoption of robotic technologies. The conventional form of interpersonal communication between individuals is considered inherent, and there is a generally comprehensive understanding of the elements of empathy, emotions, and contextual factors involved. Robotic conduct is observed when a system operates devoid of empathetic consideration for the end-user or lacks comprehension of the contextual nuances associated with a service request. Researchers in the past have presented the uncanny valley hypothesis, which proposes that humans are generally receptive to ANTH-rich systems (Pillai and Sivathanu, 2020). It is anticipated that the same will hold true for AI adoption in the smart city. Hence, the researchers of this study hypothesized:

H5: ANTH positively affects ADIN

Relationship between MLOP and ADIN

The MLOP analyzes the impact of employing a technology solution in multiple languages to

complete a task (Singh et al., 2005). India is a nation characterized by its linguistic diversity. A significant portion of the population lacks proficiency in the English language, either in terms of literacy or fluency. The field of technology has seen advancements to facilitate the utilization of many languages. Several states in India are actively advocating for the utilization of indigenous languages in the provision of government services. Similarly, AI adoption in smart city is expected to be influenced by MLOP. Thus, the researchers of this study hypothesize that:

H6: MLOP positively affects ADIN

Relationship between PBEN and ADIN

PBEN refers to an individual's belief that technology will provide economic or non-economic benefits. Offering incentives or prizes is a viable strategy for modifying the behavior of end-users. ICT technologies have a multitude of advantages as compared to conventional in-person or online services. Furthermore, the implementation of monetary incentives or other forms of rewards could potentially expedite the adoption of the new system. In the context of online services, there are direct and indirect advantages. Immediate and practical benefits of utilizing an ICT system include a monetary gain, greater working speed, and increased information accessibility (Lee, 2009). Indirect advantages include less obvious benefits, such as accessibility, 24-hour service, and alternatives for value-added services. Researchers in the past found that PBEN had a positive effect on behavioral intention to use technology solutions (Gupta et al., 2016). PBEN is expected to perform similarly for AI adoption in a smart city. Hence, the researchers of this study hypothesized:

H7: PBEN positively affects ADIN

Relationship between PSEC and TSTC

PSEC is a significant impediment to the ADIN of online government services (Yang et al., 2019). PSEC consists of both online privacy concerns and security concerns. Privacy concerns are the individual's concerns regarding threats to data privacy, while security concerns relate to an individual's perception of the overall security of the system against illegal access and fraud. The objective of e-governance systems is to enhance online safety. Although some

cities have implemented online government systems, the primary obstacles to their widespread acceptance are the apprehensions surrounding data privacy and system security. In order to enhance public trust in the planned AI4SC system, it is imperative to ensure the protection of people's privacy and security. The PSEC contributed to a decline in public trust, as observed in past studies, and is expected to behave in a similar manner for information systems for citizen services (Kuberkar and Singhal, 2021). Thus, the researchers of this study hypothesize that:

H8: PSEC has a positive relationship with TSTC

Relationship between ETHC and TSTC

Ethics is considered as an individual's judgment that a technological system complies with social and moral standards (Acman and Mishra, 2017). In this research, questions of fairness, accountability, openness, and moral principles are addressed by ETHC. There exists a potential for the introduction of bias into algorithms within the setting of a smart city, leading to outcomes that exhibit preferential treatment or adverse consequences towards specific groups. The presence of undetected data bias or lack of accountability has the potential to undermine the trust on the robust solution. In order to enhance confidence, it may also be imperative to employ concepts of Explainable Algorithms that effectively demonstrate the concept of transparent decision and outcomes by a system. Moreover, individuals tend to adopt technology that reduces risks and does not disrupt social peace. Higher ETHC has been shown to decrease trust in information systems (Kuberkar et al., 2022) and is anticipated to exhibit similar behavior to AI adoption in a smart city. Hence, the researchers of this study hypothesized:

H9: ETHC positively affects TSTC

Relationship between TSTC and ADIN

Trust is an individual's faith in the dependability of a technological solution with reduced uncertainty. The measurement of citizens' trust when using online government services can be assessed based on their judgments of the absence of risks, uncertainties, or fraudulent activities during the course of a transaction. TSTC includes trust-related concerns while working with online systems in this study. It has

been demonstrated that decreased TSTC increases the adoption of online information systems (Lewis *et al.*, 2018). A number of previous studies on trust have investigated the risk that an individual assumes when relying on new technology to achieve goals. The anticipated rise in the acceptance and utilization of online citizen services within smart cities could be contingent upon people perceiving a minimal level of danger associated with engaging with the system. Therefore, a higher TSTC may necessitate more frequent intervention or monitoring of the system's performance. This study, like previous research (Følstad *et al.*, 2018), assumes that citizen TSTC may play an important role in the adoption of AI in a smart city. Thus, the researchers of this study hypothesize that:

H10: TSTC negatively affects ADIN

Survey design and data collection

The hypothesized framework is translated into a simple-to-understand survey questionnaire consisting of questions related to the potential factors influencing citizens' intentions to adopt AI4SC. The questionnaire was evaluated from a panel of five experts. All construct-related items in the survey were graded on a five-point Likert scale. Likert scale Respondents were instructed to select the choices from the range of 1 to 5 (with 1 indicating strong disagreement; 2 disagreement; 3 neutrality; 4 agreement; and 5 strong agreement). Based on study's objective and research method, Likert scale helps to measure extent to which respondents agree or disagree on the items affecting their adoption intention of technology. In the pilot phase before mass survey, Dillman's (2000) technique of four stages of questionnaire item testing was utilized. The online survey was created using Google forms and distributed to 58 participants (i.e., greater than 10 percent of the minimal sample size) employing convenience sampling to ensure the questionnaire's wording and contextual clarity. Pilot respondents reviewed the questionnaire and provided suggestions for enhancements, such as the questionnaire wording, addition of relevant images, and the reduction of the variables survey questions from 41 to 36 questions, as shown in Table 1. The target demographic for this research study consists of all residents of India's designated 100 smart cities.

Due to practical constraints, the researcher could only collect data from three smart cities: Pune, Pimpri-Chinchwad, and Thane. The sample cities consist of population drawn from various parts of the country because of the presence of industry cluster and resulting migration. It helps in reducing cognitive bias due to small set of sample cities. According to the 2011 Census, the population under study is roughly 6.7 million (Census of India, 2011).

As per the nature of this study, the researchers of this study recruited individuals employing a combination of purposive and snowball sampling strategies. In addition, the researchers of this study assumed that people aged 25 to 60 with at least 15 years of formal education would have used internet-enabled technology for at least five years in the selected smart cities. Selecting these set of respondents ensures representation of population as mostly working people in this age group are major consumers of various municipality services. People aged below 25 years typically falls into student category while above 60 years falls into retired category. Hence, the study does not suffer from generalizability of findings. Consequently, the sample unit of this research study was a person aged 25 to 60 with at least a high school diploma or bachelor's degree who utilizes an internet-enabled gadget for employment or to access services from private or government organizations. According to the Cochran's sample size formula, the minimum sample size for the quantitative phase should be 385 for a 95% confidence interval with a 5% margin of error for the population under research. In addition, most research employing SEM implies that a sample size of 10 for each item is a sufficient estimate. A study by Irani *et al.* (2012) found that approximately 87% of the e-governance adoption studies in leading journals were done with a sample size below 750. Hence, a sample size greater than 750 would be deemed more than adequate for the current investigation based on the findings of several studies with similar objectives. As a result, the researchers of this study decided to recruit approximately 900 participants for this study, estimating that 10 to 15% of responses would be invalid or incomplete. In actuality, the researchers of this study only obtained 867 responses. The incomplete survey responses were eliminated, leaving a final survey with 772 responses for analysis.

Table 1: Survey question items

Parameter	Question	Variable	References
Performance Expectancy (PEXP)	It may provide flexibility while availing services	PEXP1	Venkatesh <i>et al.</i> , 2003
	It may deliver citizen services on-time	PEXP2	
	It may be developed with citizen needs in mind	PEXP3	
Effort Expectancy (EEXP)	It may deliver service fully in online mode	EEXP1	Venkatesh <i>et al.</i> , 2003
	It may reduce efforts to visit multiple departments	EEXP2	
	It may be easily understandable	EEXP3	
Social Influence (SINF)	My friends and family may expect me to use it	SINF1	Venkatesh <i>et al.</i> , 2003
	My social circle or people in my society may use it	SINF2	
	People whom I follow may influence my adoption	SINF3	
Facilitating Conditions (FCND)	I may have resources (phone or computer) to use it.	FCND1	Venkatesh <i>et al.</i> , 2003
	I expect availability of help centers in my area or locality	FCND2	
	I will have internet connectivity to access the system	FCND3	
Anthropomorphism (ANTH)	System interaction may be similar to human staff.	ANTH1	Pillai and Sivathanu, 2020
	It may understand context of my service request	ANTH2	
	The system may not be robotic	ANTH3	
Multilingual Option (MLOP)	It is ok if it communicates only in English language	MLOP1	Singh <i>et al.</i> , 2005
	It may work in local or Hindi language as well	MLOP2	
	I may be comfortable when it works in native language	MLOP3	
Perceived Benefits (PBEN)	It may provide monetary benefits like discounts	PBEN1	Gupta <i>et al.</i> , 2016
	It may reward me if I follow all city norms and rules	PBEN2	
	It may provide badge for my usage of new system	PBEN3	
Privacy and Security Concerns (PSEC)	I may worry about my private data sharing	PSEC1	Yang <i>et al.</i> , 2019
	I expect system and data may be secure	PSEC2	
	It may not capture my data without my permission	PSEC3	
	My data may be shared only when I authorize	PSEC4	
Ethical Concerns (ETHC)	It may deliver services in fair and ethical way	ETHC1	Kuberkar <i>et al.</i> , 2022
	Govt may inform how the system is designed	ETHC2	
	Someone may be accountable for mistakes	ETHC3	
	I expect clear responsibility and legal options	ETHC4	
Trust Concerns (TSTC)	I may not use it if it makes mistakes	TSTC1	Lewis <i>et al.</i> , 2018
	It may deliver service in dependable manner	TSTC2	
	It may provide reliable service without any issues	TSTC3	
Adoption Intention (ADIN)	I may like the idea of such an automated robotic system	ADIN1	Venkatesh <i>et al.</i> , 2003
	When ready, I may intend to use the system	ADIN2	
	Using it may be a pleasant experience	ADIN3	
	I may recommend others to use the system	ADIN4	

RESULTS AND DISCUSSION

A set of statistical tests were conducted on the collected survey responses, and the findings are summarized in this section. Initial data cleansing

process consisted of removing errors, incomplete responses, and outliers. After data cleansing, data normalization was evaluated. Subsequently, the validity and reliability of the data have been

confirmed. Finally, Confirmatory factor analysis (CFA) and Structural Equation Modeling (SEM) tests were conducted to test the hypotheses. CFA assists in testing validity of factor structure while SEM assists in evaluating multivariate causal relationship between factors of a model.

Measurement model analysis

CFA was performed using IBM SPSS V28 (Fahimah *et al.*, 2023). All 36 independent variables were initially included in the CFA, generating ten factors

that explained approximately 70.4% of the total variance. Utilizing PCA (Principal Component Analysis) with Varimax rotation, the data was extracted. According to the findings of the measurement model, the Kaiser–Meyer–Olkin (KMO) value was 0.897, which exceeded the minimum suggested value of 0.5 (Hair *et al.*, 2006). Moreover, Barlett’s sphericity test proved significant at the 0.01 level ($p < 0.000$). By examining the factor loadings, it became evident that each of the ten factors loads correctly into its own factor group. Table 2 indicates additional statistical

Table 2: Confirmatory factor analysis results: factor loadings and reliability

Latent variable	Observed variable	Standardized factor loading	Cronbach’s Alpha	VIF
PEXP	PEXP1	0.850	0.906	1.618
	PEXP2	0.914		
	PEXP3	0.858		
EEXP	EEXP1	0.782	0.883	1.819
	EEXP2	0.900		
	EEXP3	0.857		
SINF	SINF1	0.894	0.879	1.033
	SINF2	0.935		
	SINF3	0.702		
FCND	FCND1	0.807	0.887	1.865
	FCND2	0.851		
	FCND3	0.892		
ANTH	ANTH1	0.840	0.871	1.739
	ANTH2	0.825		
	ANTH3	0.838		
MLOP	MLOP1	0.861	0.890	1.424
	MLOP2	0.849		
	MLOP3	0.860		
PBEN	PBEN1	0.664	0.853	1.237
	PBEN2	0.858		
	PBEN3	0.911		
PSEC	PSEC1	0.873	0.913	1.549
	PSEC2	0.860		
	PSEC3	0.851		
ETHC	PSEC4	0.820	0.909	1.467
	ETHC1	0.853		
	ETHC2	0.851		
TSTC	ETHC3	0.855	0.907	1.680
	ETHC4	0.823		
	TSTC1	0.867		
ADIN	TSTC2	0.903	0.843	1.438
	TSTC3	0.855		
	ADIN1	0.787		
	ADIN2	0.606		
	ADIN3	0.867		
	ADIN4	0.822		

Table 3: Construct validity measures - convergent validity and discriminant validity

Construct	CR	AVE	MSV	ASV	PEXP	EEXP	SINF	FCND	ANTH	MLOP	PBEN	PSEC	ETHC	TSTC	ADIN
PEXP	0.907	0.765	0.417	0.214	0.875										
EEXP	0.884	0.719	0.510	0.244	0.574	0.848									
SINF	0.885	0.722	0.011	0.002	0.041	0.014	0.849								
FCND	0.887	0.724	0.518	0.256	0.430	0.531	-0.021	0.851							
ANTH	0.873	0.696	0.449	0.242	0.471	0.593	0.013	0.583	0.834						
MLOP	0.892	0.734	0.375	0.182	0.457	0.493	-0.047	0.433	0.432	0.857					
PBEN	0.856	0.669	0.263	0.138	0.369	0.468	0.050	0.404	0.367	0.384	0.818				
PSEC	0.913	0.725	0.362	0.185	-0.419	-0.462	0.029	-0.484	-0.516	-0.384	-0.287	0.852			
ETHC	0.909	0.715	0.457	0.220	-0.469	-0.487	-0.034	-0.633	-0.518	-0.413	-0.307	0.431	0.846		
TSTC	0.908	0.766	0.502	0.208	-0.495	-0.500	0.106	-0.499	-0.444	-0.387	-0.367	0.423	0.403	0.875	
ADIN	0.857	0.603	0.518	0.386	0.646	0.714	0.042	0.720	0.670	0.612	0.513	-0.709	-0.602	-0.676	0.776

measurements demonstrating that all constructs possess an adequate level of reliability. The CFA determined that eleven variables accounted for 64.36 percent of the total variation. Cronbach's alpha coefficients are used to measure internal consistency, with a value above 0.7 being considered adequate (Nunnally, 1994). The factor loadings and Cronbach's alpha exceed the permissible limits, confirming the construct's reliability requirements. The Variance Inflation Factor (VIF) was calculated for each latent variable for testing the multicollinearity. The VIF of each variable is found to be less than 2.5, indicating that there is no multicollinearity in the constructs.

Construct validity

Composite Reliability (CR) indicates latent variable's consistency and reliability. Convergent validity, measuring related items convergence, was determined using Average Variance Explained (AVE). The CR values should be greater than 0.7, and the AVE should be larger than 0.5 (Hair *et al.*, 2006). It is also recommended that Maximum Shared Variance (MSV) should be less than AVE and Average Shared Variance (ASV) should be less than AVE as well. Both CR and convergent validity is established, and

the values are summarized in Table 3. Discriminant validity, measuring the uniqueness of latent variables, is tested by examining correlations between latent variables (Henseler *et al.*, 2015). To verify discriminant validity using Fornell-Larcker criteria, off-diagonal values were computed, and AVE was compared to the intercorrelation of the construct. Table 3 indicates that the shared variance values were less than the square root of AVE, demonstrating the discriminant validity of the research constructs (Tajpour and Razavi, 2023; Samimi, 2024).

Structural model analysis

Using SEM, the relationship between latent variables is estimated. AMOS V26 is employed to compute a variety of parameters. Table 4 summarizes the goodness-of-fit indices which demonstrates that the observed sample values match with expected population under normal distribution (Samimi *et al.*, 2023).

After establishing goodness-of-fit measures, SEM analysis followed. Table 5 shows the results of hypotheses testing from SEM analysis and Fig. 2 shows the validated AI4SC conceptual model. The hypotheses test results are as follows: H1: The tests

Table 4: Goodness-of-fit measures for SEM model

Goodness-of-fit Indices	Recommended value	SEM model
Chi-square (CMIN)	-	1073.438
Degrees of freedom (DF)	-	548
P value	<0.05	0.000
CMIN/DF	1-3	1.959
Goodness of fit index	>=0.9	0.902
Adjusted goodness of fit index	>=0.8	0.834
Comparative fit index	>=0.9	0.948
Tucker Lewis index	>=0.9	0.940
Root mean square error of approximation	<=0.05	0.049

Table 5: Hypothesis testing results and structural relationships

Hypothesis	Path	Path coefficient (β)	SE	p-value	Decision
H1	PEXP \rightarrow ADIN	0.14	0.029	0.001**	Supported
H2	EEXP \rightarrow ADIN	0.17	0.043	0.000***	Supported
H3	SINF \rightarrow ADIN	0.07	0.023	0.021*	Supported
H4	FCND \rightarrow ADIN	0.27	0.036	0.000***	Supported
H5	ANTH \rightarrow ADIN	0.14	0.036	0.004**	Supported
H6	MLOP \rightarrow ADIN	0.17	0.030	0.000***	Supported
H7	PBEN \rightarrow ADIN	0.06	0.042	0.232 ^{ns}	Not Supported
H8	PSEC \rightarrow TSTC	0.32	0.057	0.000***	Supported
H9	ETHC \rightarrow TSTC	0.30	0.059	0.000***	Supported
H10	TSTC \rightarrow ADIN	-0.32	0.026	0.000***	Supported

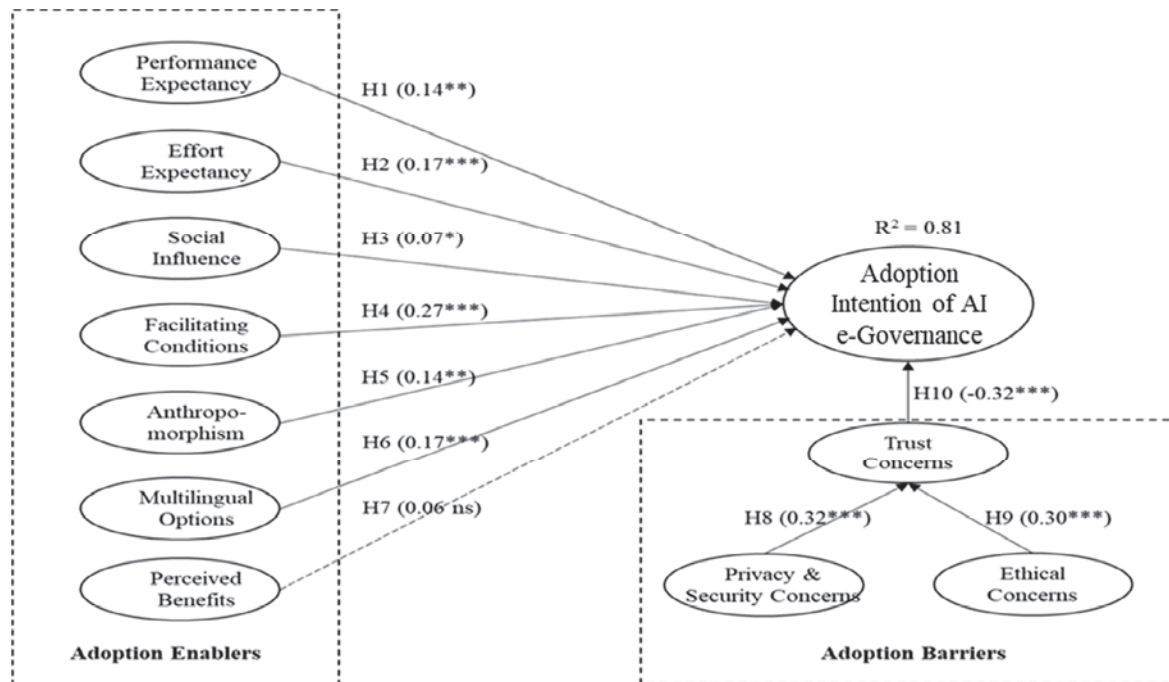


Fig. 2: SEM results of the proposed AI4SC model

revealed that PEXP had a significant impact ($\beta = 0.14$ and $p=0.001$) on the ADIN. Thus, the H1 is supported indicating that citizens feel the AI4SC system would enhance the performance of citizen service delivery, thereby increasing the likelihood of AI adoption.

H2: The results of this study prove that EEXP had a significant impact ($\beta = 0.17$ and $p=0.000$) on the ADIN. Therefore, the H2 is supported, highlighting that the citizens view AI4SC to be an easy-to-use system for availing online municipal corporation services in an SC (Rana et al., 2017). H3: The study found that SINP had a significant ($\beta = 0.07$ and $p=0.021$) impact on the ADIN, suggesting that individuals tend to imitate their peers when it comes to adopting new technology such as the proposed AI4SC. Thus, H3 is supported. H4 investigated the influence of FCND on the ADIN of AI4SC. H4: The results indicate that FCND had a significant impact ($\beta = 0.27$ and $p=0.000$) on the ADIN. Thus, H4 is supported, highlighting that the citizens perceive AI4SC will be a viable option for public services because they would have the necessary infrastructure, such as internet connectivity, electronic devices, or physical help centers in their local wards, to access the services (Gupta et al., 2016). H5: The

findings of the study demonstrate that ANTH had a significant influence ($\beta = 0.14$ and $p=0.004$) on the ADIN, suggesting that anthropomorphism, or human-like features, are crucial for the adoption of the AI4SC system by the ordinary citizens. Consequently, H5 is supported (Pillai and Sivathanu, 2020). H6: The tests revealed that MLOP had a significant effect ($\beta = 0.17$ and $p=0.000$) on the ADIN. Thus, H6 is supported, emphasizing that citizens want AI4SC to deliver services in multiple languages for effective use of online municipal corporation services without the burden of language translation (Singh et al., 2005). H7: The research indicates that PBEN had no substantial impact ($\beta = 0.06$ and $p=0.232$) on the ADIN, meaning that individuals do not anticipate additional tangible or intangible benefits while utilizing AI4SC to access municipal services. Thus, H7 is not supported. The non-significance of this hypothesis in this research study may be attributed to the existing status of government services, which are marked by delays and mistakes. Therefore, citizens may not be anticipating extra direct or indirect benefits from AI4SC beyond those already considered factors. H8: According to the data analysis, PSEC had a significant effect ($\beta =$

0.32 and $p=0.000$) on TSTC. Thus, H8 is supported. The finding emphasizes that implementing AI for citizen services within an SC requires rigorous data privacy and security considerations (Yang *et al.*, 2019). H9: The evidence indicates that ETHC had a significant effect ($\beta = 0.30$ and $p=0.000$) on the TSTC. Thus, H10 is supported indicating that citizens believe that AI-based public sector systems should be built on ethical principles such as proper accountability, minimal bias, increased transparency, and adherence to moral values (Kuberkar *et al.*, 2022). H10: The research suggests that TSTC had a significant impact ($\beta = -0.32$ and $p=0.000$) on the ADIN, indicating that individuals are ready to adopt an AI-enabled system when it is reliable, risk-free, and trustworthy. Thus, H10 is supported (Følstad *et al.*, 2018; Lewis *et al.*, 2018).

Results validation with global urban AI initiatives

The researchers of this study have compared the study findings with some of the leading metropolitan cities in the world which have taken AI initiatives for urban governance (Table 6). The secondary data is collected from various authentic web sources and

research articles on the five cities, namely, Toronto, Helsinki, Dubai, Singapore, and Melbourne.

The research demonstrates the differences between AI and other types of technologies, highlighting the need for additional research into AI-specific components, especially for broader societal implications. Being relatively nascent technologies, the academic literature currently lacks detail understanding of how ordinary citizens perceive AI technical solutions for civic operations. Therefore, the researchers of this study proposed a novel AI4SC framework to investigate the factors that will influence the adoption of AI technologies in smart city. More specifically, this research validates that UTAUT is still the relevant base theoretical model to study technology adoption in the public sector. The study brought together seven enablers and three barriers from the individual (PEXP, EEXP, PBEN, TSTC), technical (FCND, ANTH, MLOP, PSEC), and social (SINF, ETHC) domains to study the adoption intention (ADIN). While the study found that the basic four UTAUT factors are significant predictors of ADIN, the technology-specific factors are also critical to predict ADIN. For example, ANTH and ETHC

Table 6: Global urban AI initiatives and influencing factors

City name	AI Initiative	Adoption influencers	Sources
Toronto	SC initiative was launched in partnership with Google in 2017. The goal was to provide smart services using advanced technologies such as AI, cameras, and sensors. The project was abandoned due to constant concerns raised from citizens regarding data privacy, surveillance, and ethical use of data.	PSEC, ETHC, and TSTC	Artyushina, 2020
Helsinki	AI-enabled chatbot launched for 24x7 automated delivery of parking permits. Efforts were taken for local language support, involving citizen groups, informing citizens about data privacy and security, and ensuring ethical implementation.	PEXP, MLOP, ANTH, PSEC, ETHC, and TSTC	Mark and Anya, 2019
Dubai	Projected as the hub for emerging technology-led urban administration. AI is being implemented for various service automation, ensuring the right governance process.	PEXP, EEXP, FCND, PSEC, and ETHC	Batayneh <i>et al.</i> , 2021
Singapore	This city-state nation has created the Model AI Governance Framework for how AI systems should operate and also raise public knowledge and foster trust in technology.	PEXP, EEXP, PSEC, TSTC, and ETHC	Falco <i>et al.</i> , 2021
Melbourne	For Melbourne, technology is not deployed for the sake of it but used only when it provides value and experience to residents. It aims to predict traffic patterns hours in advance and set the stage for linked and driverless cars. Australian citizens are debating about data, trust, and AI ethics as the digital transformation progresses.	PEXP, EEXP, PSEC, and ETHC	Yigitcanlar <i>et al.</i> , 2021

factors should be studied when automated systems are being considered for public-facing applications. MLOP remains a significant factor for studies involving multilingual communities. Moreover, PSEC and TSTC should be considered when studying novel technology adoption.

CONCLUSION

AI's role in smart city services

Governments around the world are evaluating cutting-edge technologies to ease urban difficulties. Specifically, AI is being trialed for a variety of pressing needs in the delivery of citizen services. With its text, audio, and image processing capabilities, AI technology will be able to automate numerous smart city services. Currently, due to poor information management, a lack of strategic data usage, and operations undertaken in siloed groups, numerous government services experience delays, inefficiency, and public displeasure in a large and diverse country like India. Increased public dissatisfaction with current service delivery systems is also attributed to their reliance on physical paper and human intervention at every stage. Moreover, the deployment of continuous monitoring systems generating a huge volume of data in a smart city could make the municipal administration more technically and logistically challenging, exposing government services to increasingly intricate and unforeseen obstacles. AI will ensure automated, continuous monitoring of services and also can help in forecasting the service availability based on the external environment and data sources. For example, with AI, smart city authorities will be able to address the expanding and more diverse needs of citizens without needing to engage additional personnel. Secondly, the AI4SC system will reduce or eliminate the need for human night-shift personnel, thereby reducing the cost of providing government services. Thirdly, citizens can submit service requests to AI4SC at any time, from any location, and track their progress through fulfillment. Importantly, ordinary citizens with limited computer skills and resources will profit from its human-like characteristics, which will allow them to utilize the service in a shorter period of time. In the era of Generative AI where the models (such as ChatGPT, Bard, Midjourney, StableDiffusion etc.) capable of generating human-like text, audio, and image data, it is very important that citizens trust e-governance information delivered by AI agents

and alleviate those concerns. AI-powered chatbots and virtual assistants can handle citizen inquiries and automate routine tasks. Data analytics and AI-driven decision-making can provide insights for urban planning and resource allocation. AI can optimize smart city infrastructure, such as transportation and energy systems. Predictive maintenance can be implemented to identify maintenance needs and reduce disruptions. AI can enhance public safety through surveillance and anomaly detection. Citizen engagement and feedback can be facilitated through AI-driven platforms.

Factors influencing AI's adoption intention

With India being a multilingual country, the study recommends applications to support various languages for higher adoption. Overall, to make AI safe for citizen services, it is important to establish an ethical framework, prioritize data privacy and security, ensure transparency and explainability of AI systems, mitigate biases, maintain human oversight and accountability, continuously monitor and evaluate AI systems, educate citizens about AI, and foster collaboration and regulation. These measures will help in safeguarding citizen data, addressing biases, promoting transparency, and ensuring responsible and trustworthy AI deployment. By following these steps, municipalities can enhance the safety of AI in citizen services while upholding ethical principles and protecting individual rights. Based on the current state of e-governance in an Indian urban city and the potential of AI in e-governance, the purpose of this research was to investigate the factors influencing the adoption intention of AI in the delivery of citizen services within a smart city in India. Studying adoption intention prior to the actual usage of novel technologies and designing products and services according to numerous aspects that influence adoption intention increases the likelihood that the technology will be utilized successfully in the future. The study identifies enablers and barriers to adoption using UTAUT as the base theory. The research study provides policy recommendations for governments and service providers regarding the usage of AI technology in the public sector. More specifically, the study highlights the significance of ethics, fairness, accountability, and transparency when implementing AI for citizen services, which in turn affects trust in the systems

that are critical for the government's Digital India initiative. India being a diverse country of various cultures and demographics, the ethical aspects will play a key role in adoption of AI-based services. In addition, in order to be fair to data owners, the data gathering strategy for services should require explicit consent. These considerations would ultimately assist in increasing the return on technology investment drawn from tax payments from citizens. Smart city administrators can leverage AI in several areas to enhance e-governance. It will enable citizens to acquire relevant and accurate answers to their commonly asked questions without significant technological expertise. However, this research study also revealed that the smart city management must make sufficient effort to ensure that AI4SC service delivery is equitable for all socioeconomic levels of city residents. In addition, in order to be fair to data owners, the data gathering strategy for services should require explicit consent. Furthermore, municipal authorities should ensure enough accountability throughout the whole AI4SC system design, development, and deployment process. The significance of transparency and explainability of AI in achieving general social acceptability is highlighted as well, which would be helpful for smart city administrators. Additionally, the proposed AI system should be as secure as any existing online system, with a low likelihood of manipulation and privacy intrusion. In summary, AI would assist smart cities by increasing productivity and service efficiency.

Directions for future research

This study has a few limitations and the directions for future research. First, it was conducted in the western region of the Indian state of Maharashtra. Careful thought is required before generalizing the research's conclusions to different geographic regions. Second, this research was limited to smart city services in urban settings. Future researchers may investigate the application of AI for smart village services in rural locations. Third, this study only measured adoption intention. In future, the scholars can investigate actual usage post implementation. Furthermore, there is a scope for further exploration into more specific AI applications, like 24x7 surveillance and healthcare

diagnostics. Administrators and citizens in Indian smart cities will gain a great deal from the outcomes of such experiments, which will assist them in developing more effective procedures and systems for providing citizen services.

AUTHOR CONTRIBUTIONS

S. Kuberkar performed the literature review, experimental design, analyzed and interpreted the data, prepared the manuscript text, and manuscript edition. S. Singh helped in the literature review and manuscript preparation. T. Singhal helped in the literature review, experimental design, and manuscript preparation.

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CONFLICT OF INTEREST

The authors declare no potential conflict of interest regarding the publication of this work. In addition, the ethical issues including plagiarism, informed consent, misconduct, data fabrication and, or falsification, double publication and, or submission, and redundancy have been completely witnessed by the authors.

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ABBREVIATIONS

%	Percent
β	Regression Coefficient
ADIN	Adoption Intention
AI4SC	Artificial Intelligence for Smart Cities
AMOS	Analysis of Moment Structures
ANTH	Anthropomorphism
ASV	Average Shared Variance
AVE	Average Variance Explained
CFA	Confirmatory Factor Analysis
CR	Composite Reliability
EEXP	Effort Expectancy
ETHC	Ethical Concerns
FCND	Facilitating Conditions
Fig.	Figure
$H(1, 2, 10)$	Alternate Hypothesis
ICT	Information and Communication Technology
MLOP	Multilingual Option
MSV	Maximum Shared Variance
NITI	National Institution for Transforming India
p -value	Probability value
PBEN	Perceived Benefits
PCA	Principal Component Analysis
PEXP	Performance Expectancy
PSEC	Privacy and Security Concerns
SEM	Structural Equation Modeling
R^2	Coefficient of determination
SINF	Social Influence
SPSS	Statistical Package for the Social Sciences

TSTC

Trust Concerns

UTAUT

Unified Theory of Acceptance and Use of Technology

VIF

Variance Inflation Factor

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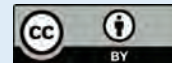
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ORIGINAL RESEARCH PAPER

Experts profiling on a healthier built environment: Lowering the threat of climate change

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ABSTRACT

BACKGROUND AND OBJECTIVES: There are indications that climate change and its consequences are already creating threats to the built environment in Nigeria. These environmental threats have negative implications for healthy, well-being, and urban sustainability. This empirical study aim to identify how climate change has influenced the built environment in Nigeria's South-Western region, considering the following objectives: to explore the reasons for climate change in South-western, Nigeria, to determine the consequences of environmental issues on inhabitant health in South-western, Nigeria; and to critically determine the key measures of climate change mitigation and adaptation to enhance the environmental sustainability of the Southwestern region of Nigeria.

METHODS: An empirical quantitative method comprising 300 questionnaires survey was administered, and 235 were retrieved and used as a sample population for the research analysis. The distribution of questionnaires was based on the convenience sampling methods among professionals within the built environment. The internal consistency was assessed using Cronbach's alpha (α), and the analysis was performed using the Statistical Software program; SPSS for Windows, version 22.

FINDINGS: The results from descriptive analysis revealed that Land-degradation, biodiversity loss, pollution, deforestation, urbanization, health challenges and population growth are predictors factors of climate change with mean scores of 4.2576, 4.2300, 4.0775, 4.0875, 4.1075, 3.8450 and 4.0925 respectively. Furthermore, the research showed a causal linkage relationship of climate change and the factors of land degradation, biodiversity, pollution and deforestation of ($p < 0.001$). Generally, the results affirm that the predictors of climate change are attributed to the factors of land degradation, biodiversity loss, pollution, urbanization and deforestation in the region.

CONCLUSION: The research gives an understanding about the impacts of climate change in the south west region, Nigeria and remains a veritable document to government and policy maker towards the prevention and mitigating measures on climate change impacts. The outcome of the research has revealed negative impacts of environmental issues on inhabitants' health through air pollution, temperature related effects and mental related infectious diseases. The climate change mitigation and adaptations results agreed that greening the environment/ green infrastructure, provision of stronger urban-rural connections and promulgation of law that discourages human activities impacts are few among the items recommended in mitigating and combating the impacts of climate change in South-western Nigeria.

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INTRODUCTION

Climate change is referred to as an alteration in the environment that can be traced back to human behavioral patterns, either overtly or covertly that modifies the creation of the global atmosphere (Friedlingstein *et al.*, 2019; Boubba and Li, 2022; Frimawaty *et al.*, 2023; Dionysius and Vasudevan, 2023). Climate change has been evidenced by the increase in ocean temperatures, heavy snow, rising average sea levels, strong winds, landslides, desertification, tidal wave, disintegration, pollution, and habitat destruction among others (Thomas, 2020; Van der Waal and Thijssens, 2020; Sivakumar *et al.*, 2022; Payus and Sentian, 2022; Samimi *et al.*, 2023). From another perspective, the construction project, public transportation, and energy industries account for around 70% of carbon dioxide (CO₂) emissions globally, also accounting for a significant share of greenhouse emissions and global climate change (Thomas, 2020; Soeprbowati *et al.*, 2023). Climate change remains the most prominent critical issue confronting countries around the globe in recent times (World Health Organization, 2021; Arredondo-Trapero *et al.*, 2023). Therefore, efforts are ongoing by scholars on the need to document the implications and remedies of climate change. It has equally been noted that the climate impacts on natural ecosystems and the current atmospheric concentrations of Greenhouse Gases (GHGs) constituted a significant threat (Intergovernmental Panel on Climate Change, 2014; Thomas, 2020). According to research, between the years 2030 and

2050, there will be a global climate change scenario that will culminate in roughly 250,000 deaths per year as a result of heat distress (World Health Organization, 2021). A recent review has enumerated that 6% of Nigeria's geographical area is thought to be susceptible to extreme weather occurrences, making it one of the most vulnerable countries to the effects of climate change (World Bank, 2019). However, the impacts are felt by the unpredictability of flooding, drought, and soil degradation (Heubes *et al.*, 2013), heavy downpours (Ibitoye and Eludoyin, 2010), dense population, and deforestation (Odey *et al.*, 2018). Other effects of climate change in Nigeria include a large rise in rural-urban migration as well as a decreased watershed (Cattaneo and Massetti, 2019). These are some of the environmental hazards that occur often time, which have threatened harmonious relationships between people and their environment. As indicated in Fig. 1, urban population growth is projected to exceed rural population growth in the next decades. Rapid urbanization, particularly unchecked urban expansion may likely encroach into earmarked open green spaces and may reduce sequestration, therefore increasing the carbon footprint of settlements (Zakka *et al.*, 2017). The poor transportation system has harmful effects on urban residents. Instances include the negative effects of automobiles on the natural surroundings and quality of life which has become a concern due to the current trend of the global environmental problem of climate change.

According to estimates, Nigeria's population

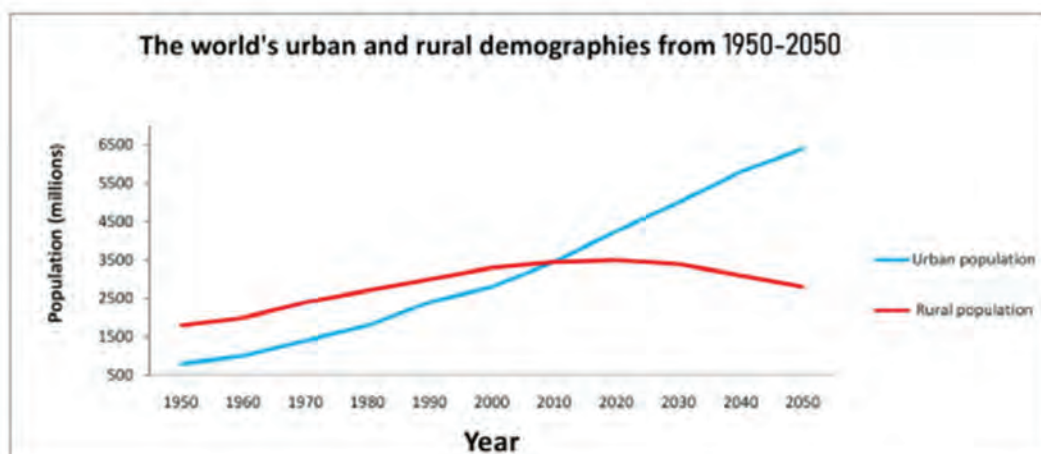


Fig. 1: The world's largest urban and rural demographics from the year 1950 to the year 2050. (Cohen, 2001)

Table 1: Several indicators of Nigeria's urban and population growth (Kumar *et al.*, 2016; IPCC, 2014)

Variables	Specifics	Rate
Land-use	Deforestation	4000 km ² /year
	Reforestation	10 km ² /year
Urban Population	Forested area (2008)	10.8%
	Annual growth	3.8%
	Urban Population in 2004, 2010	45%, 48.9%
Rural Population	Annual growth	1.8%
Total population	The population density in 2004, 2009	137.6, 167.5 persons/km ²
	Annual growth	2.5%
Total fossil fuel emission	Year 1951	460 000 tons
	Year 1980	18 586 000 tons
	Year 2008	26 113 000 tons

would reach 206 million by 2020 and 264 million by 2030, hitting the 300 million mark by 2036 (World Population Review, 2022). Without mincing words, Nigeria's fast-growing human population has resulted in greater challenges in the primary sector of agriculture, industrial sector, and infrastructural development (Olatunji *et al.*, 2021) and new forms of human habitation. The rapid urbanization and expansion of Nigerian cities have been accompanied by changes in climatic patterns in recent times. Other impacts are felt in the peoples' lifestyles; greater energy demand, transportation, and other essential infrastructural facilities. Table 1 demonstrates several indicators of Nigeria's land use, population, and fossil energy production. Almost all of the 36 States capitals in Nigeria are highly populated, including the Federal Capital, Abuja with about 1000 people per square kilometer). The degradation and fossil energy production has increased dramatically, with only 10.8% of the land area with forest. Balogun and Daramola (2019) revealed that a typical Nigerian metropolitan city may generate a considerable heat island of between 0.5 – 2.5°C during the day. Some political leaders of recent time pushed for municipal greening projects that involved planting plants in previously completely built-up regions in Nigeria (Oludare *et al.*, 2021). The primary land-use systems supported massive deforestation for urban growth, which has been shown to have an impact on the local climate.

Climate change vulnerability continues to be a key hindrance to Africa's sustainable growth and

development, as it happens to be a threat to Agenda 2030 Millennium Development Goals particularly in Africa. The Sustainable Development Goals (SDGs) reflect a broader strategy for economic growth and set out lofty targets for the main aspects of sustainable development: economic development, civic participation, and ecological sustainability (Geissdoerfer *et al.*, 2017). The Sustainable Development Goals connect areas of sustainable development (UN-Habitat, 2008; UNEP, 2014), allowing appropriate knowledge of interactions among social, economic, and environmental sustainability (Glaser, 2012; Van der Waal and Thijssens, 2020). Based on previous assertions, fewer studies have focused on adaptation techniques aiming at mitigating the impacts of climate change as collective actions in South-west, Nigeria. To address this global threat, the professional views, the causes and effects of climate change, adaptations and mitigation strategies deserve investigation. This will provide a better future approach to environmental planning and ameliorate the negative consequences. The gap in this study's context is attributable to the quantitative techniques focusing on reliable facts, for combating climate change impacts in south west, Nigeria. The Justification for this research is vested in the adaptation intervention feedback needed by the major players who are professionals. Their involvement in this study includes feedback through survey questionnaires on the study's keywords. This research document gives a clear perspective on, Impacts of climate change in the South-western

region, of Nigeria and will remain a veritable document for the prevention and application of mitigating measures on climate change to enhance the environmental quality of the built environment. Therefore, this empirical study aims to identify how climate change has influenced and impacted the built environment in Nigeria's Southwestern region. The objectives were: (i) to explore the reasons for climate change in Southwestern, Nigeria; (ii) to determine the consequences of environmental issues on inhabitant health in Southwestern, Nigeria; and (iii) to critically determine the key measures of climate change mitigation and adaptation to enhance the environmental sustainability of the Southwestern zone of Nigeria. The current study was carried out in the South- West Region States of Ekiti, Lagos, Ondo, Ogun, Osun , and Oyo in Nigeria, in the year 2019 to 2022.

MATERIALS AND METHODS

Data collection, Distribution and Analysis

An empirical quantitative method comprising questionnaire surveys was applied to provide relevant and sensitive proof of climate change's causes; implications; and strengthening mechanisms for environmental sustainability through mitigation and adaptations. These encompass one-on-one survey distribution conducted among key stakeholders who are inhabitants of the case study areas. This study draws on the population survey participants who were adult residents in the municipality (aged ≥ 18 years old). However, the respondents cut across the environmentalist, educationalists, meteorologists, professional designers, and agriculturists. A total number of 300 survey questionnaires were distributed to the respondents in the targeted states of Ekiti (50 numbers), Lagos (50 numbers), Ogun (50 numbers), Ondo (50 numbers), and Osun (50 numbers), and Oyo (50 numbers) respectively. The survey distributions were done between November and December 2019, in the study areas; and were based on the convenience sampling methods supported by a similar study by [Akinola et al., \(2020\)](#). This is considered appropriate due to the lack of detailed lists of professionals in the built environment in the regions. For satisfactory data gathering and removal of bias; stratified random sampling was still used, which involves classifying the professionals before performing a random selection across the strata. Out of the distributed survey, a

total number of two hundred and thirty- five (235) surveys were retrieved and suitable for analysis.

Data analysis

The response rate amounted to 78.30 percent, which was a justifiable percentage, which is quite good for the analysis ([Crano et al., 2014](#)). The internal consistency was assessed using Cronbach's alpha (α), and the analysis was performed using the Statistical Software program; SPSS for Windows, version 22. The data reliability measure for all the variables exceeded Cronbach's Alpha coefficient (α) of 0.6 which demonstrated reliable values [Cronbach and Shavelson \(2004\)](#) and [George and Mallery, \(2021\)](#) affirmed that scores within the range of 0.6-0.7 are acceptable. The test assisted in the clarity and level of the application of the questionnaire instrument. Meanwhile, demographic data for all respondents ($n=235$) were subjected to descriptive and comparative analyses. The survey includes demographic and socio-economic data, such as age, education, income, gender, areas of residency, and area of expertise. Aside from the demographics data, answers to a set of 49 dependents tested measurement variables that elicited respondents' opinions on self-rated predictors of climate change indicators, predictors of negative impacts of environmental issues on inhabitants' health, and climate change mitigations and adaptations among others were outlined based on the past literature of [Morecroft et al. \(2019\)](#) and [Berrang-Ford et al., \(2019\)](#). For participants' responses, the criteria were scored on a "5-point Likert scale" ranging from "Strong agreement" of "5" to "Strongly disagree" of "1."

The Study Area

The South-Western region of Nigeria, which encompasses the six states of Lagos, Ogun, Oyo, Osun, Ekiti, and Ondo, is where the study was conducted (Figure 2 refers). This region is bordered on the east by Edo and Delta States, on the north by Kwara and Kogi States, on the west by the Republic of Benin, and the South by the Atlantic Ocean. As per the 2006 demographic census, the region is situated between longitudes 20 31' and 60 00' east and latitudes 60 21' and 80 37' north, with a landmass of 76,852 Square Kilometers (KM²) and a demographic of 27,722,432; while the land area is roughly 166,361 KM². ([Agboola](#)

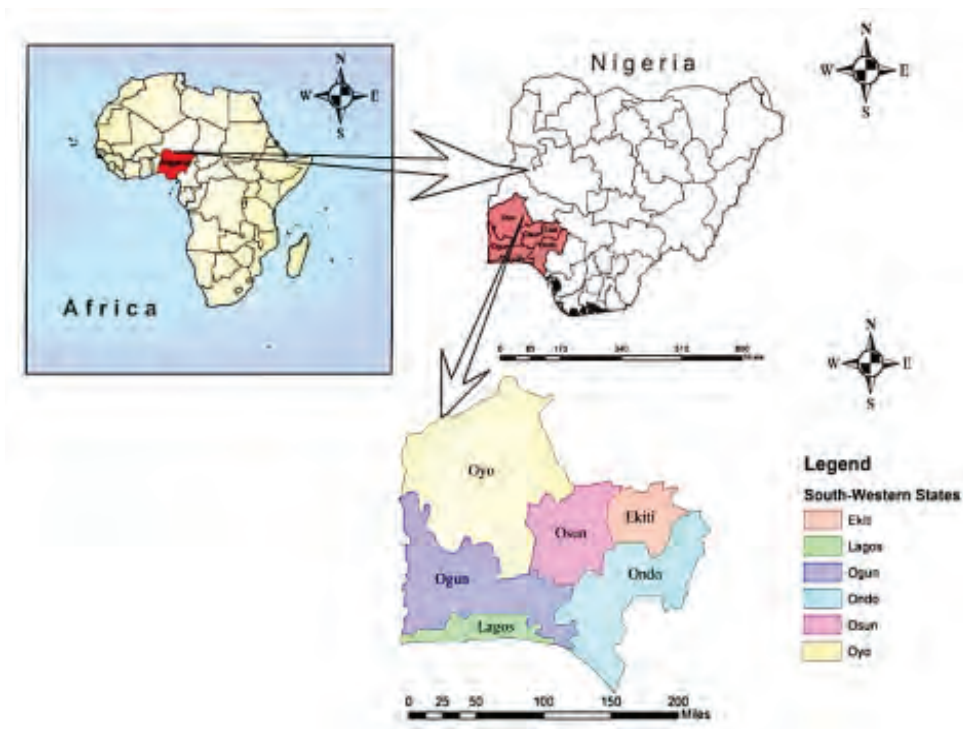


Fig. 2: Geographic location of the study area (South West States, Nigeria)

et al., 2018; Faleyimu and Oyeade, 2012).

The sub-equatorial rainforest in the southwest of Nigeria is characterized by warm, humid zones (Agboola *et al.*, 2018), the zone is the low-wet climate of the tropics, while the warm humid zone covers places such as the coasts, forests, and transitional regions. Furthermore, environmental issues were reflected in the devastating floods of 2012 in Southern Nigeria, which washed away houses, farmland, agricultural goods, and properties. The states of Oyo, Osun, Lagos, Ondo, Ogun, and Ekiti make up the regional zone of south-west Nigeria as shown in Fig. 2. In the official gazette of Nigeria's 2006; population (P) census figure of the study region was estimated to be around 27,581,992, with a gender balance of 51% for males and 49% for females. With an average population density of 481 people per square kilometer and an annual population growth (PG) rate of 2.6%, the population was estimated at 37,531,330 by 2018 (20% of Nigeria's total population) as iterated by Ogunleye *et al.*, (2018).

RESULTS AND DISCUSSIONS

The findings of a descriptive statistical analysis of

climatic changes indicators in Table 2; indicate that climate change manifest through Land-degradation (LD) (Mean= 4.25, Std.= 0.52), Biodiversity Loss (BDL) (Mean=4.23, Standard deviation (Std)=0.26), Pollution (Mean= 4.07, Std.= 0.59), Drought (D) (Mean= 4.04, Std.= 0.52), Deforestation / Desertification (DF) (Mean= 4.08, Std.= 0.46), Urbanization (Urb) (Mean= 4.10, Std.= 0.63), Population growth (PG) (Mean = 4.09, Std. = 0.74), are all factors with relatively high mean scores. Contrarily, Transport disruption Mean = 3.67, Std = 0.64), Health challenges (Mean = 3.84, Std = 0.59) and Stratospheric ozone depletion (SOD) (Mean = 3.08, Std. = 0.57) are factors with low mean scores. Regardless of their actual low average score, it is affirmed that the characteristics happen to be climate change predictors.

The descriptive analysis results in Table 3 revealed the highest mean scores of negative impacts of environmental issues on inhabitants' health in air pollution-related health effects (Mean= 4.81, Std.= 0.55), temperature-related health effects (Mean= 4.85, Std.= 0.52), mental-related infectious diseases (Mean= 4.94, Std.= 0.23), nutritional infectious diseases (Mean= 4.83, Std.= 0.41), and increase in

Table 2: Descriptive Analysis of predictors of climate change

S/N	Minimum (Min.)	Number of respondents (N)	Min.	Maximum (Max)	Mean	S.D.
1	Climate change manifests through Land-degradation (flood erosion)	235	1.00	5.00	4.2576	.52347
2	Climate change manifests through Biodiversity loss	235	1.00	5.00	4.2300	.26048
3	Climate change manifests through pollution (land, air and water)	235	1.00	5.00	4.0775	.59466
4	Climate change manifests through Drought (water shortage)	235	1.00	5.00	4.0425	.52812
5	Climate change manifests through Deforestation/Desertification	235	1.00	5.00	4.0875	.46955
6	Climate change manifests through Urbanization	235	1.00	5.00	4.1075	.63481
7	Climate change manifests through Stratospheric ozone depletion	235	1.00	5.00	3.0800	.57380
8	Climate change manifests through Health challenges	235	1.00	5.00	3.8450	.59477
9	Climate change manifests through Population growth	235	1.00	5.00	4.0925	.74201
10	Climate change manifests through Transport disruption	235	1.00	5.00	3.6750	.64001

Table 3. Descriptive Analysis of the Evidence of Negative Impacts of Environmental Issues on the Inhabitants of Built Environment

S/N	Variables	N	Min.	Max.	Mean	S.D..
1	Increase in Air pollution-related health effects	235	1.00	5.00	4.8130	.55317
2	Increase in Temperature-related health effects	235	1.00	5.00	4.8550	.52690
3	Increase in Mental-related infected infectious diseases	235	1.00	5.00	4.9404	.23726
4	Increase in Nutritional infectious diseases	235	1.00	5.00	4.8347	.41503
5	Increase in Water and foot Borne related diseases	235	1.00	5.00	4.7586	.70005
6	Increase in shortage of food production	235	1.00	5.00	3.8218	.60409
7	Increase in the low level of economic activities	235	1.00	5.00	3.8519	.51919
8	Increase in emissions of CO ₂	235	1.00	5.00	3.8727	.42299

water and foot borne related diseases (Mean= 4.75, Std.= 0.70). A lower mean scores were recorded for an increase in shortage of food production (Mean= 3.82, Std.= 0.60); an increase in the low level of economic activities (Mean= 3.85, Std.= 0.51); an increase in emissions of CO₂ (Mean= 3.87, Std.= 0.42). The results of the Multiple Linear Regression Analysis in Table 4 indicate that predictors of negative impacts of climate change are vested solely on (i) an increase in air pollution-related health effects, (ii) an increase in temperature-related health effects, (iii) an increase in mental-related health effect, (iv) increase in nutritional infectious health-related effects, (v) increase in water and food-borne related health effects, (vi) increase in shortage of food production, (vii) increase in poverty/low level of economic activities, (viii) increase in deaths. Therefore, the

emerged equation is that predictors of Negative Impacts of climate change on inhabitant's conditions = 0.035 + 0.688 (Increase in Air pollution-related health effects) + 0.686 (Increase in Temperature-related health effects) + 0.601 (Increase in Mental-related health effects) + 0.427 (Increase in Nutritional infectious-health related effects) + 0.431 (Increase in Water and foot Borne related health effects)+ 0.428 (Increase in shortage of food production)+ 0.410 (Increase in the low level of economic activities) + 0.698 (Increase in emissions of CO₂).

Table 5 shows how Principal Component Analysis categorizes and highlights the most significant factors. These categorized factors become components of the variables that are employed in subsequent analyses. The finding showed that after evaluating 49 variables, four components converged after four iterations of

Table 4: Coefficients for the predictors of negative impacts of climate change on inhabitants' conditions

Model	Unstandardized coefficients		Standardized coefficients	t	Sig.
	B	Std. error	Beta		
1 (constant)	.035	.076		0.214	.312
Increase in Air pollution-related health effects	.688	.057	.683	8.652	.004
Increase in Temperature-related health effects	.686	.048	.607	7.581	.000
Increase in Mental-related health effects	.601	.051	.406	9.522	.000
Increase in Nutritional infectious-health-related effects	.427	.066	.481	9.833	.000
Increase in Water and foot Borne related health effects	.431	.059	.434	12.572	.000
Increase in shortage of food production	.428	.053	.367	12.876	.000
Increase in the low level of economic activities	.410	.062	.389	11.768	.000
Increase in emissions of Co ₂	.698	.056	.387	12.536	.000

Dependent Variable: Opinions of the built environments' inhabitants

Table 5: The Principal Components analysis for the Demographic data and Climate change Indicators

Variables	Components			
	1	2	3	4
Education level	.765			
Gender	.743			
Age	.702			
Career backgrounds	.789			
Environmentalists	.754			
Educationalists	.756			
Meteorologists	.659			
Designers	.786			
Agriculturists	.739			
Years of residency	.799			
Land-degradation (floor/ erosion)		.786		
Biodiversity loss		.729		
Pollution (land, air & water)		.779		
Drought			.761	
Deforestation / Desertification			.793	
Urbanization			.726	
Stratospheric ozone depletion				.704
Health challenges				.733
Population growth				.761
% variance explained	26.45	21.22	18.63	20.69

rotation, accounting for 86.99 percent of the total variation. These parameters have percentages of variance of 26.45%, 21.22%, 18.63%, and 20.69%, respectively.

Principal Component Analysis was used to extract the data. In four iterations, the rotation converged.

The first factor is referred to as the respondents' demographics which consisted of various variables such as the education level, gender, age, education background, respondents' professional background, and years of residency. The second factor, which is named predictors of climate change 2

Table 6: The association between climate change predictor and impacts on built environment's inhabitants

The dependent Variable		LD	BDL	Pollution	Drought	Deforestation/ DF	Urb	Stratospheric ozone depletion
Impacts on public space's users	Pearson Correlation	0.801**	0.845**	0.825**	0.705**	0.765**	0.985**	0.715**
	Sig. (2- tailed)	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	N	235	235	235	235	235	235	235

**Correlation is significant at the 0.01 level (2-tailed)

Table 7. The casual relationship between the impacts of climate change on various built environmental elements

Casual interactive items	F	df2	Sig. p-value
Climate change causes land-degradations in the built environment.	3.423	235	0.001*
Climate change causes biodiversity loss in the built environment.	4.239	235	0.002*
Climate change causes all forms of pollution of the built environment.	206.532	235	0.001*
Climate change causes drought in the built environment.	5.632	235	0.001*
Climate change causes deforestation / desertification in the built environment.	11.054	235	0.001*
Climate change causes urbanization in the built environment.	105.045	235	0.001*
Climate change causes stratospheric ozone depletion in the built environment	4.645	235	0.001*

Significant at 0.001* levels (2-tailed). $p \leq 0.001$

(Intergovernmental Panel on Climate Change, 2014) encompasses variables such as land degradation, biodiversity loss, and pollution. Next to this is the third factor that encircles variables such as drought, deforestation/desertification, and urbanization. This factor is named predictor of climate change 3 (PCC3). The fourth significant factor is coined Predictor of Climate Change 4 (PCC4) which refers to variables such as stratospheric ozone depletion, health challenges, and population growth. Table 6 shows the connections between both variables in a Bivariate Pearson Correlation. Predictors of climate change as the independent variables and the impacts on the built environment's users as the dependent variable. The results revealed that the impacts on built environment's users have a strong relationship with the various predictors of climate change like the land-degradation ($r = 0.801^{**}$, $P < 0.01$),

biodiversity loss ($r = 0.845^{**}$, $P < 0.01$), pollution ($r = 0.825^{**}$, $P < 0.01$), drought ($r = 0.705^{**}$, $P < 0.01$), deforestations/desertification ($r = 0.765^{**}$, $P < 0.01$), urbanization ($r = 0.985^{**}$, $P < 0.01$), and stratospheric ozone depletion ($r = 0.715^{**}$, $P < 0.01$). Hence, the results affirm that the predictors of climate change are attributed to land degradation, biodiversity loss, pollution, drought, deforestations/desertification, urbanization, and stratospheric ozone depletion; and that these have impacts on the built environment's users.

Table 7 indicated the causal relationship between the impacts of climate change on various built environment elements such as land degradation; biodiversity loss; pollution; drought; deforestation/desertification; urbanization and stratospheric ozone depletion. The causal linkages led to these relationships as follows: Climate change → land-

Table 8: Coefficients a for the Predictors of Climate change Indicators

Model	Unstandardized coefficients		Standardized coefficients	t	Sig.
	B	S.E.	Beta		
1 (constant)	-620	.089		-9.40	.890
Land degradation (LD)	.331	.037	.559	8.652	.004
Biodiversity loss (BDL)	.386	.059	.605	6.831	.000
Pollution (P)	.393	.064	.504	8.744	.000
Drought (D)	.425	.073	.458	8.523	.000
Deforestation / Desertification (DF)	.486	.057	.474	10.772	.000
Urbanization (URB)	.448	.073	.497	11.876	.000
Stratospheric ozone depletion (SOD)	.783	.071	.469	10.968	.000
Population growth (PG)	.576	.059	.497	11.536	.000

Table 9: Model summary ^b model for the predictors of climate change

Model	R.	R. Square	Adjusted R. Square	Std. Error of the Estimates	Change Statistics				
					R. Square Change	F Change	df1	df2	Sig. F Change
1	.861	.766	.734	.39233	.769	258.670	5	368	.000

Table 10: Climate Change Mitigation and Adaptations: Quantitative Results from the Descriptive Analysis

Items	Code	Statistics	
		Mean Score	S.D.
Greening the environment/Green Infrastructure (incorporating parks, green spaces, and open spaces within the communities)	CCMA 1	4.96	0.20
Pedestrianized environment (Reduction in global carbon Co2 emission via less usage of motorized transport)	CCMA 2	4.90	0.50
Provision of stronger urban-rural connections	CCMA 3	4.86	0.61
The depletion of the ozone layer should be ameliorated by human influences	CCMA 4	4.85	0.66
Advocacy/awareness of the significance of greening the environment	CCMA 5	4.81	0.70
Promulgation of law that discourages human activity impacts	CCMA 6	4.79	0.74
Increasing the number of public spaces in the city environment	CCMA 7	4.78	0.75
The layout of streets to accommodate active transportation such as walking and cycling	CCMA 8	3.78	0.64
Availability of climate data and statistics	CCMA 9	3.65	0.56
More enlightenment programs on the danger of the effects of environmental challenges	CCMA 10	4.74	0.79
More research on climate change	CCMA 11	4.74	0.78
Environmental cleanness via less use of paper and plastics nylons	CCMA 12	4.73	0.87
Incorporate climate change curriculum in Tertiary education taught courses	CCMA 13	3.41	0.61
More budgetary allocation to fight the challenges of environmental degradation and its influences	CCMA 14	3.92	7.40
Alternative energy source	CCMA 15	3.01	0.78

degradation ($p < 0.001$); climate change \rightarrow biodiversity loss ($p < 0.001$); climate change \rightarrow pollution ($p < 0.001$); climate change \rightarrow drought ($p < 0.001$); climate change \rightarrow deforestations/desertification ($p < 0.001$); climate change \rightarrow urbanization ($p < 0.001$); climate change \rightarrow stratospheric ozone depletion ($p < 0.001$). The results indicated that all the hypotheses are acceptable; implying that causal relationships between climate change and the built environment

are statistically valid. In other words, the built environment suffers from the negative consequences of climate change features such as land degradation, biodiversity loss, pollution, drought, deforestation/desertification, urbanization, and stratospheric ozone depletion. To further substantiate these are [Table 8](#) and [9](#) indicating the predictors of climate indicators and the Model for the predictors of climate change respectively.

Table 10 indicates the quantitative results from the descriptive analysis of climate change mitigation and adaptations. The results indicated that greening the environment / green Infrastructure (Mean= 4.96, Std. = 0.20); Pedestrianized environment (Mean = 4.90, Std = 0.50); Provision of stronger urban-rural connections (mean = 4.86, Std= 0.61). These are the factors with the greatest average overall mean. Next, is the high average mean scores such as the promulgation of a law that discourages human activities impacts (Mean=4.79, Std= 0.74); increasing the numbers of public spaces in the built environment (Mean=4.78, Std= 0.75); more enlightenment program on the danger of the effects of environmental challenges (Mean=4.74, Std= 0.79); More researches on climate change (Mean=4.74, Std= 0.78); environmental cleanness via less use of paper and plastics nylons (Mean=4.73, Std= 0.87) that received the higher average variables.

The outcome of this research has revealed the ten (10) most predicted climate change indicators. This is consistent with previous studies by Kadir (2006) which revealed that some variables cause a serious environmental imbalance in the ecosystem, resulting in environmental difficulties evidenced by climate change. This study has equally affirmed that desertification, deforestation, floods, erosion, urbanization, and overpopulation are examples of environmental difficulties caused by climate change and ecosystem degradation. In the light of above findings, the adverse effects of global warming have a huge impact on inhabitants' living conditions. Increased CO₂ emissions, increased air pollution-related health impacts, increased temperature-related health effects, and increased mental-related health effects as the greatest impact as equally opined by Federici et al., (2015). Increases in dietary infectious-health impacts, increases in water and foot-borne disease-associated health effects, increases in food production shortages, and increases in poverty/low economic activity have impacted negatively as supported by (Agbebaku, 2020). This study has shown that (i) residents' health is severely impacted by carbon emissions, and as a result of high levels of industry and urbanization, rising carbon emissions pose a bigger threat to the health of the population; (ii) that health problems have resulted from the conflict between nature conservation and economic

expansion, which has been exacerbated by rapid industrialization as corroborated by Hanmin et al., (2021). Climate change would aid the transmission of several infectious diseases as well as local food productivity, according to this study. Consequently, a significant rise in the human population is having a negative influence on human health. This is in line with previous findings by (Pedersen et al., 2021). This study identified fifteen (15) crucial climate change mitigation and adaptation strategies. Hence, greening the environment; pedestrianized environment; provision stronger urban-rural connections are among the mitigation and adaptations required for the climate change impacts. These inferred that incorporating green spaces, within the communities; reducing global carbon emissions via less usage of motorized transport, and establishing more robust urban-rural links are the greatest determinants of adaptation strategies to climate change (Ezeabasili and Okonkwo, 2013). In the same vein, the stratospheric layer's degradation should indeed be mitigated by human interventions; advocacy and creating awareness on the significance of greening the environment are other variables. This was corroborated by the past study of McPherson (2007) in which awareness of the ozone-depleting substances through the ability to filter the contaminants from the air remains paramount. The findings from this study elucidate further that a series of measures are best available for climate change mitigations and adaptations which have critical roles to play in consolidating the SDGs and enhancing the built environment. The results also reveal that sustainable communities could be achieved by greening the environment and reduction in global carbon emissions via less usage of motorized transport while delivering clean energy sources is also one of the responsibilities that can be filled towards mitigating the effects of climate change and achieving the SDGs. As a result, when backed by effective government goals and procedures, the built environment can work as a catalyst for achieving the SDGs. In support of this is the notion of Caglar and Ulug (2022) that opined that the SDGs have made the transition to a low-carbon economy more feasible, while economies are moving toward the 2030 and 2050 targets by raising environmental consciousness. According to the findings of this study, greening a

roadway by planting along the public right of way performs services such as providing shade from the sun, cooling the atmosphere in hot weather, and supplying fresh air all of the time. Trees help to minimize pollutants in the air and water. When it comes to air pollution, every tree planted provides shade. This is accomplished with trees filtering and retaining particle materials such as dust and soil that can irritate the respiratory tract. Trees help filter particulates from rainwater and potential pollutants from the human influence that enter soils, keeping them from reaching aquatic bodies. This is in agreement with [Anthun *et al.* \(2019\)](#) that affirmed that green areas and open spaces play a significant role in lowering emissions that contribute to global climate change. Enhanced activity in the green areas that are available and accessible to people from all walks of life can encourage contact with nature, social interaction, and physical activity such as walking, jogging, and cycling. These consequently improve a variety of health outcomes as concurred with the past studies of [Sugiyama *et al.* \(2018\)](#). According to this study's findings, access to public green spaces is linked to social health indicators such as community identity and interpersonal networks as equally opined by [Arnberger and Eder, 2012](#)).

CONCLUSION

This research has contributed substantially to the study of climate change consequences towards modifying the built environment and the functionality of the human settlements, as well as the perception of experts towards a shift. The interaction and synergy between climate change and human settlements must be a priority for government at all levels. A focus on this research shows how climate change has influenced the built environment in South western region of Nigeria, and has revealed the negative impacts of environmental issues on climate change which includes the following: land degradation, biodiversity loss, land air, water air and water pollution, temperature-related health effects and mental related infectious diseases and increase in the emission of CO_2 . Based on findings as revealed by this research, the climate change mitigation and adaptation strategies using the ten (10) most predicted climate change indicators remain very viable and effective in the quest towards combating the impacts and consequences of climate change.

SUGGESTIONS

Following the climate change mitigation and adaptation analysis of the research, the following suggestions were put forward:

- Greening the environment using the natural green infrastructure in communities open spaces and the development of parks.
- The need for reduction of dependence on automobile motorized transportation to help reduce the CO_2 emission level within the human settlements.
- Provision of strong urban-rural connections and the increase in creating advocacy and awareness of the significance of greening the environment.
- The need for more budgetary allocation to mitigate the challenges of environmental degradation and its influences

Future study

There is a link between ecosystem vulnerability and efforts toward achieving mitigation and adaptation goals. As a result, further evaluation of the effectiveness of alternative ecological systems becomes imperative. An additional comprehensive assessment is required for future interventions. Habitat intervention strategy becomes extremely difficult to measure, and monitoring and control will have to progress in lockstep with human experience.

AUTHORS' CONTRIBUTIONS

O.P. Agboola conceptualized the research from the proposal stage. He developed the methodology approach and Literature materials that were reviewed in accordance with the research work. He prepared the initial draft which was later reviewed. He further carries out data analysis and put together all the results for the original manuscript. S.D. Zakka and S.A. Olatunji developed the research instrument and they were directly involved in data collection and compilation. They later reviewed the original manuscript and developed a draft in accordance to this journal template.

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CONFLICTS OF INTEREST

The authors declare that there is not any conflict of interests regarding the publication of this manuscript. In addition, the ethical issues, including plagiarism, informed consent, misconduct, data fabrication and/or falsification, double publication and/or submission, and redundancy has been completely observed by the authors.

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ABBREVIATIONS

<i>BDL</i>	Biodiversity Loss
<i>CCMA</i>	Climate Change Mitigation and Adaptation
<i>CO₂</i>	Carbon dioxide
<i>DF</i>	Desertification
<i>D</i>	Drought
<i>GHGs</i>	Green House Gases

<i>GT</i>	Green Technology
<i>KM²</i>	Square Kilometre
<i>LD</i>	Land Degradation
<i>Max.</i>	Maximum
<i>Min.</i>	Minimum
<i>N</i>	Number of respondents
<i>P</i>	Population
<i>PG</i>	Population Growth
<i>PCC</i>	Predictors of Climate Change
<i>SDGs</i>	Sustainable Development Goals
<i>Std</i>	Standard Deviation
<i>SOD</i>	Stratosphere Ozone Depletion
<i>SPSS</i>	Statistical Package for the Social Sciences
<i>UN</i>	United Nations
<i>Urb</i>	Urbanization

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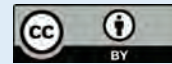
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ORIGINAL RESEARCH PAPER

Conceptualizing collective decision-making in organizations: A grounded theory approaches

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ABSTRACT

BACKGROUND AND OBJECTIVES: Collective decision-making can increase the probability of reaching the correct decision. In Collective decision-making, information, experience, and knowledge are shared, and managers can use the wisdom of their employees with this method. In addition, in Collective decision-making, learning and ideation take place, and employees express their opinions freely and reach a common decision with the help of each other.

METHODS: In this study, the concepts related to Collective decision-making are explained using the research background. Then, by using the grounded theory method, the most important questions related to why and how Collective decision-making are answered. To get the opinions of organizational and academic experts in this field, a semi-structured interview was conducted with 54 people who were selected by purposeful sampling. After collecting the data through interviews, the components are coded in an open, axial, and selective.

FINDINGS: Through coding, 26 concepts were obtained which were later classified into 5 categories: causal conditions, contextual conditions, intervening conditions, central phenomenon, strategies, and consequences. The findings of this study provide a comprehensive model for the central phenomenon of Collective decision-making.

CONCLUSION: The results show that collection alliance, increased awareness and knowledge, growth, and development of members, increased wisdom and collective intelligence, increased members' commitment, increased quality of decision-making, and increased justice are the most important consequences of Collective decision-making. This study is important because it broadens the perspective of managers, and provides a deeper understanding of the nature of Collective decision-making in the organization.

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INTRODUCTION

According to [Herbert Simon \(1993\)](#), decision-making is the main issue of management. For this reason, Collective decision-making (CDM) is one of the most important subjects of management knowledge ([Azizi et al., 2020](#)). To improve the decision-making quality of managers, the use of the CDM method will be very helpful ([Zafeiris et al., 2017](#)). This claim is proved by various reasons, for instance, employee participation in decision-making can provide more information to deal with organizational problems and thus improve efficiency ([Mann, 2018](#)), or through participating in decision-making, employees will obtain more awareness, which can lead to better implementation of decisions ([Dionne et al., 2019](#)). Also, CDM as a teamwork can lead to the sharing of ideas, create learning and innovation, and facilitate trust among employees ([Tajpour and Razavi, 2023](#)). CDM is the process by which members of a group decide on an action with a consensus ([De Oca et al., 2011](#)). Thus, the CDM process can be defined as the process by which a group of individuals, based on their own opinions or preferences, try to reach a common solution to a decision-making problem with several options ([Wu et al., 2017](#)). In other words, CDM involves two or more actors seeking to improve their situation on a particular issue and they coordinate the goal they want to achieve and reach a similar decision ([Marks et al., 2019](#); [Xu et al., 2022](#)). CDM is an increasingly growing field. Mainly due to the increase in many IT-enabled environments with which people interact and share information with others and they can easily make a collective decision ([Rossi, 2014](#)). Many human and environmental factors are effective in CDM. Addressing the CDM process for a long time by researchers shows the great importance and practicality of this scientific field ([Neef et al., 2022](#); [Zafeiris et al., 2017](#)). Despite the many advantages of CDM, a comprehensive model that includes the dimensions of CDM and shows the factors and consequences of CDM have not yet been designed. This study fills this gap and tries to show the effective factors of CDM and its consequences in a model based on grounded theory. In this research, using interviews with experts, through three stages of open, axial, and selective coding as the basis of the grounded theory work of the foundation, first, the interviews are analyzed and then a model for CDM is designed. This method is chosen because the findings

of the study are presented in the framework of a new conceptual model. Various questions can be asked in this research, but the most important questions that lead to the creation of a systematic process in this area are: What are the causal, interventional, and contextual conditions affecting CDM? And what are the most important strategies to face the CDM and what are the consequences. If the different dimensions of CDM and its consequences are well clarified and the strategies to reach it are determined, this important strategy can be recommended to managers who use CDM in various issues to achieve greater success.

Literature review

The necessity of CDM

People face CDM situations everywhere in their daily lives ([Veen, 2011](#)). The study of CDM covers various areas such as the brain and behavioral sciences, economics, management sciences, and artificial intelligence, and focuses in particular on the question of how decision-makers can make optimal choices from multiple options ([Hasegawa et al., 2017](#); [Horsevad et al., 2022](#)). The main task of groups is to provide effective solutions to the complex problems they face. This is a very relevant aspect of the behavior of social groups, because “collective wisdom” can be qualitatively beyond the behavior of individuals ([Zafeiris et al., 2017](#)). Due to the rapid changes in the environment, the decision-maker should have complete mastery of all issues, sciences, and technologies to be able to find the best solution to solve the problem or make good use of the situation ([Chen et al., 2021](#)). But few people know everything, have all the qualifications, and master all the sciences and technologies within the framework of their managerial duties. So, using CDM can greatly help them find the optimal solution. The social feature of changing the structure of society today is such that without the participation of managers and employees in the process of management decision-making and their implementation procedures, they cannot reach the optimal decision ([Prigozhin, 1991](#)). Having calculated the inevitable variation in the accuracy of individual decision-making, further improvement in CDM is indispensable ([Bosel et al., 2017](#)) and the learning of members increases with CDM ([Zhang and Hsu, 2021](#)). Studies show that when people’s voices are heard and people can respectfully

participate in the decision, they are more willing to accept a collective decision, even if the outcome is against their wishes (Šerek *et al.*, 2022). The study of CDM is necessary for many groups or participatory systems along with the development of the internet, electronic communications, knowledge-based economics, and information technology (Wu *et al.*, 2017).

Process of collective decision making

In general, a CDM system can be composed of (1) Situations, goals, beliefs, or preferences of agents, (2) The ability of agents to influence the positions, preferences, and opinions of other agents, or the result of the final decision (3) Interpersonal interactions and groups that arise from these interactions and (4) the wider context in which a group is located (Zellner *et al.*, 2014). In CDM, individuals usually express their views despite some restrictions and preferences, then one consensus decision is made (Rossi, 2014). In CDM, in addition to people who generally make their decisions in a particular field, competent employees who are generally not directly involved in decision-making, participate on an equal basis (Prigozhin, 1991). Khaluf *et al.* (2019) examine the relationship and interaction among two components namely (1) Individual (microscopic) and (2) System-level (macroscopic). For CDM, two important types of information to be acquired by the system are examined and identified as neglected parts of the decision-making process: (I) stimuli, and (II) a set of choices (options) that are available for a particular decision. Different features of stimuli and options, such as their amount and distribution, affect the output of the decision-making process (Khaluf *et al.*, 2019). In groups with a high level of communication and appropriate conditions, participation can quickly lead to an agreement at the group level. The behavior of the members of the group is also part of the formation of the CDM mechanism (Ward *et al.*, 2011). When a collective decision fails, participants in a 'group issue' need to start bargaining or negotiating until a consensus is reached (Bui, 1987).

Applications of CDM

CDM is a widespread and practical phenomenon among organisms (Watzek *et al.*, 2021). CDM is a major topic not only in economics and social choice theory, but also in communication, computer

science, machine learning, game theory, and control theory (Parrondo *et al.*, 2007). It can be seen in many organizations including the cabinet, the central bank, etc. (Veen, 2011). CDM is growing increasingly which is mainly due to the increase in many IT-enabled environments in which people interact and share information with others (Rossi, 2014). The introduction of technology into CDM can also help organizations cross physical, social, and psychological boundaries (Slevin *et al.*, 1998). Thus, CDM is increasingly playing an important role in today's societies and organizations. As for advanced technologies, the number of engineers involved in designing a product can be hundreds or even a thousand, which goes far beyond the capacity of any engineer (Dionne *et al.*, 2019). CDM is seen in a wide range of natural and artificial collective systems. In the case of natural systems, individuals in a group need to make collective decisions to get the best solution. In the field of artificial systems, CDM can be considered a principle for robotic collective behaviors (Prasetyo *et al.*, 2019). Just as individuals in a group may prefer to participate in CDM in which all individuals seek agreement on a result or are functionally integrated, this may also be the case for a group of social insects (Bonabeau, 1996). Research on other organisms may provide new insights into the basic principles of CDM in social groups (Bosel *et al.*, 2017). So far, many studies are being conducted on applications of CDM in other organisms such as insects (Frank and Linsenmair, 2017; Sasaki and Pratt, 2018), ants (Sasaki *et al.*, 2015, 2019; Stroeymeyt *et al.*, 2014; Stuttard *et al.*, 2016), bees (Detrain and Deneubourg, 2008; Seeley *et al.*, 2012; Szopek *et al.*, 2013), bison (Ramos *et al.*, 2015), monkeys (Rowe *et al.*, 2018), robots (Vigeliu *et al.*, 2014; Wessnitzer and Melhuish, 2003), birds (Bhattacharya and Vicsek, 2010; Farine *et al.*, 2014; Santos *et al.*, 2016), etc. This research shows the importance of CDM for researchers because, with the help of simulation, its research findings can also be used in the human domain.

How to reach a collective decision

In general, a CDM system can be composed of (1) situations, goals, beliefs, or preferences, (2) the ability of an agent to influence positions, preferences, or other operating opinions or the result of the final decision, (3) Interpersonal interactions and group

fields that arise from these interactions and (4) the wider context in which a group is located (Zellner *et al.*, 2014). Many aspects of CDM can be predicted by considering what a logical agent is (Mann, 2018). CDM processes emerge from social feedback networks within a group (Planas-Sitja *et al.*, 2015). In CDM, individuals usually express their views despite some restrictions and preferences rather than a certain set of possible decisions, and then one decision is selected (Rossi, 2014). In CDM, in addition to people who generally make their decisions in a particular field, competent employees, who are generally not in direct decision-making, participate on an equal basis (Prigozhin, 1991). Research on the design of CDM mainly examines the relationship and interaction between the two components: (1) Individual (microscopic) and (2) system-level (macro). For CDM, we highlight two types of important information that should be obtained by the system, and we remind them as forgotten parts of the decision process: (I) stimuli and (II) a set of choices (options) that are available for a particular decision. A stimulus is a signal that stimulates the system to begin a decision-making process. Different features of stimuli and options, such as the amount and distribution of them, affect the output of the decision-making process. In general, interaction mainly affects two characteristics of collective decisions: (1) the degree of coherence of decision-making, and the percentage of people who are committed to the same belief. The coherence of a collective decision describes the level of agreement in the system, that is, the percentage of individuals who are committed to the majority. (2) Decision-making speed, through the speed of information dissemination in the system (Khaluf *et al.*, 2019). Collective decisions are coherent, namely, relying on joint information and consensus, which allows the system to act as a unified entity when exposed to different inputs and stimuli. Processes that lead to coherent decisions create tension in a decentralized system between (1) individual feedback to select actions and (2) a common system goal. Despite these tensions, many natural systems show how a collective system can make its own organized and coherent decisions. Common examples include social insects, brain neurons, and immune system cells (Khaluf *et al.*, 2019). In a collective with high communication and appropriate conditions, the selection in the collective can very quickly lead to an

agreement at the collective level. In groups with high communication and appropriate conditions, choosing in the group can lead to an agreement at the group level. The behavior of the members of the group is also part of the formation of the decision-making mechanism at the group level. In unrelated groups, individual behavior should maximize their expected compatibility in the group. The inference of “group recognition” capabilities for unrelated groups may be more difficult than previously felt (Ward *et al.*, 2011). When a collective decision fails, participants in a group issue need to start bargaining or negotiating until a consensus is reached (Bui and Co-oP, 1987).

Models of CDM

To define and develop effective CDM systems, we need efficient and flexible techniques to help agents both model and present their preferences and calculate their CDM (Rossi, 2014). (Bui and Co-oP, 1987) In the book “A group decision support system for cooperative multiple criteria group decision making”, five different structures of CDM are presented. They also show the predicted effects of these structures on the speed and accuracy of the decision-making process. These five structures are hierarchical, star, wheel, honeycomb, and multi-connected. In this book, it is found that, in general, star configuration seems to be the most effective for solving structured and ill-structured problems, while wheel configuration seems to be a little more appropriate for creative or unstructured decision-making situations (Bui and Co-oP, 1987).

In another model, CDM consists of four main parts (Wu *et al.*, 2017):

- 1) Opinion Collecting Module: First, we should consider the comments and direct settings of all users as basic data that can be collected through a questionnaire. This section includes one process: Get original comments.

- 2) Opinion Processing Module: User comments may be changed by the influence of others. So, after getting direct feedback from users, the second part is to share the information with everyone and then help them make new decisions after being influenced by other users. Many methods can be used, such as voting and auctions. Also, different decisions are made by different people with different voting weights. Therefore, this section consists of two processes: the voting process and the weight calculation process.

These processes may be repeated several times to reach a final decision.

3) Negotiation Module: To support CDM, we must consider not only the opinion of the individual but also the whole group (social community). So, users are categorized into different groups by analyzing their opinions, and then, they discuss with each other and rearrange the results. This section includes three processes: user grouping, negotiation, and the process of ranking with the voting result. After the discussion, a balance point must be found to make the final decision. Therefore, the negotiation process must be repeated several times, and feedback on the data related to the opinion processing section must be sent.

4) Consensus: The last step is to reach a consensus. After discussing the negotiation process, the weight of the voting results must be recalculated and rearranged. If the weight of the first opinion is higher than the threshold (average), it can be considered the final collective decision. In another model proposed by (McHugh *et al.*, 2016), CDM includes individual characteristics (intelligence and knowledge), collective characteristics (collective intelligence, Participative Leadership Type, and inspiration), work structure (i.e., Collaboration method), and the characteristics of the work (i.e., Task complexity). McHugh *et al.*, (2016) have validated this model with two methods of agent-based simulations and content-coded field study data.

The aims of this study is to identify the dimensions and parameters affecting CDM. These parameters are categorized into 5 categories: causal conditions, contextual conditions, intervening conditions, strategies, and consequences. In this study, various questions have been asked in the field of CDM, and the research findings have been presented in the framework of a new conceptual model. The current study has been carried out in Tehran- Iran in 2022.

MATERIALS AND METHODS

Grounded Theory was introduced into social research by Glaser and Strauss (1967), which provides inductive methods for generating new theories through data. Experimental hypotheses are generated through the initial analysis of raw data, such as unstructured interviews or observations. Participants in the interviews are more likely to seek to expand and correct hypotheses, a process

known as theoretical sampling. Grounded Theory is a Constant Comparative Method (CCM) that identifies patterns and interpretations in primary data and seeks a comprehensive explanation and presentation of a theory (Yates, 2020). Grounded Theory is a qualitative research method to elucidate the social processes behind human interactions. Grounded Theory is a method in which, instead of interpreting and analyzing information based on a theory, a theory is formulated focusing on the data collected and based on their content (King and Snowden, 2020). In this approach, research does not begin with a theory and then prove it, but the research process begins with a field of study, and gradually, related cases emerge (Kokorelias and Ashcroft, 2020). According to the explanations provided, this method was chosen for this study for the following reasons:

1- It is appropriate to the social and managerial field of study.

2- It analyzes primary raw data such as interviews well.

3- Makes a connection between the data and builds a model or theory, which is the purpose of this study.

4- CDM is done in a social process, this method also seeks to clarify social processes in people's interactions.

There are 5 analytical (but not necessarily consecutive) steps in a Grounded Theory (Fig. 1):

In the Grounded theory method, three types of coding are used, which are: (Da Silva Barreto *et al.*, 2018)

Open coding: creating concepts and their features

Axial coding: Communicating between concepts

Selective coding: integrating and improving concepts

These are reciprocal steps, for example, when open coding, some of the relationships between concepts are considered correct by the researcher, and these relationships are established. Also, new concepts are discovered when communicating between concepts. Coding here means choosing words for themes; In other words, when a word is assigned to a subject, that subject is coded (Zimmermann *et al.*, 2020). Data collection in this method is done with the help of the interview and the selection of the next sample of the interview is done until no new code is extracted from the interview. In other words, no new information will be obtained, and new interviews will not add data to

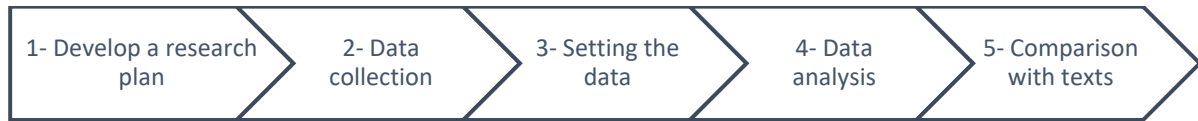


Fig. 1: The stages of a grounded theory (Corbin and Strauss, 2014)

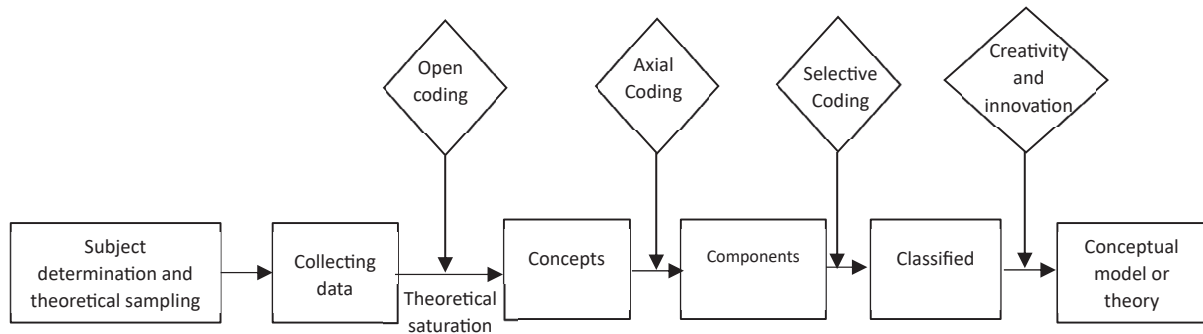


Fig. 2: The developed model of the grounded theory implementation process

previous categories or alter the relationships between categories (theoretical saturation). After categorizing the information, the results are analyzed based on it to extract the mental pattern of individuals in CDM. Therefore, the modeling stages of the grounded theory are that first, the data is open coding, then the basic concepts are extracted, and then, based on the axial coding, the data are classified into main categories. Finally, based on selective coding, the overall structure of the mental model is extracted (Charmaz, 2015). These steps are shown in Fig. 2.

Data collection

The statistical sample of this research includes government managers who have at least five years of managerial experience and are familiar with the issues of CDM and collective work. In this study, to collect the highest quality data and have the knowledge that exists of effective managers, at the beginning of the work with 54 managers with top performance among a large number of government managers, initial interviews were conducted and thus, the initial questions listed in line with the main research question were reviewed. At this stage, the focus and questions of the interview were reviewed and gradually corrected based on the feedback received from the initial interviews. In each interview session,

participants identified one or two people who could help make the research more productive. Then by referring to other experts who had experience using CDM and were familiar with the concepts related to CDM, the desired sample was obtained. The request to introduce the next person was made at the end of the interview session, and the participant could introduce the next person more accurately, considering the familiarity with the research objectives and the type of questions. This method of obtaining samples in the methodological literature is called the Snowball sampling method. Because in this study, the research is based on a qualitative method and grounded theory is used, sampling is also subject to the rules of the same method and is done in a purposeful and theoretical manner. In this approach, the sample size is determined during the work and, as mentioned, the sampling continues until the data is saturated. In this study, after 44 interviews, the researchers reached data saturation and no new data was added to the previous data, but to ensure the theoretical saturation, 10 more interviews were also conducted, and no data was added to the previous data in the new interviews. For this reason, 54 interviews were conducted for this study and it was sufficient. To obtain data that can answer the research question, in-depth and semi-structured interviews were conducted with selected

managers. In these interviews, which vary in time from 10 to 100 minutes, the topics of the interview were provided to the interviewee in advance, so that she could participate in the meeting with the desired preparation and provide the desired information. Interviews were recorded, and each was immediately analyzed. In some sentences, the interviewees used terms that could be used directly as a code, and in some cases, a concept was hidden behind the sentences, to which the researcher attributed a concept according to the speaker's intention and considered it as an initial code. Based on open, axial, and selective three-stage coding, the data were continuously reviewed and refined, and based on the similarities and consistencies of the data, in an inductive process, a set of similar data was gathered around a concept. Concepts that had common meanings were organized into categories that had a more abstract surface than the concepts. Finally, categories that semantic and content loads were more closely related were placed under a special category. This process was repeated over and over again until, after repeated refinements, the initial codes to the concepts and concepts were organized into a broader concept as a category based on the conceptual homogeneity process, and the resulting categories were combined in the form of classes on a more abstract level, based on the logic of continuous comparison in terms of conceptual similarity.

Reliability and validity

To ensure the reliability and validity of the findings and the accuracy of the data analysis process, despite the theoretical saturation in the forty-four interviews, the interviews continued until the fifty-four persons. Some of the initial codes were seen by the interviewees, the results of the selective coding were shared with several CDM experts, and their opinions were applied. Also, the results of the research were provided to several employees of government organizations who had managerial expertise, and based on the provided feedback, the strength of the results was strengthened. Therefore, to ensure the validity of the research, the following measures have been taken:

1. Adaptation by participants; Expert opinion was applied in the coding stage.
2. Review by other professors; Thirty faculty members of the university related to the subject, reviewed the findings and commented.

3. Participatory research; The present study was obtained simultaneously with the participation of the authors and the opinions of all three members were aggregated in the analysis and interpretation of the data.

4. Comparison with research background; All the concepts extracted in the interviews are also present in the background of the research. The point is that the factors identified in the background of the research were scattered and inconsistent, but in this study, they are organized and presented as a conceptual model.

RESULTS AND DISCUSSION

The findings are reviewed in the form of results obtained from three types of open, axial, and selective coding.

Open coding

Open coding is an analytical process of naming concepts and classifying and discovering their features and dimensions in data through continuous comparison, in which the researcher examines and analyzes concepts from different angles from inside and outside or upside down to gain a different perspective on the importance and status of concepts (Corbin and Strauss, 2014). In this stage, first, the issues related to CDM in interviews are reviewed, sentence by sentence, and its key points and topics are coded. These codes are in the form of concepts, which are derived from the sentences of texts related to CDM. By reviewing and studying the information, 86 sentences related to the subject were extracted from the texts, then the contents with duplicate codes were removed, and finally, 26 sentences were coded, which are collected in Table 1. The collective decision ID is indicated by the letter "R".

Axial coding

After finding concepts related to CDM, they are categorized. "Category is the classification of concepts". When concepts are compared with each other and appear to be related to similar phenomena, these categories are discovered. In this way, the concepts are categorized in a more orderly manner. A category is a concept, which is more abstract than other concepts (Zimmermann et al., 2020). The categorization method in this research is the accumulation method, in which

Conceptualizing Collective Decision-Making

Table 1: Generate basic concepts from data related to CDM in open coding

ID	Data	Concept /code
R1	Wrong decisions of officials in various matters and their negative effects.	Wrong decisions
R2	Weakness in reaching understanding, and aggregation of decision makers' opinions and tastes in CDM.	Weakness in reaching an agreement
R3	Lack of knowledge about the benefits and low culture of CDM and, consequently, collective work.	Failure
R4	Low productivity and motivation of employees and increasing tensions and complaints in organizations due to communicating individual decisions of managers.	Low productivity and motivation of employees
R5	Groups can have complex structures and include individuals, groups, and even much larger social networks.	Structure
R6	Ideas, beliefs, judgments, and values can influence and guide individuals in decision-making situations.	Beliefs
R7	The influence and psychological and cultural interactions of individuals in each other, including the decision execution environment, the culture that governs the decision-making environment, the norms and anomalies of the environment, and the practices and values that dominate the decision-making environment.	Culture
R8	People use their inner desire and energy to make decisions and behave to achieve their goals.	Motivation
R9	Organized and analyzed information that can be understood as well as applied to problem-solving and decision-making.	Knowledge
R10	Creating and developing the skills needed to make good decisions is vital.	Skill
R11	Experience changes people's preferences and influences decision-making through the cognitive process.	Experience
R12	Minimizing the possibility of Prejudice and absolutism at the group level is critical to group success, and may require increased diversity within the group.	Prejudice
R13	Infiltration between delegates in CDM situations, in which individuals must choose between different options, may have a significant impact on CDM and, consequently, on collective performance.	Infiltration
R14	The arrogant do not value the participation of decision-making members, nor do they use the knowledge and information of others themselves, nor do they inform others.	Arrogance
R15	Individuals under the influence of group pressure present an opinion that is not their real opinion and has been imposed on them, and in such cases, CDM is not effective.	Group Coalition
R16	Due to the weakness of the culture of collective work, one of the most important strategies is to create a culture and explain the benefits of collective decisions.	Coherent culture building
R17	The result of collective behavior is strongly dependent on the structure of information sharing in the group as well as the quality of information transmitted.	Transfer and share information
R18	Experience and training to develop human capabilities affect preferences and consequently decision-making in different ways.	Education of collective members
R19	People who are members of a group must be justified and coordinated with the goals of the group, otherwise, they may cause clutter and disintegration over time.	Selection of appropriate human resources
R20	CDM enables the manager to actively collaborate with different groups of employees in the organization and unite different departments in the performance of their common tasks.	Collection Alliance
R21	The collective benefit to a particular individual can be the transfer of information between them, that is, a central individual increases his or her awareness and knowledge by gaining access to information held by others.	Increased awareness and knowledge
R22	One of the most important goals of CDM is to formulate specific recommendations to deal with the desired task develop the skills of the participants and find collective solutions to common problems.	Growth and development of members
R23	Aggregates can have superior decision-making performance over individuals for a variety of reasons. The simplest argument is based on "collective wisdom" and the intelligence of each individual in the collective contributes to collective intelligence as a whole.	Increased wisdom and collective intelligence
R24	As people's participation in decision-making increases, CDM becomes more valuable and easier to implement, and employees execute decisions with greater commitment and interest.	Increased members commitment
R25	CDM increases the quality of decision-making by maximizing the knowledge capacity of members and making it possible to reach the optimal decision.	Increasing the quality of decision-making
R26	If a collective decision is made, individuals can freely express their views and resolve disputes and conflicts.	Increased justice

Table 2: Concepts and categories related to CDM in axial coding

ID	concepts	categories
R1+R2+R3+R4	Wrong decisions + Weakness in reaching an agreement + Failure + Low productivity and motivation of employees	causal conditions
R5+R6+R7+R8	Structure + Beliefs + Culture	intervening conditions
R9+R10+R11+R12+R13 R14+R15	Motivation + Knowledge + Skill + Experience + Prejudice + Infiltration + Arrogance + Group Coalition	contextual conditions
R16+R17+R18+R19	Coherent culture-building + Transfer and share information + Education of collective members + Selection of appropriate human resources	strategies
R20+R21+R22+R23+R24+R25+R26	Collection Alliance + Increased awareness and knowledge + Growth and development of members+ Increased wisdom and collective intelligence + Increased members' commitment + Increasing the quality of decision-making + Increased justice	consequences

while working on the content and in dealing with each concept, a new class is formed and concepts similar to the new class are organized under that title. Table 2 shows the concepts of each of the data extracted from the text and finally their classification. Thus, based on the similarity, conceptual relationship, and common characteristics between open codes, 26 concepts were classified into 5 categories: causal conditions, contextual conditions, intervening conditions, strategies, and consequences.

The following are definitions related to these 5 categories (Corbin and Strauss, 2014):

Causal conditions

Causal conditions are conditions that are the main cause of the phenomenon under study. The results of the content analysis of the interviewees' answers to questions such as their perception of the causes of CDM and the necessity of using it indicate the existence of 5 main concepts regarding the causal conditions for creating the phenomenon under study, open codes related to which are described in Table 1.

Core Phenomenon

An incident or major event that has a series of interactions to control or manage it, and is related to it. The core Phenomenon studied in this research is CDM. All 5 categories are related to the central phenomenon, and for this reason, this category is not included in Table 2.

Intervening conditions

Intervention conditions are general and broad

which affects how they interact. In the present study, based on the content analysis of the interviews, four components were identified as environmental intervening conditions.

Contextual conditions

Represents several special features that underlie the emergence of a phenomenon; In other words, it is the place of events related to phenomena in which interaction takes place to control, manage, and respond to the phenomenon. Contextual conditions are specific conditions that affect the main phenomenon and strategies. Contextual conditions in this research are divided into two parts: encouraging conditions and deterrent conditions. Encouraging conditions increase the speed of CDM, and deterrent conditions are conditions that are known as an obstacle to achieving the goal. These conditions usually slow down the speed of achieving results or prevent them from continuing.

Strategies

Strategies in grounded theory refer to providing solutions to deal with the phenomenon under study, the purpose of which is to manage and show sensitivity to it. In this research, 4 important strategies have been identified.

Consequences

Consequences are the result of the action and reaction of the conditions that exist regarding the phenomenon. In this study, 12 basic outcomes to achieve the desired situation regarding CDM have been proposed.

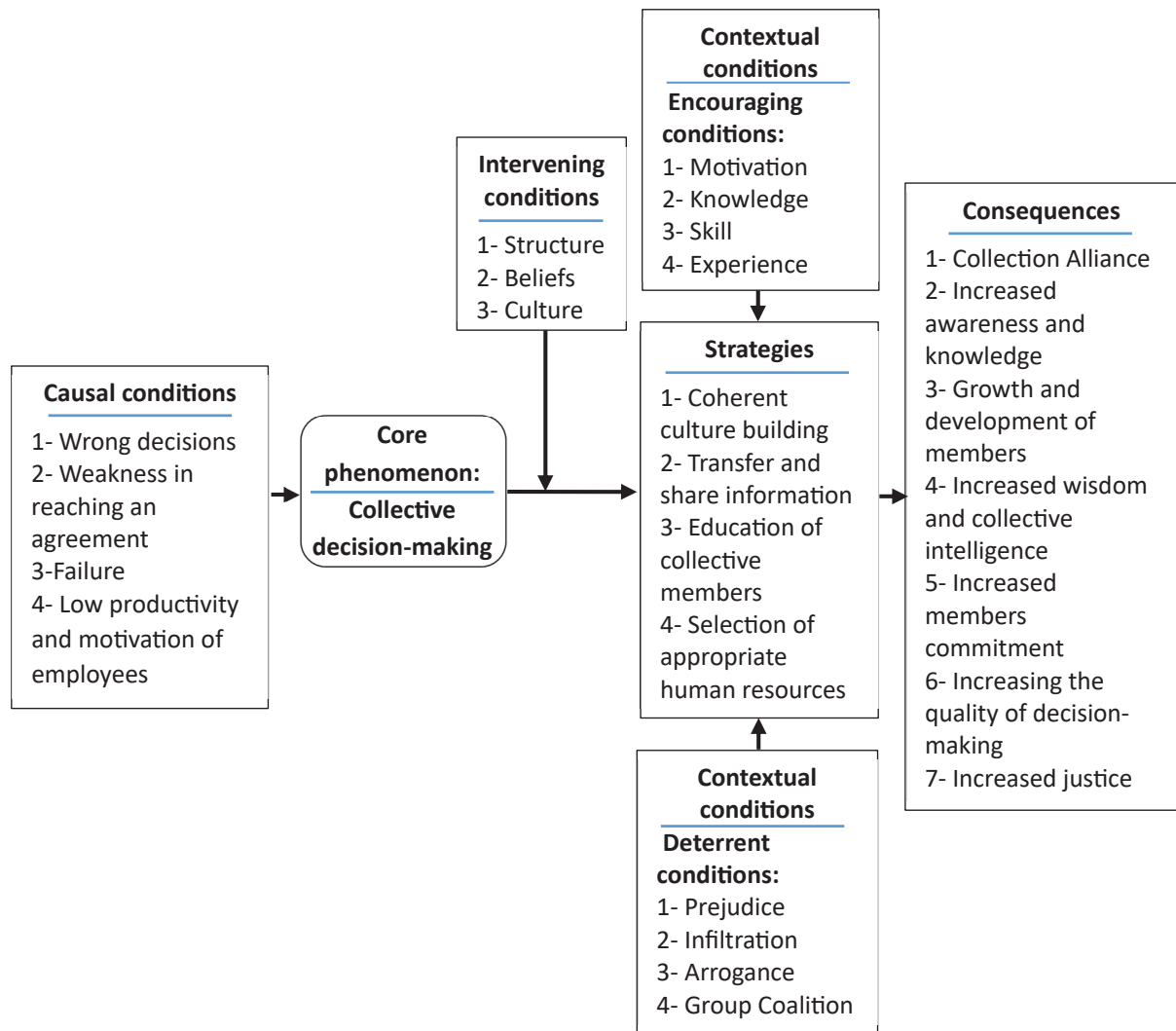


Fig. 3: The conceptual model of collective decision-making

Selective coding

In the grounded theory method, the obtained categories and the relationships between them are discovered and those categories are related in a new way rather than the usual way. Therefore, at this stage, the central phenomenon of "CDM" is placed in the center of the process, and then the categories obtained in Table 2 in the model according to the type of their relationship with the central phenomenon, the paradigm is placed and related. (Corbin and Strauss, 2014). This step involves drawing a diagram, which is called a "coding pattern" and is a kind of model derived from the findings. This model is shown

in Fig. 3.

As shown in Fig. 3, According to the coding steps and data analysis, it can be said that the conditions affecting CDM are in three general categories of conditions: "causal conditions, intervening conditions, and contextual conditions". In the next step, according to these conditions, "strategies" are presented, and then the short-term and long-term results of CDM are identified as "consequences". In this model, it is shown what factors justify CDM, what factors influence CDM, what conditions are the foundation/obstacle of CDM, what strategies should be adopted to promote CDM, and what consequences will result

if decisions are made in a collective organization. The models that were designed in previous studies were often about CDM structures. For example, Bui (1987) presents five different structures of CDM including hierarchical, star, wheel, honeycomb, and multi-connected. In another model designed by McHugh *et al.* (2016), the collective decision model includes parameters such as individual characteristics (i.e., intelligence and knowledge), collective characteristics (i.e., collective intelligence, participative leadership, and inspiration), work structure (i.e., collaboration method), and the characteristics of the work (i.e., task complexity). In another model, CDM consists of four main parts (Wu *et al.*, 2017): Opinion collecting module, opinion processing module, negotiation module, and consensus. As it is clear, none of the previous studies have investigated CDM regarding causal conditions, intervening conditions, contextual conditions, strategies, and consequences. This article tries to fill this research gap. In this study, using grounded theory, the effective factors in CDM have been taken into consideration and an attempt is made to have a comprehensive view of CDM to create more motivation for managers to use CDM.

CONCLUSION

Decision-making is the main problem of management and managers must make correct decisions in different situations. Due to the many mistakes of managers in their decisions, CDM is one of the most important tools to make the right choices that bring great benefits to the individual and the organization. Since, a group holds more knowledge than an individual, to some extent, the quality of decision-making in complex tasks is protected and decision-makers make decisions with deeper knowledge and less bias. The purpose of this paper, presented in the form of a grounded theory, is to provide a broad view of the dimensions and consequences of CDM. The main novelty of this research is the presentation of a comprehensive model of CDM, derived from the findings, which can motivate managers to use the CDM method in their choices. In this study, five important research questions have been answered through interviews with 54 experts and university professors. To do so, the grounded theory is utilized to obtain data which is categorized into three types open, axial, and selective coding. In open coding, the findings were summarized

in 26 concepts, and in the axial coding stage, these 26 concepts were classified into 5 main categories: causal conditions (generating conditions), contextual conditions (internal conditions affecting the main phenomenon, including encouraging conditions and deterrent conditions), Intervention conditions (mediators), strategies (solutions and programs) and results of the collective decision (consequences). In selective coding, these categories were structured, and by establishing a relationship between them, they were presented as a CDM model with 5 main criteria and 26 sub-criteria. The classification of this 26 sub-criteria has been as follows: causal conditions (Wrong decisions, Weakness in reaching an agreement, Failure, Low productivity and motivation of employees), intervening conditions (Structure, Beliefs, Culture), contextual conditions (Motivation, Knowledge, Skill, Experience, Prejudice, Infiltration, Arrogance, Group Coalition), strategies (Coherent culture-building, Transfer and share information, Education of collective members, Selection of appropriate human resources), consequences (Collection Alliance, Increased awareness and knowledge, Growth and development of members+ Increased wisdom and collective intelligence, Increased members' commitment, Increasing the quality of decision-making, Increased justice). This model clearly shows that many conditions play a role in CDM, and despite its very helpful consequences, many deterrent conditions do exist. Eliminating these barriers requires believing in the benefits and conceivable improvements of CDM which is time-consuming and requires planning and discourse-building in the organization. Obtaining information from a small number of managers who use the CDM method in their work was the limitation of this study. Using CDM as a managerial attitude is a suitable tool to increase productivity and advance organizations toward their goals. The research in this area could be extended in future studies to investigate its other dimensions. The following three suggestions are presented for future studies. First, a cross-cultural analysis of the acceptance or rejection of CDM methodology among managers in different societies could be studied. Second, researchers could carry out further research on barriers to CDM such as individual bias. Third, researchers could carry out further research on moderating variables that influence collective decision making such as gender,

age, and experience of managers.

AUTHOR CONTRIBUTIONS

S.M. Mirbagheri performed the literature review, and methodology, analyzed and interpreted the data, and prepared the manuscript text. A. Rafiei Atani performed the manuscript edition, literature review, compiled the data, and manuscript preparation. M.R. Parsanejad helped in the literature review, results, and discussion.

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CONFLICT OF INTEREST

The authors declare no potential conflict of interest regarding the publication of this work. In addition, the ethical issues including plagiarism, informed consent, misconduct, data fabrication and, or falsification, double publication and, or submission, and redundancy have been completely witnessed by the authors.

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ABBREVIATION

CDM	Collective decision-making
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ORIGINAL RESEARCH PAPER

The impact of green training, green reward, and green recruitment on organizational citizenship behavior for environment

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ABSTRACT

BACKGROUND AND OBJECTIVES: Green Tourism to be an important factor as a medium of learning information for residents, managers and government. However, since Covid-19 this sector has experienced a decline in the performance of human resources for greening at the Gembira Loka Zoo conservation agency, even though this plays an important role. At the beginning of this pandemic, it was like “starting from scratch” in procuring environmentally friendly human resources. This study aims to analyze the Effect of Green Training, Green Reward, and Green Recruitment on Organizational Citizenship Behavior for Environment Employees at the Gembira Loka Zoo conservation agency, Yogyakarta, Indonesia. This research is interesting, because of the innovative research conducted in the conservation sector on employees who are environmentally conscious.

METHODS: This study uses inferential statistics. Field and library methods, literature reviews, and questionnaires were used to gather information. This study used a saturated sample method with quota sampling technique on 147 employees of the Gembira Loka Zoo conservation agency with Variance Based Structural Equation Modeling analysis. The outer model was made by testing the quality of raw material instruments with reliability tests using the Cronbach's Alfa method and Composite Reliability > 0.7. The validity test used convergent validity and discriminant validity with outer loading factor > 0.70, and discriminant validity with Average Variable Extract > 0.50. Inner model by looking at goodness-of-fit. Finally, the collected data was analyzed using SmartPLS version 4 software.

FINDINGS: Based on the results of Structural Equation Model test, all indicators are reliable where the loading factor and Composite reliability > 0.7, all variables are valid because Average Variance Extracted > 0.50, P < 0.05 value for hypotheses 2 and 3 is accepted, while hypothesis 1 is rejected because P > 0.05. This model is in accordance with the goodness of fit measures.

CONCLUSION: The results of the study show that Green Training has no effect on Organizational Citizenship Behavior for the Environment, but green reward and green recruitment have a positive and significant effect on Organizational Citizenship Behavior for Environment, and green recruitment has a positive and significant effect on Organizational Citizenship Behavior for Environment.

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INTRODUCTION

Green tourism is a biodiversity area that serves as a real witness over time for destination sustainability initiatives. This sustainability makes the tourism sector a lesson for citizens, namely visitors, local residents, managers, and the government (Branstrator et al., 2023; Le Dinh et al., 2022). Green tourism must follow environmentally friendly measures in operations and management to contribute to greening the environment, and improving people's lives (Ibnou-Laaroussi et al., 2020; Saif et al., 2023; Samimi, 2024). Gembira Loka Zoo as a conservation organization is a key factor in animal and plant conservation as well as a tourist spot which is a fun place to learn about various animals and plants as well as educational and family tourism in Yogyakarta, Indonesia, during the Covid-19 pandemic experiencing a decline in performance, and endemic or post-Covid-19 period must involve green factors for future performance. The green factor as the front guard, namely human resources at the Gembira Loka Zoo conservation organization (Febriono, 2020), so that the management will uphold ideals that are in harmony with the basics of environmental ethics (Nurjannah et al., 2020). Along with the development of the expansion of the tourism sector, Human Resources (HR) are needed who must have knowledge of dynamic environmental behavior. To increase the efficiency of environmental management, Organizational Citizenship Behavior for Environment (OCBE) organizations must play an important role (Gurmani et al., 2021). Support for OCBE comes from training activities so that people understand the value of environmental protection in the workplace and will be better able to adapt. Employees will also gain important knowledge about how to save resources and reduce waste at work (Mačiulytė and Sekhniashvili, 2021). Habit by implementing environmentally friendly training (green training) such as energy conservation through green training to be more aware of the value of protecting the environment and to more easily accept environmental management procedures (Silvester et al., 2019; Samimi et al., 2023). The process of educating staff members how to behave and environmental management in the organization is applied to the organizational environment (Jayabalan et al., 2020), requires management of green training supported by green rewards, as a reward for employee performance. With the implementation of green

rewards, it is hoped that they can be used as a tool to encourage environmental initiatives in business and programs to promote employee awareness of organizational environmental values (Mandago, 2018). These green awards enhance employees' green skills, knowledge and behavior as well as their commitment, motivation and alignment with the organization. This commitment develops a sense of green citizenship among employees, who perceive themselves as loyal members of the organization and contribute to their role in improving and stabilizing the organizational environment (Meng et al., 2022).

Theoretical review and hypothesis development Green training on organizational citizenship behavior for environment

When Green training is implemented, the company is expected to be able to make employees more sensitive and active in socializing so that they care more about the importance of protecting the environment. To bring up organizational citizenship behavior for the environment based on environmental awareness, skills, employee expertise, creating emotional involvement of employees in environmental management that is embedded in each employee, it is necessary to have green training (Bharti et al., 2022). Green Training aims to advance environmental management systems (Mansour, 2023). Organizations must educate and train their employees through environmental training to achieve sustainable performance (Dumont et al., 2017). Then it can educate employees about informal practices such as energy conservation to reward voluntary green behavior (Ercantan and Eyupoglu, 2022). As a green training agenda in environmental control to create programs to protect and solve problems regarding the environment is very important to improve OCBE better (Japir Bataineh et al., 2023). Scholars have also underlined that green training enhances pro-environmental behavior throughout the organization and portrays a better image of social responsibility within an organization or company.

Based on this statement, the hypothesis formulation can be determined, namely:

H1: Green training has a positive and significant effect on Organizational Citizenship Behavior for the Environment.

Green reward on organizational citizenship behavior for environment

Implementing green rewards as a form of appreciation for employee performance while working will motivate employees to carry out their respective job descriptions (Wang *et al.*, 2022). Green reward is a potential method for promoting environmental management activities and can be an effective tool to support organizational environmental activities (Tirno *et al.*, 2023). As well as with recognition and praise through non-financial rewards, employees will be more motivated to protect the environment (Alabi *et al.*, 2022). The sustainability of organizational environmental performance is highly dependent on green rewards and organizational management practices to positively manifest OCBE (Yue *et al.*, 2023). Based on this statement, the hypothesis formulation can be determined, namely:

H2: Green rewards has a positive and significant effect on Organizational Citizenship Behavior for the Environment.

Green recruitment on organizational citizenship behavior for the environment

Green organizations should recruit members who are also committed to environmental issues. The issue of green recruitment issues should apply candidates who can maintain environmental values (Jiao *et al.*, 2022). Green hiring is a concern and aligned with the company's increase in attracting environmentally conscious talent. Employees are involved in green activities, creating a green learning climate that encourages employees and management to participate in and address environmental issues (Agrawal and Pradhan, 2023). Furthermore, by implementing Green Recruitment, employees have

a background of love for the environment and actively increase their environmental knowledge, and ultimately have a real impact on employee performance (Malik *et al.*, 2021). Providing an understanding that companies should have an environmental policy, this needs to be supported by the way the organization implements environmentally sound workforce recruitment (Memon *et al.*, 2022). When a company implements green recruitment correctly in its procedures, it will increase OCBE, meaning that there is efficient employee involvement in environmental behavior in the company (Elena and Renate, 2022). Based on this statement, the hypothesis formulation can be determined, namely:

H3: Green recruitment has a positive and significant effect on Organizational Citizenship Behavior for Environment.

To facilitate understanding, more in Fig. 1.

This study aims to explain the relationship between Green Training, Green Reward, Green Recruitment, and OCBE at the Gembira Loka Zoo Conservation Institute, Indonesia. This study was conducted in Indonesia, in July 2022 to February 2023.

MATERIALS AND METHODS

Survey design and data collection

The approach used in this study is a multivariate analysis approach. This study adopts from research (Arulrajah *et al.*, 2016) or green training variables, (Obaid and Alias, 2015) for green reward variables, (Tang *et al.*, 2018) for green recruitment variables, and (Gurmani *et al.*, 2021) for organizational citizenship behavior for environment variables. These variables are measured by 21 indicators, which are measured

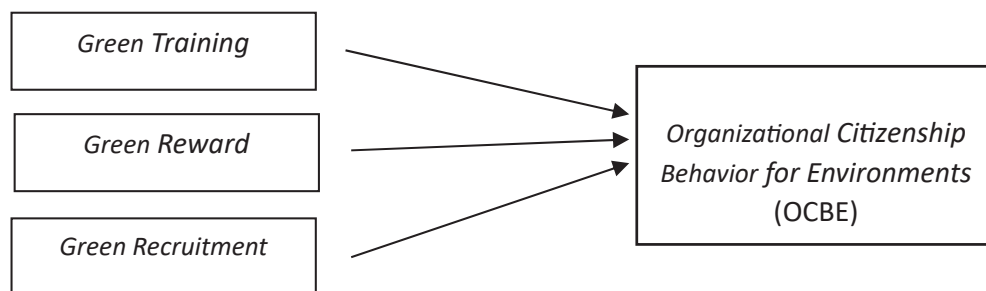


Fig. 1: Research framework

Organizational citizenship behavior for environment

Table 1: Mean and outer loading

Variable	Questionnaire	Mean	Loading
Organizational Citizenship Behavior for Environment (Y)	Y.1. I spontaneously give of my time to help my colleagues account for the environment in everything they do at work.	4,141	0.836
	Y.2. I encourage my friends to adopt environmentally conscious behavior.	4,152	0.865
	Y.3. I encourage my colleagues to share their ideas and opinions on environmental issues.	4,111	0.872
	Y.4. I spontaneously talk to my colleagues to help them better understand environmental issues.	4,061	0.851
	Y.5. Even when I am busy, I am willing to take time to share information about environmental issues with new colleagues.	4,040	0.907
	Y.6. I actively participate in environmental events organized by my organization/company.	4,061	0.880
	Y.7. I consciously and voluntarily carry out environmental initiatives in my daily work.	4,061	0.880
	Y.8. I offer suggestions to co-workers on more effective ways to preserve the environment even though it is beyond my direct responsibility.	4,101	0.890
	Y.9. In my work, before I do something, I always consider the consequences of my actions whether they can affect the environment.	4,051	0.889
Green Training (X1)	X1.1. Provide training to develop skills and knowledge related to the environment	4,091	0.904
	X1.2. Provide training to reduce long distance business travel and recycling.	4,028	0.828
	X1.3. Provide training to create 'environmental awareness' among the workforce.	4,071	0.909
	X1.4. Provide environmental education to the workforce.	4,051	0.877
	X1.5. Provide training to staff to produce workspace green analysis.	4,040	0.911
Green Reward (X2)	X2.1. The company provides non-financial rewards for good employee environmental performance.	4,071	0.843
	X2.2. Companies are able to appreciate the environmental performance of employees.	3,980	0.900
	X2.3. Companies can reward financially for good employee environmental performance.	4,081	0.893
	X2.4. Give praise to employees who have done a good job.	4,172***	0.904
Green Recruitment (X3)	X3.1. Attract green job candidates using green criteria in selecting organizations.	4,020**	0.931
	X3.2. Recruit employees who have environmental awareness.	4,121	0.935
	X3.3. Using green company branding to attract eco-friendly employees.	4,040	0.887

Lowest average *Highest average

by a Likert scale of 1 – 5 (1 = strongly disagree, and 5 = strongly agree). Sampling used the simple random sampling method (Ramezan *et al.*, 2019), because the sample population is homogeneous. How to collect data using google form with quota sampling technique to 147 employees at Gembira Loka Zoo conservation institute, Quota sampling is carried out by collecting data continuously until all samples are fulfilled.

Analytical framework

The analysis tool uses validity, reliability, Structural

Equation Modeling (SEM) tests, and hypothesis testing. Inferential statistics are used with the Cronbach's Alpha technique and Composite Reliability > 0.6 (Juliandi *et al.*, 2014) for reliability tests to ensure the accuracy of the outer model (Agerre *et al.*, 2006). Convergent validity is determined when the outer loading factor is more than 0.70 (Chin, 1998), and discriminant validity is determined when the AVE is greater than 0.50 (Sarstedt *et al.*, 2014). The entire model uses goodness of fit analysis (Henseler *et al.*, 2015) to build an internal model. The software used is SmartPLS Statistics version 4.0

RESULTS AND DISCUSSION

Descriptive statistics

Respondents' demographic data based on gender, age, and last education. The respondents were dominated by male employees 88 people or 60% with ages 21-30 years there were 83 or 57% and Senior high school 106 or 72%.

Estimating the PLS model in Table 1, all indicators have a loading factor value of > 0.7 , so it can be concluded that the model meets the convergent validity requirements. Overall that social media contributes to increasing employee participation in the decision-making process (Tajpour *et al.*, 2023).

Average Variance Extracted (AVE), Cronbach's Alpha dan Composite Reliability

Table 2 shows that all the variables are valid, as all values of Average Variance Extracted > 0.50 (Sarstedt *et al.*, 2014), and concludes that all variables are declared reliable because the Composite Reliability and Cronbach's Alpha values ≥ 0.70 (Ghozali, 2018).

Discriminant Validity

Table 3 for the discriminant validity, square root of the average variance extracted (AVE) for each factor was compared with the correlations between that and all other factors. It has been suggested that

square roots of the AVEs should be greater than correlation coefficient between the constructs, which indicates that a construct is more strongly correlated with its indicators than with the other constructs in the model (Shrestha, 2021). Referring to Table 4, there is no correlation between Green Training and Organizational Citizenship Behavior for the Environment as measured by the t-statistic of 1,062. The original sample value is -0.095. The original sample value was 0.568 and the t-statistic value was 6.918, both of which show that green awards have a positive value for Organizational Citizenship Behavior for the Environment. The T-statistic of 6,940 and the original sample value of 0,528 shows that green recruitment is a positive variable from Organizational Citizenship Behavior for the Environment.

Path coefficients P- values

It is necessary to carry out a suitability test using several indicators in accordance with the objectives to find out whether the proposed model is good and correct in a study (Hair *et al.*, 2010). Based on Table 5, the Strandardized Root Mean Square Residual (SRMR) value in this study was 0.052, so that the model in this study is suitable (Shi *et al.*, (2018). In addition, the d_ ULS and d_ G confidence intervals were not obtained

Table 2: Average Variance Extracted (AVE)

Variable	AVE	Cronbach's Alpha	Composite Reliability	Test Result
Green Training (X1)	0,785	0,931	0,934	Valid and reliable
Green Reward (X2)	0,784	0,908	0,910	Valid and reliable
Green Recruitment (X3)	0,843	0,906	0,908	Valid and reliable
OCBE (Y)	0,765	0,962	0,962	Valid and reliable

Table 3: Discriminant Validity (Fornell Larcker Criterion)

Variable	Green Training (X1)	Green Reward (X2)	Green Recruitment (X3)	OCBE (Y)
Green Training (X1)	0,886			
Green Reward (X2)	0,892	0,885		
Green Recruitment (X3)	0,909	0,880	0,918	
OCBE (Y)	0,892	0,948	0,942	0,875

Table 4: Test Hypothesis

Variable	Green Training (X1)	Green Reward (X2)	Green Recruitment (X3)	OCBE (Y)
Green Training (X1)	0,886			
Green Reward (X2)	0,892	0,885		
Green Recruitment (X3)	0,909	0,880	0,918	
OCBE (Y)	0,892	0,948	0,942	0,875

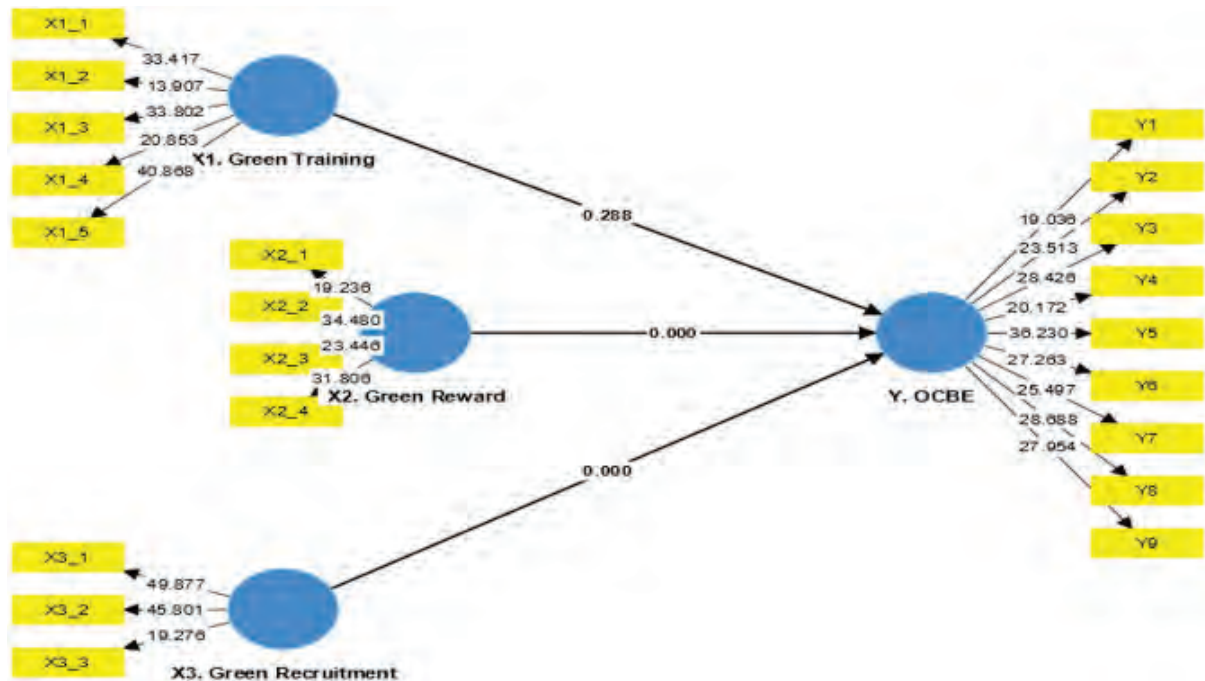


Fig. 2: Path Coefficients P values

Table 5: Goodness-of-Fit Measures

Indicator	Result	Criteria
*SRMR	0.052	acceptable if ≤ 0.08
**d_ULS	0.635	acceptable if ≥ 0.95
***d_G	0.038	acceptable if $P \geq 0.05$
Chi-square	164.065	close to zero
****NFI	0.980	acceptable if ≥ 0.90

* Standardized Root Mean Square Residual - ** Squared Euclidean distance - *** Geodesic distance - **** Normed Fit Index

using the “normal” bootstrap approach, so there is no correlation between d_ULS (squared Euclidean distance) and d_G (Geodesic distance) values. In one study, the model used was declared good if the covariance matrix of the empirical model was equivalent to the covariance matrix of the estimated model or the p value results in the chi square test (Henseler et al., 2015). In this study, the chi square value was $164.065 > 0.05$, which means that H_0 is accepted. In addition, the NFI value in this study was 0.980, so it can be concluded that the model used in this study was good. According to Al-Ghmadi et al., (2021) states that when the NFI value gets closer to 1, it can be concluded that the model used is good, and

the NFI value is from 0 to 1.

Green training has no effect on organizational citizenship behavior for the environment

Based on the results of the descriptive analysis in this study, it can be seen in the distribution of the questionnaires in question X1.2. Provide training to reduce long distance business travel and recycling (lowest mean). Based on the average and loading, it is considered low. According to Yi and Park, (2015) states that remote work and company recycling have an impact on high operational costs and continue to increase so that they do not support the management system. This also has an impact on the inefficiency of work organization, has an impact on employees

who are less organized and worsens work efficiency. Another impact is the lack of net sustainability, and a number of employee behaviors, ranging from travel to energy consumption, digital devices and waste management itself (Abdoli, *et al.*, 2011). And influence on a number of situational factors such as real estate development and environmental infrastructure (Gurumurthy and Kockelman, 2020). The way to overcome these problems is through an appropriate and relevant training needs analysis (Morrison, 2023). Steps that can be taken are to improve employee performance through training coordinated by the right trainers, so as to develop the quality of employees so that the company's vision and mission can be realized (Japir Bataineh *et al.*, 2023). In addition, interaction within an organization must be increased in order to increase the sense of togetherness in an organizational environment (Mozammel, 2019). Another way to overcome this problem is to reduce paper use, this technology also allows saving paper in operation. Technological developments can also be maximized in every company activity, using the help of this technology, communication will become easier and cheaper (Chakravarty and Mishra, 2019). The theoretical contribution is that green training must involve certified trainers and produce green behavior.

Green rewards have a positive and significant effect on organizational citizenship behavior for the environment

The application of Green rewards in the organizational environment is important in supporting environmental activities within the organization. Nowadays, organizations develop reward systems to foster employee self-awareness which aims to implement environmentally friendly properties (Ullah *et al.*, 2020). Employees can be motivated by being given green rewards and compensation, to motivate them to carry out practical green activities. Thus, the organization plays an important role in developing green rewards among its employees, this can improve employees' green skills, knowledge, and behavior as well as their commitment, motivation, and alignment with the organization (Shafique *et al.*, 2017). Based on the results of the descriptive analysis in this study, it can be seen in the distribution of the questionnaires in question X2.4. Give praise to employees who have done good performance (highest mean). Based on

the average and loading including high scores. In general, this means that employees at Gembira Loka Zoo conservation, Yogyakarta, Indonesia, consider that giving positive praise with the aim of building an individual, which is done verbally to employees, is very important for better performance by employees. This was not spared from the positive word affirmations taught by the expert staff to their members who have achieved performance in accordance with the vision of the Gembira Loka Zoo Conservation Institute. Then green rewards can be a way for employees to be consistent with their work in an organization (Tsymbaliuk *et al.*, 2022). Theoretical contribution, green rewards are part of the benchmark for morale and improve employee performance, the results of this study support research of Amani *et al.*, (2022).

Green recruitment has a positive and significant effect on organizational citizenship behavior for the environment

With the implementation of green recruitment within the company, so as to recruit job candidates who use environmentally friendly criteria to choose organizations so that they are aware, and can be involved in maintaining the environment after entering the world of work (Lulaj, 2023). Typically, such companies also prefer to hire employees who exhibit a green mindset and an eco-friendly approach to work and other job prospects (Guerci *et al.*, 2016). Based on the results of the descriptive analysis in this study, it can be seen in the distribution of the questionnaire in question X3.2. Recruit employees who have environmental awareness (highest mean). Based on the average and loading including high scores. In general, this means that employees at the Gembira Loka Zoo Conservation Institute think that with the organization where they work in attracting human resource candidates, having an awareness of understanding environmental friendliness is important in their work in caring for animals and the surrounding environment (Alvarado *et al.*, 2009). Providing an understanding that companies should have an environmental policy, this needs to be supported by the way the organization implements environmentally sound workforce recruitment (Han *et al.*, 2023). The theoretical contribution of this research supports research of Kumar and Pandey (2018) where green recruitment is a fact in making important decisions in organizational sustainability.

CONCLUSION

The results of the study show that green reward and green recruitment have an impact on OCBE, but this is not the case with green training. This means that and at the same time providing advice or developing recommendations, appropriate and certified training from expert sources is needed, and is carried out on an ongoing basis, so that the training objectives are successful and are able to create time, effort and cost efficiencies. Another recommendation that can be made is that it is necessary to carry out a performance evaluation, the goal is to produce according to the desired target, if the evaluation or target is not appropriate then further action is needed. This needs to be considered as a recommendation for stakeholders and decision makers in this conservation institution. The limitations of this research were carried out on a relatively small organizational scale, namely the Gembira Loka Zoo conservation organization in Indonesia, further research can be applied to other larger organizations and in other countries, by involving another variable green motivation as a moderator variable, this is a research recommendation that will dating.

AUTHOR CONTRIBUTIONS

A.R.P., Saputra performed the literature review, research design, data analysis and interpretation, and prepared the manuscript for publication. W., Widarta, conducted the literature review, data collection, analyzing and interpreting the data, and editing manuscripts for publication. I., swiyanto performed the questionnaire, grouping and arrangement of the data, script preparation, and run the smart PLS.

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CONFLICT OF INTEREST

The authors declare no potential conflict of interest regarding the publication of this work. In addition, the ethical issues including plagiarism, informed consent, misconduct, data fabrication and,

or falsification, double publication and, or submission, and redundancy have been completely witnessed by the authors.

ABBREVIATIONS

AVE	Average variance extracted
CA	Cronbach's alpha
CR	Composite reliability
FLC	Fornell larcker criterion
GoF	Goodness of fit
M	Mean
NFI	Normed fit index
O	Original sample
P	Probability
SEM	Structural equation modelling
SRMR	Standardized root means square residual
STDEV	Standard deviation
T	T statistics

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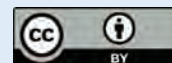
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ORIGINAL RESEARCH PAPER

Identifying the dimensions of employee experience according to the effect of satisfaction, work place and organizational culture

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ABSTRACT

BACKGROUND AND OBJECTIVES: The employee's experience during employment can play a very important role in various aspects of the employee-employer relationship and subsequently in the personal improvement of the employee and the development and progress of the organization. Due to the fact that so far, the experience of employees has not been measured with regard to the effect of job satisfaction, workplace and organizational culture, this research has innovation. Therefore, the purpose of this research is the identifying the dimensions of employee experience according to the effect of satisfaction, workplace, and organizational culture.

METHODS: This study is applied and descriptive. The statistical population consisted of employees of the municipality of Kohgiluyeh and Boyer Ahmed provinces. The statistical population of the research included 823 municipal employees, which was estimated to be 260 for the statistical sample according to the online Cochran formula. The researcher-made questionnaire was compiled according to the research literature and sent to the statistical sample through the porsline link of the questionnaire. For content validity, the evaluation of scientific and executive experts who are aware of the subject and society showed that the questions of the questionnaire evaluate the variables and their relationships well. In the measurement model, the internal consistency of the model or reliability has been measured by calculating Cronbach's alpha coefficient and shared reliability. To measure divergent validity, Fornell and Larcker criteria were used. Data analysis was done using the software of structural equations of Lisrel.

FINDINGS: Convergent validity and Cronbach's alpha were used to fit the measurement. The convergent validity was higher than the standard value of 0.5, which was acceptable for all variables. Cronbach's alpha was higher than the standard value of 0.7, which was acceptable for all variables. The t-statistic was used to test the hypotheses. The amount of t-statistic for culture and satisfaction variable was more than the acceptable limit, i.e. 1.96, which means that these two hypotheses have been confirmed. The value of t statistic was less than acceptable and this hypothesis was rejected.

CONCLUSION: Considering the relationship between organizational culture and job satisfaction with employee experience, there is a need for managers to try to carry out activities or make decisions that increase employee job satisfaction and improve and make organizational culture more effective in order to create an effective experience and be efficient for employees.

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INTRODUCTION

Nowadays, considering sweeping changes, successful and effective organizations are those organizations that can predict changes and transformations and direct these changes in the way to create optimal transformations in order to make a better future in addition to adjust with contemporary society changes (Tajpour et al., 2018). Therefore, human Resources is an important factor in an organization because it is a group of people who work together to achieve certain goals (Hosseini et al., 2023). As the main resources of the organization, employees are required to provide the best quality and optimal performance to the organization (Arifin and Putra, 2020). In fact, while solving their previous and past problems, they will be able to deal with new issues and continue to be efficient and up-to-date by applying new policies and solutions (Hosseini et al., 2020). Employee experience, simply put, is the type of experience an employee has while working for a particular organization (Morgan 2017). Employees must be able to perform their duties and responsibilities effectively and efficiently (Wazirman et al., 2022). Because companies with positive employee experiences grow faster and have higher profit margins, employee experience has become a top priority on the HR agenda in recent years. Employee experience encompasses several factors, including how employees find meaning in their work and how they perceive, interact with, and respond to internal practices and organizational culture throughout their employment (Zel and Kongar, 2020). Employee experience is the type of professional experience an employee gains during his or her tenure with a particular organization and includes everything the employee encounters or experiences at work. Factors such as food, people, work environment, job design, and overall environment all contribute to the employee experience. A positive experience is one of the factors that leads to employee job satisfaction (Soni et al., 2017). In another definition, employee experience refers to all of an employee's perceptions, feelings, interpretations, and understandings of the work environment (Absalan et al., 2021). Employee experience is a new approach to human resource management that views employee experience as a holistic perception with the goal of engaging employees by creating value and meaning, and views human resource management as a strategic process.

Given that modern organizations are made up of four generations working together, prioritizing the employee experience creates a different perspective. The quality of an organization's employee experience has a direct impact on employee satisfaction, retention and performance (Plaskoff, 2017). High-quality experiences play a critical role in attracting and retaining employees, and organizations can use employee experience platforms to engage and increase productivity, as well as maintain and continuously improve the efficiency of their workforce (Shivakumar, 2020). The employee experience refers to the totality of interactions that take place among employees within an organization (Morgan, 2017). An engaged workforce is an engaged experience (Tajpour and razavi, 2023). Given that today's age of participation has transformed hard work into smart work, researchers have confirmed that engaged employees are more productive, efficient, and committed to the organization; given that experience and interaction are not the same, but they can work together (Itam and Ghosh, 2020). Experience guides employee behavior and attitudes (Jamadi et al., 2023); the employee's experience within an organization, particularly in relation to senior leaders and the processes by which leaders evaluate and assess employees, influences employee behavior, shared perceptions, and organizational commitment (Farndale and Kelliher, 2013). Efforts have been made to conceptualize and measure the employee experience. IBM's Employee Experience Index identifies five factors, including belonging, purpose, achievement, happiness, and rigor, as dimensions. The BetterUp index defines six dimensions, including authenticity, interaction, optimism, purpose and meaning, social connection, and belonging. Jacob Morgan's model and index depict the physical workplace (30%), culture (40%), and technology (30%) as three environments along with 17 indicators to assess the state of organizations. A growing body of research on the employee experience validates the elements that make up this concept and suggests ways for employers to deliver value to customers (Panneerselvam and Balaraman, 2022). As mentioned earlier, human resource researchers have recently focused specifically on the concept of employee experience. Researchers in this field are trying to discover the factors that influence this concept. Some studies have confirmed a significant positive impact

of job satisfaction on performance (Syardiansah and Latief, 2020). Other articles have also confirmed that employee experience has an impact on employee performance and is essential for improving performance (Ardianto, 2020; Plaskoff, 2017). Another influential variable in the employee experience is the work environment, which affects employee satisfaction, job performance, organizational success, and absenteeism and turnover rates. The third variable, organizational culture, influences and shapes the behavior of members within an organization. It is also used to enhance job commitment and individual performance within the organization, and it can have an impact on the employee experience (Meng and Berger, 2019). Considering the importance of urban planning, the environment, and the role of municipal employees in informing the people, the importance of work experience in the municipality is clear. In the municipality, work experience is considered the main pillar of the success of the organization and promotion of social knowledge in the field of environment and urban planning. Also, in an organization like the municipality, which is always trying to find ways and tools to make itself more efficient in order to fulfill its mission and achieve its goals, paying attention to the factors that can increase this efficiency is an undeniable necessity. Therefore, managers' attention to job satisfaction, organizational culture, and work environment can lead to the improvement of providing public services to citizens in the long term and even in the medium term and improving the efficiency and effectiveness of municipal organizational processes. This study is theoretically important in two ways. First, it examines the simultaneous effect of these three variables on employee experience, which has not been previously studied by researchers, and fills this scientific gap. Second, it extends the employee experience, job satisfaction, organizational culture, and work environment literature. From a practical perspective, it serves as a guide for managers and decision makers in the field of human resources to create a more effective and impactful employee experience and improve the employee-organization relationship. So, the current research aims to examine the effectiveness and impact of three variables, namely job satisfaction, organizational culture, and work environment, on the variable of employee experience. In the continuation of this research, literature review and research methods are

discussed. Also, the research findings are considered. Finally, the findings are discussed and the research results are stated.

Theoretical Foundations

Employee experience

Changes inside and outside of HR, such as dissatisfaction with traditional interaction approaches, advances in technology, evolving consumer experiences, and competitive talent markets, impact the employee experience. A positive employee experience can lead to increased employee engagement (Tucker, 2020). Employee experience is the cumulative sum of all the things an employee experiences throughout his or her lifetime (Gheida and ShamiZanjani, 2020). The employee experience is defined as the evolving mental perceptions of employees regarding their cognitive, behavioral, and emotional states, as well as their social interactions within the employing organization and the relevant social actors involved, whether internal (such as colleagues and managers) or external (such as suppliers and customers). These perceptions are derived from various encounters that affect employees' well-being and perceived value throughout their experiential journeys within organizations (Pillai et al., 2023). Employee experience refers to the perspective and feelings of employees regarding their participation in an organizational health and safety program or intervention. Subcomponents of employee experience include the impact of the intervention (which itself has three dimensions: behavior change, general awareness, and impact on others) and the impact of the intervention on the organization (including organizational priorities and communication (Rispler and Luria, 2021). Employee engagement is driven by employee experiences in the workplace, which drive employee behavior in the workplace. 91% of employers expressed a willingness to use employee experience as an approach to fostering interaction. Employee experience is described as a continuous process and the sum of all interactions between an employee, the employer and the organization. Employee experience begins before an employee is hired and continues after an employee leaves the organization. It differs from the temporal and situational nature of employee engagement with the workplace (Singh et al., 2023). The employee experience is a new tool in the ongoing

battle for legitimacy within the HR function. The displacement of HR managers as “former designers” heralds the integration of the conflicting roles HR has traditionally played as defender of the individual employee and strategic partner at the organizational level. However, it also raises the question of what is at stake for HR, and it may even reduce organizational participation in HR (Mahadevan and Schmitz, 2020). Employee experience is the sum of the interactions an employee has, from the first contact as a potential employee to the last interaction after leaving the company. Employee experience goes beyond traditional HR functions to create an external reputation that enhances talent attraction (Yohn 2020). The employee experience has changed significantly in recent years as a result of widespread digitization and remote working. The digital employee experience integrates technology at key employee touchpoints and takes a digital approach to the entire employee lifecycle from hire to learn (Syahchari et al., 2021). Pioneers of strategic human capital management emphasize the entire employee experience, from entry to exit, as the core foundation of an organization’s talent management strategy (Tran and Smith 2020).

Job satisfaction

Job satisfaction refers to a combination of physiological, psychological, and environmental conditions that cause an individual to honestly say, “I am satisfied with my job” (Aziri, 2011). Job satisfaction refers to an individual’s feelings about a job (Soni et al., 2017). Gen Y employees’ attitudes toward workplace entertainment have a positive impact on their experience of workplace entertainment. In turn, their experience of workplace entertainment has a direct positive impact on their job satisfaction and performance. Job satisfaction refers to an individual’s positive attitude toward their job and everything they encounter in the work environment (Vaziri et al, 2020). It is an emotional state in which employees’ rate whether they find their work enjoyable or unpleasant, indicating their personal feelings about their job. Each individual will have a different level of satisfaction (Nurbaeti, 2022). Job satisfaction refers to an individual’s positive or negative perspective on their job or the type of work they have performed. It can also be described as an individual’s personal disposition toward their

work activities, whether positive or negative in nature (Andreas, 2022). Organizational commitment and rewards can affect not only performance but also employee job satisfaction. Job satisfaction is a general attitude toward one’s job, or the difference between the amount of reward an employee receives and the amount they believe they should receive (Nurlaila 2022). The Job Satisfaction Survey is a comprehensive measure of various individual job elements such as compliance, co-worker interaction, and work standards, among others (Sapta et al ., 2021). Employees stay longer in the organization only because of the reward system, appreciation, incentives, leadership roles to achieve goals, high self-esteem, and their growth through various training programs and getting feedback from them (Taimuri 2019). Wnuk(2017) In its research model examines the relationship between job characteristics, supervisor support, organizational support, individual fit with the organization, and their effect on job satisfaction. Therefore, the experience of employees at work has a significant impact on their job satisfaction, which can ultimately affect the organization’s bottom line. Recent research has shown that companies that perform well on employee experience metrics also tend to perform well on customer experience metrics. Improvements in employee satisfaction can drive improvements in customer satisfaction (Bulgarella 2005). Employee experience is subjective and is the holistic impact of the job and the organization on the individual. It includes the interactions an employee has with people, systems, policies, and the physical and virtual workspace. Both the small details of day-to-day work and the periodic events and transitions matter. Employee engagement is a measure of how committed and motivated employees are to their work and the organization. High levels of engagement can indicate a positive employee experience, while low levels of engagement can indicate a negative employee experience (Soni et al.,2017).

Organizational culture

It is a collection of beliefs, values, work styles, and relationships that distinguish one organization from another (Habib et al., 2014). The main theme behind the growing academic interest in organizational culture has been that the “scientific” management of institutions can and should be strengthened or even replaced by an approach that emphasizes a

softer and more human understanding of values and human culture (Bellot, 2011). Organizational culture is a complex phenomenon that manifests itself in behavioral norms, underlying assumptions, and visible human nature. It is the result of interactions between individual and organizational processes. Organizational culture is commonly defined as the social glue and normative framework that holds an organization together (Witte and Muijen, 1999). Another definition is that organizational culture is a set of values, beliefs, and assumptions shared by the members of an organization that can be transmitted from one generation of members to the next and has an impact on the effectiveness of the organization (Meng and Berger, 2019). Organizational culture, based on the collective meaning perspective, is a complex set of values, beliefs, assumptions, and symbols that guide the way the organization does business and help people understand and make sense of the organization's performance and activities. It provides norms for behavior in the organization, and from one perspective, organizational culture shows that people are not constrained by culture, but have the freedom to use cultural resources from the cultural toolbox to justify and construct their actions (Grover *et al.*, 2022). Organizational culture is a sustainable generator that shapes an organization's behavior through its decisions and practices (Assoratgoon and Kantabutra, 2023). Organizational culture has a significant impact on employee experience, affecting day-to-day interactions, relationships between employees and managers, and even the physical workplace environment (Gemmill 2004). Employee perceptions of company culture have a direct impact on engagement and retention. An organization's culture affects employee performance since it proposes to employees how to operate (Belias and Koustelios, 2014). A strong organizational culture allows for open communication and participation in decision-making. Employee participation, innovation and risk-taking, reward system, openness of communication, and customer service orientation are essential parameters in understanding organizational culture's impact on employee performance. Healthy organizational cultures result in an established pool of professionals who can tackle problems in creative ways. A strong culture is a key factor in reducing employee stress (Isensee *et al.*, 2020). Organizational culture plays a crucial role in shaping the employee

experience in a municipality. A strong organizational culture can attract and retain employees who share the same values and beliefs. When employees feel that they fit in with the company culture, they are more likely to stay with the organization (Contreras-Cruz *et al.*, 2023). A positive organizational culture can lead to higher employee engagement. When employees feel that they are part of a supportive and collaborative culture, they are more likely to be engaged in their work and committed to the organization (Malik *et al.*, 2023). A strong organizational culture can lead to higher employee satisfaction. When employees feel that they are part of a culture that values their contributions and well-being, they are more likely to be satisfied with their job and the organization. A supportive organizational culture can lead to better employee well-being. When employees feel that they are part of a culture that values work-life balance, mental health, and physical health, they are more likely to have a positive experience at work (Harlianto and Rudi, 2023). It is the responsibility of management to provide employees with an organizational culture that helps them understand the organizational system. A correct understanding of organizational culture leads to increased employee performance (Munir and Arifin 2021). Morton *et al.* (2019) (in its conceptual model examines the impact of different types of organizational culture on employee satisfaction, business variables, customer satisfaction, and overall customer focus. Mousavi *et al.* (2015) in its research model examines the combined effect of commitment, stability, adaptability, and mission as organizational culture variables on a set of variables categorized in the article as enablers. These enablers include leadership, strategy, people, partnership, and products and services. Ultimately, capability in these five areas leads to positive impacts on customer satisfaction, community well-being, and key outcomes. Thus, it is concluded that in this conceptual model, the set of organizational culture variables significantly influences the set of enablers, and the enablers play a mediating role in the relationship between organizational culture and stakeholders. Organizational culture encompasses four dimensions: participation (involvement in the work), compatibility (stability and cohesion), adaptability, and mission. *Participation*: Effective organizations empower their employees, use and develop their skills, and engage them, where individuals see themselves as integral

parts of the organization.

Compatibility: Research shows that effective organizations are often cohesive and stable.

Adaptability: Cohesive organizations are resistant to change, so internal unity and external adaptability are seen as advantages and strengths. These organizations are risk tolerant and customer focused.

Mission: One of the most important characteristics of an organization's culture is its mission. Organizations without a clear mission are lost (Assoratgoon and Kantabutra, 2023).

Workplace

The workplace Based on Rola et al. (2016), essay model is a collection of factors, departments, and components that an employee encounters and is affected by in his or her organization and workplace, and it consists of both social and physical aspects. The space in which an employee performs individual tasks that define his or her role, in collaboration with others, within predetermined time frames, based on specified procedures, identified needs, and within a formal workflow structure, and from which meaning can be derived (Steenkamp and Basson, 2013). O'Driscoll (2022), in its research focuses on identifying the relationship between an organization's ideals for a culture of diversity and inclusion, its documentation and policies, and the experiences of employees. Purbasari and Abadi (2022), have focused their research on analyzing the nature and impact of organizational culture and retention of millennial employees, leadership style on organizational culture, organizational culture on employee experience, leadership style on millennial employee experience and employee impact. Soni et al. (2017), examine the relationship between job satisfaction and employee experience, and the impact of employee experience on job satisfaction. They collected data from 40 individuals using questionnaires and found that there is a correlation between job satisfaction and employee experience. Job satisfaction is partially dependent on employee experience, and positive employee experience not only influences job satisfaction but also promotes word-of-mouth among employees. Alam and Shin, (2021), have examined the reciprocal influence of employee experience and job satisfaction through the mediating role of perceived discrimination. They argue that the implementation of diversity management can reduce perceived discrimination related to age, gender,

and racial diversity in the workplace. This study has shown that when employees have a positive attitude toward gaining experience, diversity management has a stronger effect on reducing employees' perceptions of age, gender, and racial discrimination and increasing their job satisfaction. The findings suggest that an organization can better manage its diverse workplace by considering employees' personalities and experiences and implementing diversity management practices. Buys et al. (2017), examine the experiences of healthcare employees during periods of prolonged absenteeism due to fatigue and the reactions of their colleagues to this issue, examining the impact of the workplace on employee experiences. This research suggests that employees who are absent due to long-term illness value the support and understanding of their supervisors, which is associated with a supportive workplace. However, the extent to which employees experience this support is important. It should be perceived by employees as supportive, including a focus on strategies (e.g., job modifications) to facilitate return to work. Supervisor training in this area is necessary to support the return-to-work process. Ronda and Garcia (2022), investigated another aspect of the impact of the workplace on the employee experience. The results indicate that aesthetic features in the workplace can be just as important as non-aesthetic features in the decision-making process, and that aesthetic features are just as beneficial to the employee experience as non-aesthetic features. Ahire and Sinha (2022) refer to the fourth-generation workspace as a modern workspace that emerged after the COVID-19 pandemic. They believe that it can provide new experiences for employees. The objectives of this research are to analyze the shift from employee interactions to employee experiences, its impact on organizational efficiency, its impact on employee support, and the redefinition of human resource practices that are enhanced in the modern workplace. Based on the findings of this research, the modern workplace leads to better employee experiences, which in turn lead to excellent customer experiences, fostering loyal customers and stronger financial results. As a result, it supports both employees and employer branding efforts. Sunyoto et al. (2019), examined the effects of motivation, experience, commitment, and regulation of general accounting principles on auditor performance and job satisfaction with auditor knowledge as an intervening variable. The research

results indicate that experience and commitment variables can influence performance through knowledge variables, and performance has a positive and significant effect on job satisfaction. Furthermore, auditor knowledge variables act as mediators in the relationship between experience and commitment on auditor performance. Plaskoff, (2017), focuses on analyzing and designing the organization's work path and the workplace that employees experience during their work. The goal is to use the employees' experiences to design and adapt the workplace and the work path, as well as to align it with the modern workplace, thus enabling the empowerment and participation that organizations strive for. Shivakumar (2020), research focuses on investigating user-centric digital experience platforms and employee experience platforms that lead to long-term relationships with users and engage employees throughout their lifecycle. In addition, this experience platform is used for employee interaction, empowerment, and retention. The research also examines the key characteristics of this platform. Esmailikia and Alibeigi (2019), examined the impact of private sector experience on judgment and decision making in implementing accrual accounting. They collected data from 40 individuals from medical universities in four provinces using a questionnaire. The results showed that experienced accounting employees prefer accrual accounting more than inexperienced employees. They also have a higher level of usefulness in using accounting information for decision making and face fewer challenges in implementing a new system. Absalan et al. (2021), examined and explored employees' lived experiences of the workplace and concluded that these experiences can be described and interpreted in terms of six major themes and twenty-two subthemes. Itam and Ghosh (2020), focus on exploring the concept of employee experience in today's HR context and identifying its key drivers. The results show that when an organization strives to improve and prioritize employee experience, it consistently paves the way for high-performing teams that believe in loyalty and go above and beyond expectations. The goal of employee experience is to create and sustain a workforce that exceeds pre-defined boundaries and expectations. Therefore, the purpose of this research is to Identifying the dimensions of employee experience according to the effect of satisfaction, work place and organizational culture of Kohgiluyeh and Boyer Ahmed Municipality.

The current study has been carried out in Kohgiluyeh and Boyer Ahmed provinces- Iran in 2023.

MATERIALS AND METHODS

Survey design and data collection

In terms of its purpose, the study is applied, and in terms of data collection methodology, it is a descriptive. Based on the explanations provided in the introduction and research background, workplace and organizational culture variables, along with job satisfaction, are represented as independent variables, while employee experience is represented as the dependent variable. The data collected is quantitative and the time interval is cross-sectional. The data was collected through a questionnaire, and the reliability of the questionnaire was confirmed in the initial stage through the sampling of 30 people. The questionnaire used a five-point Likert scale with three independent variables: culture, workplace, and satisfaction with the structured questionnaire. Questions related to the dependent variable of employee experience were collected from online sources and validated by experts. Exploratory factor analysis was conducted to determine the number of dimensions and the questions related to each dimension using SPSS software (Parsafar et al., 2023). Confirmatory factor analysis and structural equation modeling were performed using Lisrel software. Validity was assessed using construct validity, convergent validity, and divergent validity, and reliability was assessed using Cronbach's alpha and composite reliability. The statistical population of this research consisted of employees of the municipality of Kohgiluyeh and Boyer-Ahmad Province. A questionnaire was distributed to about 350 of these employees using convenience sampling and finally, 260 validated questionnaires were collected and analyzed. The sample size collected was considered sufficient for the analysis of the validated model using a sample adequacy test.

Validity and reliability check

Validity and reliability have been used to check the measurement fit of the model. In order to check the validity of the measurement tool, the approach of content validity analysis and construct validity was used. For content validity, the evaluation of experts and knowledgeable experts showed that the questions of the questionnaire evaluate the variables and their relationships well. In the measurement model, the

internal consistency of the model or reliability is measured by calculating composite reliability and Cronbach's alpha coefficient. As shown in Table 1, all Cronbach's alpha is above 0.5 and the composite reliability is above 0.7, indicating their acceptability and demonstrating convergent validity. To assess convergent validity, the Average Extracted Variance (AVE) should be greater than 0.5 and the Construct Reliability (CR) should be greater than 0.7, indicating that all constructs have convergent validity. The Fornell-Larcker criterion was used to assess divergent validity, which states that a model has acceptable validity if a variable interacts more with its own indicators than with other variables (Fornell and Larcker, 1981).

In Table 2, which contains the correlation coefficients between variables and the square root of the eigenvalues corresponding to each variable, it is evident that divergent validity is confirmed based on the results obtained from the correlations and eigenvalues (main diagonal).

RESULTS AND DISCUSSION

The personal information (socio-demographic characteristics) included in the questionnaire refers to the demographic characteristics of the statistical sample, as shown in Table 3.

Factor analysis

Exploratory Factor Analysis Results

According to Table 4, the coefficient values of KMO and Bartlett's test are higher than 0.5. Therefore, the sample size collected is acceptable and reasonable. In

addition, the significance level (sig) of the KMO test is less than 0.05, which confirms its validity.

Confirmatory Factor Analysis

First-order factor analysis of employee experience Fig. 1 shows the significant figures from the first-order confirmatory factor analysis of employees' experience with Lisrel software. All paths shown are at a significant level (values of all estimated parameters are greater than 1.96). Therefore, the internal correlation between dimensions as well as between dimensions and questions is at a significant level.

Second order factor analysis

Considering that the first-order factor analysis confirmed the internal correlation between the dimensions and the dimensions with the questions, the second-order factor analysis was performed in Lisrel software to check the significance of the relationship between the employee experience and its three dimensions. Based on the output of Lisrel software, the main confirmatory factor analysis model of the experience, shown in Fig. 2, shows the relationships between the variables and their coefficients.

Significance analysis of coefficients obtained from confirmatory factor analysis

To accomplish this task, a meaningful model test was performed based on the t-value index. If the said index is greater than 1.96+ or less than 1.96-, all coefficients of the model are considered significant, and the Lisrel output indicates the significance values

Table 1: Evaluation of reliability and validity values of research variable

Variable	Cronbach's alpha	Composite reliability	(AVE)
Adaptability	0.735	0.835	0.559
Job Satisfaction	0.898	0.918	0.585
Compatibility	0.717	0.823	0.539
Work Place	0.852	0.888	0.532
Mission	0.883	0.919	0.740
Participation	0.814	0.878	0.642

Table 2: Fornell and Locker Criterion

Row	Variables	1	2	3	4	5	6
1	Adaptability	0.748					
2	Job Satisfaction	0.623	0.765				
3	Compatibility	0.650	0.639	0.734			
4	Work Place	0.613	0.714	0.640	0.730		
5	Mission	0.687	0.746	0.641	0.704	0.860	
6	Participation	0.577	0.614	0.682	0.716	0.644	0.801

Table 3: Demographic characteristics

Valid	Type	Frequency	Percent
Gender	Male	127	48.8
	Female	133	51.2
	Total	260	100.0
Marital Status	Single	72	27.7
	Married	188	72.3
	Total	260	100.0
Age	Years		
	Less Than 25	22	8.5
	25 To 30	30	11.5
	31 To 35	40	15.4
	36 To 40	61	23.5
	Above 40	107	41.2
	Total	260	100.0
Term of Service	Less Than 5	62	23.8
	6 To 10	36	13.8
	11 To 15	46	17.7
	16 To 20	35	13.5
	Above 20	81	31.2
	Total	260	100.0
Education Level	Associate Degree and Less	25	9.6
	Bachelor	152	58.5
	Master	71	27.3
	PhD And Above	12	4.6
	Total	260	100.0

Table 4: KMO and Bartlett's Test

Test results	KMO	0.948
	Bartlett's Test	7570.136
	df	1080
	Sig	0.000

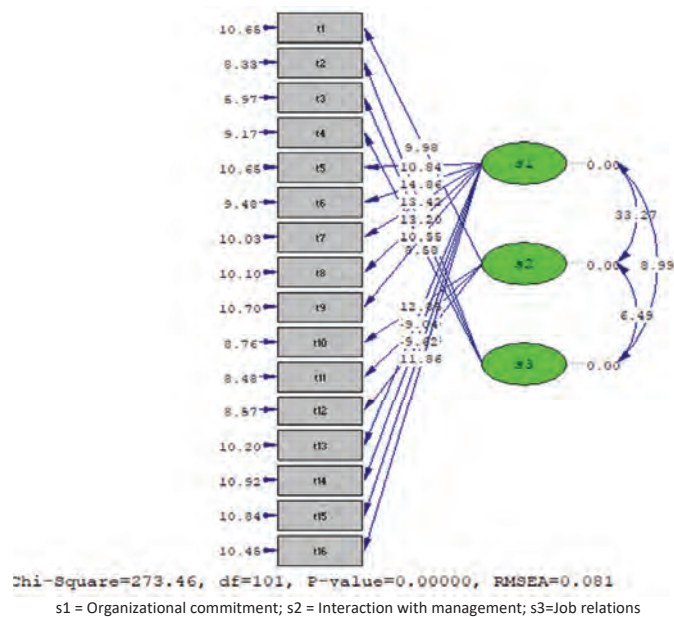
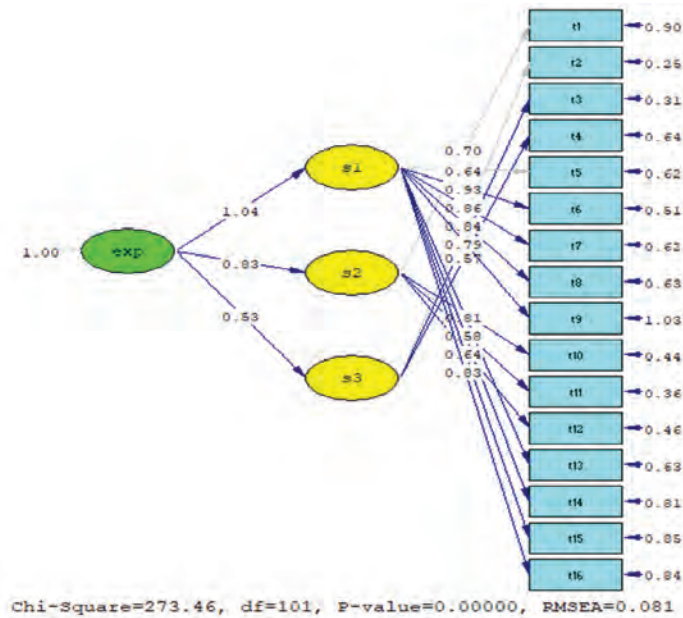


Fig. 1: Model of Significant numbers of first-order factor analysis of employee experience (T-value)

of each coefficient.

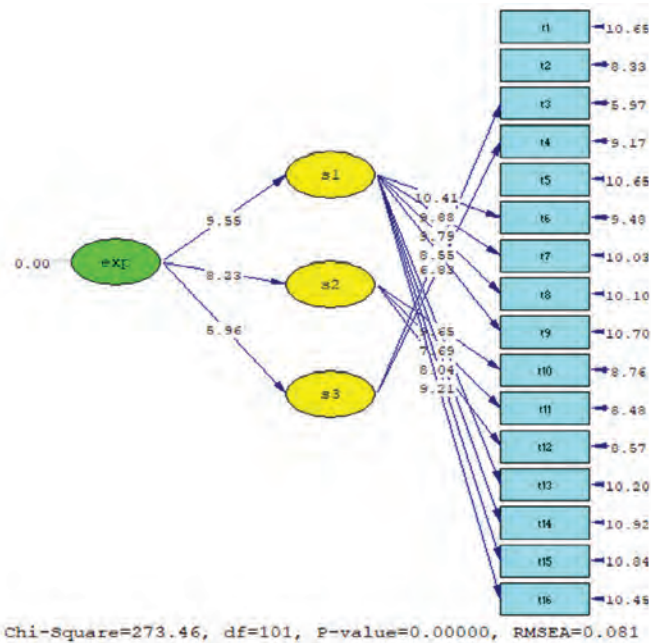
Based on Fig. 3, most coefficients above 1.96 are displayed, resulting in the first, second and fifth questions being eliminated. The general indicators

resulting from fitting the model are ready in Table 5. Based on the output of the Lisrel software, as shown in Table 5, most of the indices are considered acceptable and the model is considered valid with some tolerance.



s1 = Organizational commitment; s2 = Interaction with management; s3=Job relations

Fig. 2: The original second-order confirmatory factor analysis model of employee experience

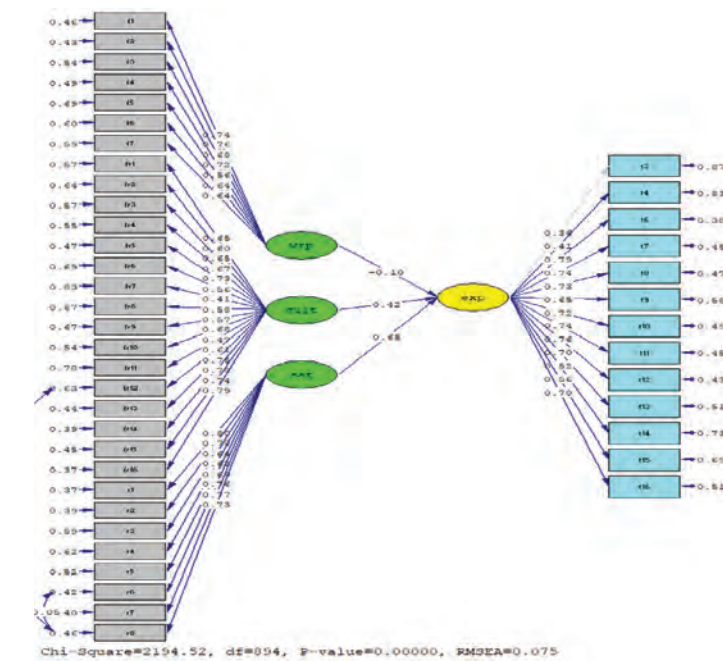


s1 = Organizational commitment; s2 = Interaction with management; s3=Job relations

Fig. 3: The model of significant numbers of second-order confirmatory factor analysis of employee experience (T-value)

Table 5: Fit indices of second-order factor analysis of employee experience

Index name	The standard value of the index	Index value in the desired model
χ^2		273.46
χ^2/df	<3	2.70
GFI	Above of 0.9	0.88
AGFI	Above of 0.9	0.84
NFI	Above of 0.9	0.95
NNFI	Above of 0.9	0.96
CFI	Above of 0.9	0.97
RMSEA	Less of 0.1	0.081
IFI	Above of 0.9	0.97



s1 = Organizational commitment; s2 = Interaction with management; s3=Job relations

Fig. 4: Structural model of research in standard estimation mode

Structural Model of Research

Fig. 4 illustrates the structural research model in a standard estimation mode (standardized coefficients model). In this model, culture (0.42) and satisfaction (0.65) have a positive impact on employee experience.

Fig. 5 shows the structural research model in the significance level mode; the significance model (T value) indicates the significance of each parameter and path. When their values exceed the absolute value of 1.96, the parameters of the model are considered significant. Since the significance numbers for culture and satisfaction are greater than the absolute value of 1.96, these two hypotheses are accepted. However, since the significance value for the workplace is less than the absolute value of 1.96,

the hypothesis regarding this variable is rejected.

Based on the output of the Laserl software, as shown in Table 9, most of the indices are considered acceptable and the model is considered valid with some tolerance.

The current research focuses on investigating the impact of job satisfaction, organizational culture, and the workplace on the experience of individuals in their respective workplaces. It also independently identifies the dimensions and drivers of employee experience using an exploratory approach. This research was conducted among the employees of the Municipality in Kohgiluyeh and Boyer-Ahmad provinces. In the next approach of this research, the variable of employee experience was independently subjected to exploratory analysis, and the result of this analysis identified three

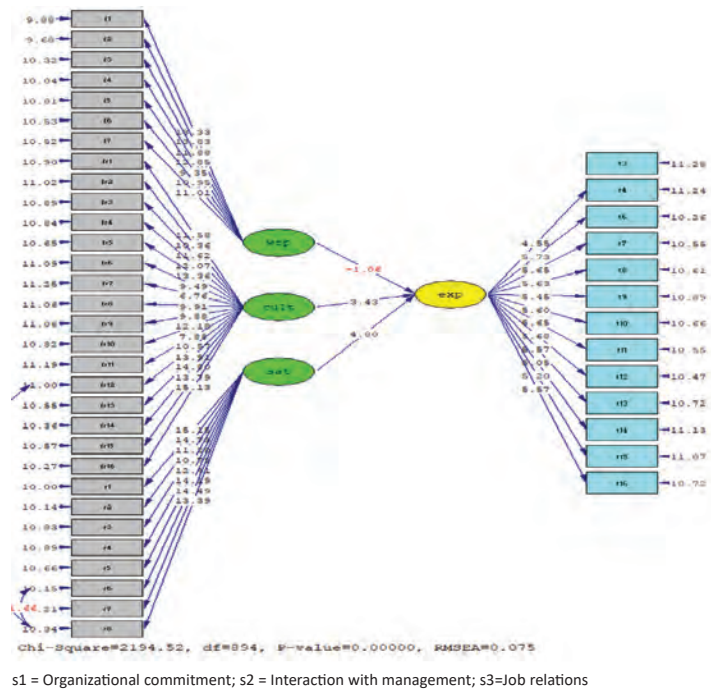


Fig .5: The structural model of research in the case of significant numbers (T-value)

Table 8: Summary of the results of the structural model of the research

Hypothesis	Relationships	Path coefficient	T value	Result
1	Work place → Employee experience	-.10	1.06	Reject
2	Organizational Culture → Employee experience	0.42	3.43	Confirmed
3	Job Satisfaction → Employee experience	0.65	4.80	Confirmed

Table 9: Fit indices of the structural model of the research

Index name	The standard value of the index	Index value in the desired model
χ^2		2194.52
χ^2/df	<3	2.455
GFI	Above of 0.9	0.72
AGFI	Above of 0.9	0.69
NFI	Above of 0.9	0.95
NNFI	Above of 0.9	0.97
CFI	Above of 0.9	0.97
RMSEA	Less of 0.1	0.075
IFI	Above of 0.9	0.97

factors as influential factors on employee experience. The first factor is organizational commitment, which is the feeling of obligation and responsibility toward the organization and its goals that form the basis of the employee experience. This commitment goes beyond the performance of duties and creates a feeling of pleasure and job satisfaction. The second

factor was identified as interaction with management, which indicates the influence of supervisors and their communication with subordinates in creating a meaningful and positive experience for people. Finally, the third factor is called work relationships, which shows the effect of communication and the way a person interacts with colleagues and

other employees within the organization, and this concept also determines the employee experience. Exploratory factor analysis was used to identify the questions related to each dimension, and first and second-order confirmatory factor analysis was used to examine the correlations between dimensions and questions, as well as among dimensions. Finally, three questions were removed from this questionnaire and the remaining questions were confirmed. Based on the research results, job satisfaction has a significant impact on employee experience and is one of the influential factors in improving the experience and creating a positive attitude. The research by [Soni et al. \(2017\)](#), [Alam and Shin \(2021\)](#), points in the same direction. Another influential factor in the employee experience is organizational culture. As [Purbasari and Abadi \(2022\)](#) had measured this effect, the effect of this variable was also confirmed to significantly influence the experience. Undoubtedly, if the organizational culture is aligned with the principles and attitudes of an individual, it can create a more satisfying experience for them. The next concept that was evaluated was the workplace and its impact on the employee experience was not confirmed. Therefore, it can be concluded that one of the concepts that has no or minimal impact on improving the individual experience in the organization is the workplace and its subcategories. This result contradicts the findings of the study by [Buys et al. \(2017\)](#).

CONCLUSION

Employee experience is a topic of discussion and interest in the field of human resources because it has a significant impact on individuals, organizations, their communication, life, satisfaction, performance, and even their decision to stay or leave an organization. Therefore, considering the type of functioning of municipalities and the mutual relationship between the organization and citizens, diversity management is an important tool that allows all employees, regardless of individual differences, to fully develop their personal potential. bring different ideas; And pay attention not only to routine work activities, but also to innovative approaches, searching, expanding and supporting their implementation in the team. Therefore, increasing the use of cross-functional and virtual teams in the workplace through work experience often requires connecting people with different cultures, backgrounds, and perspectives. Such differences bring

benefits to the team and thus to the municipality, which can respond flexibly to the changing needs of customers, citizens, employees and other stakeholders, and can adapt services and work processes to the new environment. Innovate internally and externally. Also, beliefs, values and rules of diverse culture in municipalities are the starting point of innovative behavior of employees. Therefore, the presence of strong bureaucracy, rigid organizational culture, less opportunity for participation, less flexibility, less loyalty or poor job satisfaction in municipalities leads to their poor performance. Therefore, although managers have recognized the teamwork atmosphere as favorable, the reality may be different in the perception of employees due to their understanding of satisfaction, loyalty and commitment. The strategic choices of municipalities respond to environmental changes and the challenges of the post-globalization era and require officials to open the horizon of innovation. This fact brings many benefits to municipalities, which can be reflected in the job satisfaction of employees and also in the form of creating public value for citizens.

Practical and theoretical implications

Municipalities with higher employee engagement have higher productivity, better retention, lower absenteeism, and better citizen/ratepayer satisfaction. Municipal employees experience excessive workloads, psychological stress, and poorer organizational and psychosocial work environments, leading to more health problems, a higher risk of stress-related disorders, and higher sick leave rates than other occupations. The use of a support model for workplace improvements can render positive changes in the work environment, leading to better employee experiences. Human resource managers can in municipalities conceptualize talent by focusing on employee engagement, employee development, and employee retention. A positive organizational culture can promote a sense of dedication to one's work and connection to the organization, leading to improved attitudes, job involvement, and organizational commitment. Therefore, administrators can adjust their leadership behavior to influence employees' job satisfaction, which can ultimately benefit the organization.

Limitations and future suggestions

Clearly, this research encountered some limitations and the researchers made an effort to

reduce the respective effects. First, the research was conducted in municipality and other types of organizations were not included. Second, it was limited to a certain geographical area and the results may not be the same in other contexts. Therefore, it is recommended to perform a similar methodology in different areas where the researchers might be able to compare the findings of two or more regions in an integrated study. Researchers are advised to focus on investigating and examining the impact of three concepts, namely organizational commitment, interaction with management, and work relationships, on the employee experience in the future. They should explore the relationships among these concepts and examine employee experience and its improvement in relation to other management variables and concepts, such as internal marketing, supply chain management, internal word-of-mouth advertising, and other human resource concepts, including subsets. In addition, the impact of emerging technologies such as artificial intelligence, the Internet of Things, and other technologies can greatly contribute to a positive and enriching employee experience in an organization, and pay attention to these aspects in future employee experience research.

AUTHOR CONTRIBUTIONS

A.R. Rajabipoor Meybodi and A. Jahanfekr author performed the conceptualization and literature review, compiled the data, and manuscript preparation. E. Hosseini and H. Mahjoor author performed the Methodology, analyzed, and prepared the manuscript text and editing references.

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CONFLICT OF INTEREST

The authors declare no potential conflict of interest regarding the publication of this work. In addition, the ethical issues including plagiarism, informed consent, misconduct, data fabrication and, or falsification, double publication and, or submission, and redundancy have been completely witnessed by the authors.

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ABBREVIATIONS

<i>AVE</i>	Average Extracted Variance
<i>CR</i>	Construct Reliability
<i>KMO</i>	Kaiser-Meyer-Olkin

χ^2	Normed Chi-Square
GFI	Goodness Of Fit Index
AGFI	Adjusted Goodness Of Fit Index
NFI	Normed Fit Index
NNFI	Unnormalized Fit Index
CFI	Comparative Fit Index
RMSEA	Root Mean Square Error Of Approximation
IFI	Incremental Fit Index

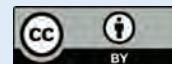
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ORIGINAL RESEARCH PAPER

Changing pattern of livelihood capitals of urban slum dwellers during COVID-19 pandemic

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ABSTRACT

BACKGROUND AND OBJECTIVES: Historical reports show that COVID-19 pandemic has been confirmed over 213 nations or territories which accelerates the livelihoods. It also hampers the livelihoods of urban people's mainly poor slum dwellers in developing countries like Bangladesh. The purpose of this article is to assess the vulnerability of urban slum dwellers based on five livelihood capitals during COVID-19.

METHODS: Rajshahi City Corporation area is purposively selected which is grouped into three zones (central, interim and peripheral) based on the distance from the central business district, Shaheb Bazar. The study is conducted with a semi-structured and self-developed questionnaire to fulfill its objective. The questionnaires are focused on predetermined 48 indicators of five livelihood capitals (human, social, physical, natural and financial). Total 361 slum households (9%) are selected from 4010 households at 95% significance level which are proportionately distributed in 12 slum areas and household heads are nominated through simple random samplings. Data are coded, edited and inserted carefully; standardized and livelihood capital index are calculated with SPSS and map is produced with ArcGIS 10.4.

FINDINGS: Study reveals that about 47.8% (central), 57.5% (interim) and 45.1% (peripheral) slum dwellers are illiterate and live in a miserable condition. Human capital index is found higher in central slums (0.435) than peripheral (0.406) and interim (0.387). The social capital index is revealed as similar of human capital index. But physical capital index claims the trend as central (0.776)> interim (0.646)> peripheral (0.536). Again, financial capital index of the central slum dwellers is higher as they receive help during pandemic and get earning opportunity and these slum areas are located near the central business district. In addition, natural capital index is totally different and peripheral slum dwellers are in better position (0.635) than interim (0.549) and central (0.358) slums. Finally, the study concludes that mean livelihood capital index of central (0.4334) slum dwellers are better than interim (0.4216) and peripheral (0.4222) slums which assesses all the study slums as moderate.

CONCLUSION: The study suggests that financial improvement is becoming an ultimate need for slum dwellers since the financial capital index reveals as poor among all the slum areas. Moreover, individual or community-based strategies, international collaborations, government and non-governmental organizations need to come forward to improve not only the financial capital but also other four capitals in all slum areas to build a sustainable livelihood as majority of them live below the standard livelihoods.

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INTRODUCTION

Globally, COVID-19 pandemic has dramatically changed the pattern of livelihood capitals in the urban slum dwellers. This unexpected pandemic has introduced a new shape of livelihoods which accelerates the living standard of human beings (Saini and Deepak, 2021; Alzghoul et al., 2022). The livelihood capitals are essential for determining the status of one's living standard. Now-a-days livelihood study is becoming popular due to disastrous phenomena and sudden pandemics in the world but our country Bangladesh is not exception of this. Therefore, livelihoods are the resources, skills, and pursuits through which an individual use to obtain basic needs for survival (Ouko et al., 2020; Mutea et al., 2019). The collection or opportunity set of skills, resources and activities are needed to support a living that is often referred as livelihood (Olsson et al., 2014; Ellis et al., 2003; Chambers and Conway, 1992). On the contrary, households seek for a way of life that is both highly resilient and less sensitive to pressures and shocks (Béné, 2020). When people and households adjust to unforeseen situations, they frequently manage their assets and activities in an opportunistic or reactive manner rather than with predetermined 'strategy' (Manlosa et al., 2019; Rakodi, 1999). For this reason, Elasha et al. (2005) emphasized livelihood as the concept of 'livelihoods' which refer to the ways, pursuits, rights and resources for individual's use to support themselves and it is frequently used to refer to the resources and abilities that people and families use to create plans for their survival and well-being (Lemessa et al. 2023; Ablo et al. 2020). In addition, household frequently holds a number of capitals or assets which is access to natural, human, physical, financial, social, and cultural capital (Singgalen et al. 2019). For earning basic standard of living the household tries to enhance their capitals or assets. The activities which enhance their income level and livelihood strategies is also sum-up with all the capitals or assets. The need for access to livelihoods is a burning issue by the chaotic scenario followed by COVID-19 pandemic (Yazdanpanah et al., 2021; Jackson, 2020). Eventually, people rely on a variety of capitals and assets that usually reveals how they support their livelihoods in developing nations (Guillotreau et al., 2012). The social relationships of people rely on the combination, transformation and expanding their assets, the ways

that people utilize and enhance their capabilities to act and the ways people make lives meaningful that influence how they are able to function it regularly (Olsson et al., 2014; Bebbington, 1999; Scoones, 1998). According to DFID (1999), human capitals are skills, knowledge, ability to work and good health that together enable people to pursue different livelihood strategies and achieve their livelihood objectives. It also includes leadership's potential, ability to work in adverse condition, health status, skills, knowledge and experience about the pandemic condition. In different perspective, human capital can be strengthened by involving best and skillful candidates in order to develop any company's performance (Santos, 2023). In addition, companies require human capital with a desire and capacity to come up with original ideas, create innovative techniques and take advantage of new chances while they are creating new goods and streamlining management procedures (Amani et al. 2022; Scarbrough, 2003). Moreover, social capitals are network-connectedness, memberships of formalized group, even the relationships, belief, exchange thoughts to one another and it serves as a source of data and assets that would be challenging to obtain (Craig et al., 2022). Physical capitals are those which includes the essential producer's commodities and infrastructure required to sustain livelihoods and it also requires particular supervision in order to improve financial condition (Usman and Wirawan, 2021). Financial capitals are those which people employ to accomplish their living goals. Generally, it indicates the utilized money to purchase consumer items required for the survival and manufacture as well as the accessibility of loans (Kuang et al., 2019; Jezeer et al., 2019; Zhifei et al., 2018; Li et al., 2017). It also takes into account both flows and stockpiles which can affect both consumption and output. On the other hand, natural resources and services that enhance human well-being are included in natural capitals (Kuang et al., 2019; Pandey et al., 2017b). Natural capitals are the resources that make up from indivisible assets employed directly for manufacturing to intangible public goods like the environment and biodiversity, such as, trees, land, irrigation systems, ponds, etc. (Sharna et al., 2020). Therefore, these five livelihood capitals provide information on how effectively people can adjust to changing circumstances and utilize their resources to deal with

particular dangers (Bhowmik *et al.*, 2021; Koomson *et al.*, 2020). Additionally, strong livelihood capitals signify a more resilient state that lessens the vulnerability of people to threats (Bhowmik *et al.*, 2021; Apine *et al.*, 2019). The number of poor people is increased globally from 15.75-24.5 million between 2015-2012 for the dominating factors COVID-19 (Boughton *et al.*, 2023). Moreover, World Bank predicts that about 71-100 million people fall into extreme poverty (about USD 1.90 per day) primarily in sub-Saharan Africa and another 176-231 million people fall into poverty (about USD 3.20 per day) in South Asia (Alizadeh *et al.*, 2023; Johri *et al.*, 2021). There are several existing researches which examine the livelihood capitals status in different context. Paul (2013) assesses the post-cyclone livelihoods capitals status of coastal households. Rahman and Siddik (2018) analyze the status of the char dwellers livelihood and the relationship between the various capitals and level of well-being. Livelihood options of the informal sector employees were drastically worsening due to closure of urban centers during COVID-19 in Ghana (Amoah-Nuamah *et al.*, 2020). Lustig and Tommasi (2020) reveal the strategies to lower epidemiological risks to protect lives, safeguarding livelihoods and try to ensure human capital accumulation. LIU *et al.* (2021) suggests that the livelihood capitals of farmers are benefited greatly from industrial growth. Rahman *et al.* (2021) explores the livelihood status of shrimp producers which is negatively impacted by COVID-19. Overall farmers in the main epidemic areas do not have much capital for their livelihoods and after the epidemic restoration of livelihoods is largely dependent on the growth of their financial and human capital (Zhao *et al.*, 2021). Islam *et al.* (2021) examined the signs of depression and post-traumatic stress disorder and relevant factors of related to financial worries of the underprivileged urban residents during COVID-19 pandemic. Soma *et al.* (2022) focuses primarily on the situation of Dhaka in order to obtain a clear knowledge of the relationships between the livelihood capitals owned by slum households and their housing conditions. A study of China revealed that peasants' perception of risk which is substantially heightened by COVID-19 pressure and it lowers their livelihood capital (Zhao *et al.*, 2022). Okyere *et al.* (2023) performs a quantitative investigation in Ghana's Greater Accra Region's Adenta Municipality

and discovers a negative correlation between COVID-19 impacts and five urban livelihood capitals. Manzoor *et al.* (2022) investigates several types of social capitals and how it assists during the COVID-19 in urban settlements in Dhaka, Bangladesh. Jowarder (2023) reveals that COVID-19 has made rickshaw pullers more depressed, anxious and at risk of losing livelihoods. A review paper by Habib *et al.* (2023) claims the impact of five livelihood capitals on diversification livelihood strategies in developing countries. Fahad *et al.* (2023) examines the several facets of impoverished households' poverty situation in Ha Giang province, Vietnam by using DFID's framework and tries to find the most deficient capitals. As mentioned earlier, there are several researchers who tried to reveal the capitals status, impact and importance on individual or community livelihoods and the measurement criteria are varied in different situations. However, very few studies put emphasize control over five livelihood assets/capitals (i.e. human, social, physical, financial and natural capital) of urban slum dwellers incorporating with COVID-19 pandemic. The urban slum dwellers livelihood capitals are mostly neglected in this regard. Again, it is not clear about the changing pattern livelihoods capital of urban slum dwellers during pandemic since all kind of economic and income generating activities are almost stagnant. COVID-19 has changed the livings of global population and the conditions of the urban slum dwellers are not deeply considered. In the context of Bangladesh, there are few researches on poor dwellers livelihood of Dhaka City Corporation but cities outside Dhaka is almost absent. To minimize this research gap, the objective of the study is to assess the changing pattern of livelihood capitals and vulnerability of the slum dwellers of Rajshahi City Corporation area in Bangladesh during COVID-19 between June-September 2022.

Sustainable livelihood framework

The idea of sustainable livelihoods has dominated the development initiatives in underdeveloped economies, notably in Africa, Latin America and central Asia (Jackson, 2021; Cline-Cole, 2016). The framework that is most frequently accepted by academicians is the Sustainable Livelihood Analysis (SLA) framework which was developed by United Kingdom (UK) Department for International Development (DFID)

in 2003 (Su *et al.*, 2021; Su and Yin, 2020). DFID conceptualizes the framework as a household's sources of income based on the accessibility of capitals for subsistence in a certain political and institutional settings (Trang and Loc, 2021; Simon and Khambule, 2021). This SLA framework (Fig. 1) considers five different types of livelihood capitals (human, social, physical, financial and natural) and these livelihood capitals are regarded as the key component of the framework (Su *et al.*, 2021). In this context, capitals are described as both natural/biological (i.e., land, water, common-property resources, flora and fauna) and social (i.e., community, family, social networks, participation and empowerment) as well as human (i.e., knowledge and skill generation) and physical resources (i.e., roads, markets, clinics, schools, bridges). The framework for sustainable livelihoods aids in organizing the variables that limit or improve livelihood prospects and demonstrates their interrelationships. It also seeks to broaden the fundamental idea that many families have access to different resources for sustaining their way of lives (Serrat, 2017). However, the DFID's sustainable livelihood framework is a people-centered approach which is mainly prioritized to this framework (Nasrnia and Ashktorab, 2021; Pandey *et al.*, 2017a; Quandt *et al.*, 2017). In household livelihood research, this

framework is now extensively utilized and widely recognized paradigm around the globe (Kuang *et al.*, 2019; Pour *et al.*, 2018; Zhifei *et al.*, 2018) and it is used in this research also (Fig. 1).

MATERIALS AND METHODS

Study area and sampling

The present study uses mix-method approach that means both qualitative and quantitative data are gathered to achieve the objective of the study. In order to fulfill the study objective, the Rajshahi City Corporation (RCC) slum areas (twelve slum) are purposively identified. Slums of RCC are also categorized into three slum areas, such as, central, interim and peripheral (Fig. 3) from Central Business District (CBD) of Shaheb Bazar. Central slum area is enclosed within 1.5 km, followed by interim slum area by 1.5-3.5 km and peripheral slum area by >3.5 km respectively from the CBD. Household holding information are collected from the slum leaders of twelve slums and sample size 361 (out of 4010 households) are determined by using Kothari's formula (Kothari, 2005) for known population at 95% confidence level. The number of samples is determined by simple random samplings procedure which are proportionately distributed into three defined slum areas. Primary data are accumulated

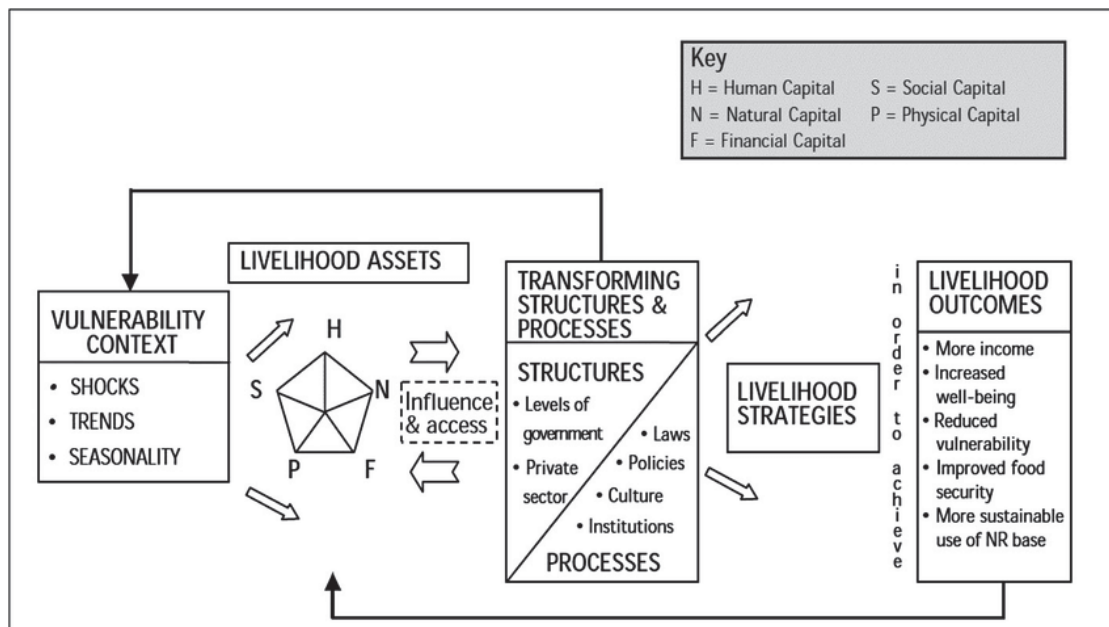


Fig. 1: Schematic diagram of SLA framework (DFID, 1999)

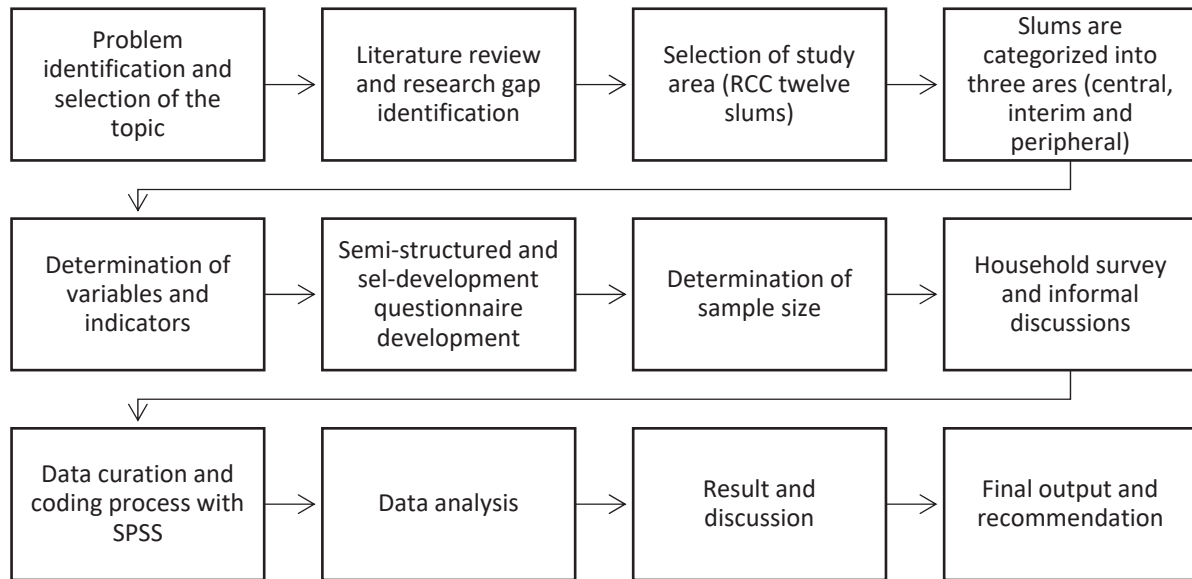


Fig. 2: Schematic diagram of the conceptual framework of the study

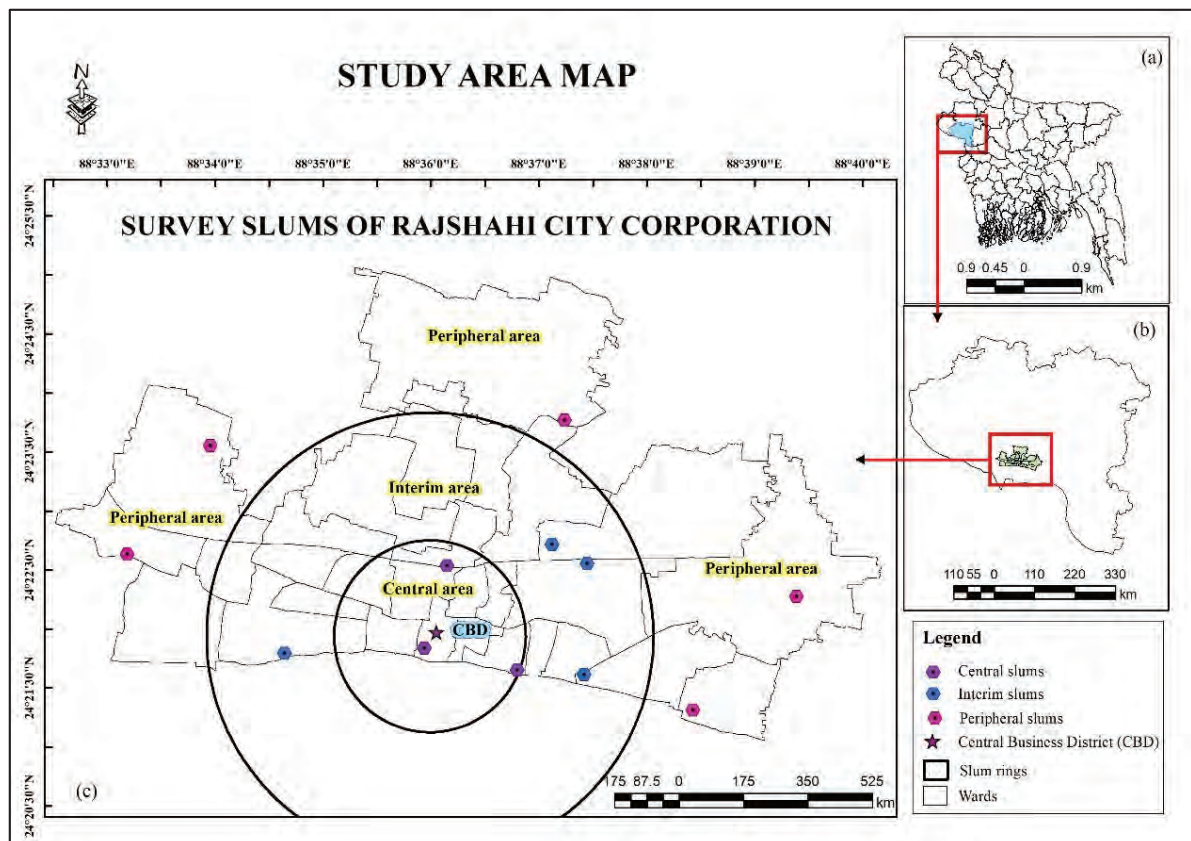


Fig. 3: Geographic location of the study area; (a) Bangladesh, (b) Rajshahi District, (c) Study slum area (Banglapedia, 2021)

through a semi-structured and self-developed questionnaires survey with pre-tested five-point Likert scale. The current study conducts with predetermined variables (i.e., human, social, physical, financial and natural capital) with 48 relevant indicators (Table 1) to reveal the livelihood capital status of slum dwellers in three separate areas. For gathering additional information and validation of survey data, informal discussions are also conducted in the three slum areas. The SPSS (version 25.0) software is used for coding and analysis of the accumulated data of the household survey (Fahimah et al., 2023) and Arc GIS (version 10.4) is used for mapping (Khan et al., 2023). Analysis of Variation (ANOVA), chi square and t-test are performed to identify statistically significant difference among the slum areas (Samimi and Nouri, 2023; Samimi, 2024). The conceptual process is presented in Fig. 2 for better understanding the research methodology.

Measuring livelihood capitals

According to DFID and CARE international livelihood framework, an analytical model is developed by identifying the relevant indicators of five livelihood capitals and those indicators are defined considering the slum dwellers livelihoods of Bangladesh. However, a five-point Likert scale is used to measure five types of livelihood capitals considering the discrete values of 0.20, 0.40, 0.60, 0.80 and 1.0. In addition, this scale is used to calculate the five livelihood capitals value of the study respondents (Paul, 2013) and assessment scale is classified into poor (<0.33), moderate (0.34-0.67) and high (>0.67) to reveal the status of livelihood capitals (Khan and Paul, 2023). Each of the livelihood capitals indicators (Table 1) are calculated separately for three individual slum zones to get separate capital index.

Human capital

Average year of schooling or enrolment rate has been the most often utilized proxy up to measure human capital (De Silva and Yamao, 2007). In addition to have inherent worth, human capital—knowledge and labor or the ability to command labor is necessary for utilizing any of the other four categories of assets (DFID, 1999). The knowledge, talent, creativity and health of the individual have actually been described as human capital (Pasban and Nojededeh, 2016). To assess the essential elements of human capital across

economies a worldwide tool was introduced in 2018 as Human Capital Index (HCI), which is the component of human capital (World Bank, 2021). Though, using indicators such as, school enrolment, average years of education or adult literacy rate are known as indicator approach to identify a nation's investments in human capital (Abraham and Mallat, 2022). Overall human capital index is calculated by Eq. 1 (Rahman et al., 2020; Paul, 2013) with considering 11 indicators. Before calculating the overall human capital index, individually each indicator of human capital (Table 1) is calculated separately and finally total aggregated value is divided by total indicators.

Social capital

In general, social capital is composed of relationships among groups, affiliations, networks, and interactions (Adger et al., 2003). Through a certain form of communication with one another, people and communities may access certain resources and capitals (Nasrnia and Ashktorab, 2021). When it comes to the dynamics and growth of social aspects among urban dwellers, then social capital is regarded as one of the sources of human interactions which plays a significant role (Allahyari and Khakzand, 2019). According to Nooripoor and Noori (2012) social capital in any group reflects the degree of interpersonal trust and societal cohesion. Though, it can help a person to increase the financial income and savings rate. It also can improve people's knowledge and capabilities through enhancing social bonding and relationships. Generally, it is interconnected with other assets, including human, physical, financial and natural capital and may have an impact on a variety of aspects of a person's life as well as on society at large (Craig et al., 2022; Volker, 2020). Though, it is controversial to other kinds of capitals and is highly developed in informal settlement (Braun and Aßheuer, 2011). Even though the definition of the social capital is haggled (Castiglione et al., 2008) but it may be defined as social resources that allow a person to claim access to resources that they would not be able to pay or acquire (Braun and Aßheuer, 2011). However, in the present study indicators of social capitals are in four individual broad groups (Table 1). These four groups of social capitals (MCICI, PACI, MI and SCBI) are determined by Eq. 2 to 5 and finally the mean of these indicators is declared as overall social capital index is determined by Eq. 6

Table 1: Livelihood capitals with indicators

Livelihood capitals	Indicators
Human capital	Level of education ^{1,3,5,6,7,8} Mental stress due to COVID-19 ^{1,8} Work in adverse COVID-19 situation ⁸ Experience in health related training program ^{1,2,3,5,6,8} Gain new knowledge on COVID-19 ⁸ Solving problems during COVID-19 ^{2,8} Voted as a representative of any group or groups community ⁸ Solve their problem within the group ⁸ Participate in community activities during COVID-19 ^{2,8} Facilitated community and GO-NGO activities in COVID-19 situation ⁸ Solve any conflict in the slum community during the COVID-19 ⁸
Social capital	Mass Communication and Individual Communication Index (MCICI) Mobile phones ^{2,8} Television ⁸ Newspaper ⁸ Printed materials/leaflet ⁸ Health and family planning worker ^{2,8} City corporation ⁸ NGO's ^{1,2,3,5,6,7,8} Police and law enforcement ⁸ Participation and Connection Index (PACI) Participation in community based awareness programs of COVID-19 ⁸ Participation on disaster (COVID-19) mitigation activities ⁸ Connection with NGOs for COVID-19 mitigation ⁸ Household head relationships with others in the community ^{1,4,7,8} Assisting each-other during COVID-19 pandemic crisis ^{4,8} Membership Index (MI) Voluntary group ^{2,8} Religious group ^{2,8} Co-operative group ^{1,2,3,5,6,7,8} Micro-credit group ^{2,8} Closely associated with City corporation ^{2,8} Social Connection and Bonding Index (SCBI) Social connectedness ⁸ Assist in slum ⁸ Accessibility in slum ⁸ Borrowing ⁸ Getting help ⁸
Physical capital	Access to road to reach market ⁸ Access to electricity system ⁸ Access to transport services ⁸ Access to latrine ⁸ Access to sanitation system ⁸ Access to sewers system ⁸
Financial capital	Reserved cash ^{1,3,5,6,7,8} Deposits in banks/cooperatives/groups ^{2,8} Remittances ^{1,3,5,6,7,8} Pensions ⁸ Liquid assets (e.g. livestock, poultry, jewellery, furniture, storage of food and cash crops, trees) which can provide liquid money ^{2,8}
Natural capital	Access to road to open water bodies ^{1,2,4,7,8} Access to collect fuel wood ^{1,2,7,8} Access to open grazing lands ^{2,8} Access to government-owned lands ⁸

(Rahman *et al.*, 2020; Paul, 2013). However, higher social index represents low vulnerability to COVID-19 pandemic in the study area.

$$HCI = \left(\frac{\sum HCI1 / N + \sum HCI2 / N \dots \sum HCI11 / N}{11} \right) \quad (1)$$

$$MCICI = \frac{(\sum MCICI1 / N + \sum MCICI2 / N \dots \sum MCICI8 / N)}{8} \quad (2)$$

$$PACI = \frac{(\sum PACI1 / N + \sum PACI2 / N \dots \sum PACI5 / N)}{5} \quad (3)$$

$$MI = \frac{(\sum MI1/N + \sum MI2/N + \dots + \sum MI5/N)}{5} \quad (4)$$

$$SCBI = \frac{(\sum SCBI1/N + \sum SCBI2/N + \dots + \sum SCBI5/N)}{5} \quad (5)$$

$$SCI = \frac{(\sum MCICI + \sum PACI + \sum MI + \sum SCBI)}{4} \quad (6)$$

$$PCI = \frac{(\sum PCI1/N + \sum PCI2/N + \dots + \sum PCI6/N)}{6} \quad (7)$$

$$FCI = \frac{Av}{Ava} \quad (8)$$

$$NCI = \frac{(\sum NCI1/N + \sum NCI2/N + \dots + \sum NCI4/N)}{4} \quad (9)$$

Here,

HCI = Human Capital Index; HCI₁, HCI₂,..... HCI₁₁ = Human capital indicators; MCICI = Mass Communication and Individual Communication Index; MCICI₁, MCICI₂,.... MCICI₈ = MCICI indicators; PACI = Participation and Connection Index; PACI₁, PACI₂,.... PACI₅ = PACI Indicators; MI = Membership Index; MI₁, MI₂,.... MI₅ = MI indicators; SCBI = Social Connection and Bonding Index; SCBI₁, SCBI₂,.... SCBI₅ = SCBI indicators; SCI = Social Capital Index; PCI = Physical Capital Index; PCI₁, PCI₂,..... PCI₆ = Physical capital indicators; FCI = Financial Capital Index; Av = Available financial deposit and monetary value of liquid assets of each slum household; Ava = Average available financial deposit and monetary value among the slum areas; NCI = Natural Capital Index; N=Total sampled respondents.

Physical capital

A household's physical capital is made up of its foundational structures and other tangible assets (Braun and Aßheuer, 2011; Krantz, 2001). According to Braun and Aßheuer (2011), the most important types of physical capital in the case of Dhaka's slum residents are housing, shelter, sanitation and water supply. In terms of shelter, it is frequently known as privately owned and some of them are utilized for free-based consumption such as toll roads and energy supplies (DFID, 1999). However, in this study physical capital index (PCI) is measured with the help of Eq. 7 (Rahman et al., 2020; Paul, 2013) considering

six indicators tabulated in Table 1.

Financial capital

There are two main sources of financial capital which was determined by DFID in 1999 and these two sources are available stocks and regular inflows of money respectively. Likewise, a household's financial capital is made up of two main components: first, the regularly received returns or income and second, the savings of the household which is also revealed by Braun and Aßheuer in 2011. However, out of the five types of capitals, this capital is arguably the most adaptable one. The value of each household's liquid assets, such as cash reserves, deposits in banks, cooperatives and groups, remittances, pensions and liquid assets from livestock, poultry, jewellery, furniture, storage of food and cash crops, trees and other assets that can provide liquid money, are some important indicators use in the current study to measure the financial capital index (Paul, 2013). To calculate the financial capital index, all forms of such assets converted into monetary values for each slum household and then it was divided by the average available financial deposit and monetary value among the slum areas. The Eq. 8 is used to measure the financial capital index derived and modified from Rahman et al., 2020; Paul, 2013. However, higher the financial index represents higher level of financial capital which indicates lower vulnerability to COVID-19 pandemic as the slum dwellers can secure their livelihoods.

Natural capital

DFID (1999) emphasizes that those who depend entirely or partially on resource-based activities place have a high value on natural capital such as, farming, fishing, gathering fuel wood from forests, mineral extraction, etc. Though, containing all the natural resources that individuals can use to improve their quality of life is called the natural capital (Braun and Aßheuer, 2011; Krantz, 2001). In this current study, Natural Capital Index (NCI) is calculated by adding the average of four selected natural capital indicators (Table 1) by Eq. 9 (Rahman et al., 2020; Paul, 2013).

RESULT AND DISCUSSION

Socio-demographic profile of the slum dwellers

The study reveals that the age of the slum respondent ranges between 18-65 years. Though 31-

60 years' age group are dominant in central (71.1%), interim (76.6%) and peripheral (68.2%) areas, followed by age group 18-30 years (central-23.3%, interim-16.7% and peripheral-25.2%) and >60 years (central-5.6%, interim-6.7% and peripheral-6.6%). Education reveals that majority of interim (57.5%) slum dwellers are illiterate, followed by central (47.8%) and peripheral (45.1%) slums (Table 2). Though, 23.3, 13.3 and 18.5% of central, interim

and peripheral slum dwellers are primary qualified and about 15.6 (central), 20.8 (interim) and 13.9% (peripheral) slum dwellers know to read and write. Secondary educated slum dwellers are also observed among the slum areas (central-7.7%, interim-5.9% and peripheral-19.9%) but higher educated dwellers are found less in all slum areas (Table 2). Family size of the slum household are categorized into three groups to reveal the actual demographic scenario. About 70

Table 2: Demographic profile of slum dwellers

Criterion	Central		Interim		Peripheral		Tests
Age (year)	f	%	f	%	f	%	
18-30	21	23.3	20	16.7	38	25.2	t=68.849, Significance value=0.000, df=360, α=0.05
31-60	64	71.1	92	76.6	103	68.2	
>60	5	5.6	8	6.7	10	6.6	
Education level							
Illiterate	43	47.8	69	57.5	68	45.1	χ²: F=21.617, df=8, p=0.006
Only can read and write	14	15.6	25	20.8	21	13.9	
Primary	21	23.3	16	13.3	28	18.5	
Secondary	7	7.7	7	5.9	30	19.9	
Higher study	5	5.6	3	2.5	4	2.6	
Gender							
Male	47	52.2	72	60.0	65	43.0	χ²: F=7.765, df=2, p=0.021
Female	43	47.8	48	40.0	86	57.0	
Family size (member)							
1-3	24	26.7	40	33.3	53	35.1	t=51.214, Significance value=0.000, df=360, α=0.05
4-6	63	70.0	70	58.3	93	61.6	
>6	3	3.3	10	8.4	5	3.3	
Housing type							
Pucca (concrete wall and roof)	8	8.9	1	0.8	2	1.3	Likelihood ratio: Value=86.747, df=8, p=0.000
Semi-pucca (brick wall and CI sheet roof)	51	56.7	19	15.8	61	40.4	
Kaccha (mud wall and CI sheet roof)	0	0.0	1	0.8	3	2.0	
Corrugated Iron (CI) sheets (wall and roof)	31	34.4	84	70.0	85	56.3	
Hut (Jhupri)	0	0	15	12.6	0	0	
Household income (BDT)							
<5000	2	2.2	5	4.2	6	4.0	t=38.547, Significance value=0.000, df=360, α=0.05
5001-10000	24	26.7	37	30.8	44	29.1	
10001-15000	28	31.1	35	29.1	59	39.1	
15001-20000	19	21.1	20	16.7	27	17.9	
>20000	17	18.9	23	19.2	15	9.9	
Land ownership							
Lease land	6	6.7	4	3.3	48	31.8	χ²: F=48.001, df=2, p=0.000
Possession land	84	93.3	116	96.7	103	68.2	

(central), 58.3 (interim) and 61.6% (peripheral) of the slum households have 4-6 members, followed by 1-3 members are also found in central (26.7%), interim (33.3%) and peripheral (35.1%) slums and >6 members are found less percent which indicate maximum families are nuclear in size (Table 2). It is found that majority (56.7%) central slum dwellers housing is semi-pucca. On the other hand, 70 and 56.3% of interim and peripheral slum dwellers housing are built with CI-sheets. Eventually, concrete housing type are found less among the slum areas (central-8.9%, interim-0.8% and peripheral-1.3%). Because of several wage-earning opportunity, the slum household income differs among the study areas. It reveals that 31.1 and 39.1% of central and peripheral slum household income ranges between 10001-15000 BDT. Whereas, 30.8% of interim slum household's monthly income ranges between 5001-10000 BDT. Among the slum areas, about 18.9, 19.2 and 9.9% of central, interim and peripheral household's monthly income reaches >20000 BDT (Table 2). In term of land ownership, the study has revealed that majority (central-93.3%, interim-96.7% and peripheral-68.2%) of the slum dwellers are living in possession land. Though, 6.7, 3.3 and 31.8% of central, interim and peripheral slum household had lease land to live. However, the study founds significant differences exist among the slum areas in terms of age, education level, gender, family size, housing type, household income and land ownership (Table 2).

Household livelihood capitals

DFID (1999) reports five types of core capitals or assets which builds up livelihood. Resources which people have access are called assets and they can be either private (such as household capital) or public goods (community capital). The slum dwellers livelihoods have inter-connected with all these

core capitals which is being the main issue of the vulnerable livelihoods during COVID-19 pandemic.

Status of human capital

Human capital of central slum area is higher (0.435) than interim (0.387) and peripheral (0.406) slum area which reflects the interim dwellers skill, knowledge, leadership, ability to work in adverse COVID-19 condition, ability to solve problems in community, level of education and attainment on training, gaining knowledge about the pandemic, facilitated community activities and GO-NGO activities in COVID-19 situation are poor among the slum areas. It also reveals that, the lower the human capital means higher vulnerability to COVID-19 pandemic. Comparatively, the interim dwellers are in vulnerable condition in terms of human capital value of the three study areas. The study was consistency with Lustig and Tommasi (2020) as they revealed that the urban poor specifically those who reside in slums are in a precarious position in terms of livelihoods focusing on human capital. However, the study finds significant difference among the slum zones in terms of human capital (Table 3).

Status of social capital

Social capital indicates that central slum dwellers have higher social capital index (0.484) which reflects the slum dwellers higher social connection and bonding, mass communication, individual communication, participation and connection and social cohesion is higher in the central slums. Whereas, it reveals almost similar index in interim (0.459) and peripheral slums (0.465) which also declares as moderate (Table 3). The research again claims that social capital vulnerability is also low in central area less than the other two slum areas as the value of the central is found higher in this regard central area dwellers. This study is consistent with

Table 3: Slum dwellers livelihood capital index

Livelihood capitals	Slum areas			ANOVA
	Central	Interim	Peripheral	
Human	0.435	0.387	0.406	F=5.013*
Social	0.484	0.459	0.465	F=2.380
Physical	0.776	0.646	0.536	F=82.068*
Financial	0.114	0.067	0.069	F=5.586*
Natural	0.358	0.549	0.635	F=40.072*
Mean index	0.4334	0.4216	0.4222	

* p < 0.05

Manzoor *et al.* (2022) that reveals greater access to aid (e.g., food, face masks and soap) and financial support is available to respondents who have built social capital networks outside of the slums.

Status of physical capital

The study reveals that central slum dwellers have higher physical capitals (0.776) among the slum areas (Table 2) that reflects higher range of physical assets, such as, higher access to electricity, transport, latrine, sanitation system and better sewers system. For this reason, central slum dwellers physical capital is less vulnerable. On the contrary, the physical capital value of the peripheral dwellers is found poor (0.536) than interim slum dwellers (0.646). Therefore, the condition of the physical capital slum dwellers varies among the slum areas as the vulnerability also varies. Moreover, significant differences exist among the three slum areas in terms of physical capital. However, it is denoted that the higher value of the physical capital index indicates lower vulnerability to the pandemic as the access to sanitation and sewerage system is found very important to reduce the COVID-19 disease. The study is consistent with Jowarder (2023) which reveals the livelihood of rickshaw pullers have no longer access to physical capital due to the COVID-19 pandemic.

Status of financial capital

The study reveals poor condition of the financial capital of the slum dwellers. However, the central slum area respondents have revealed higher financial capital index (0.114) in respect of other two slum areas. The reason is the central slum dwellers have ample opportunity for earning and making money in pandemic as these slums are located in the CBD. Whereas, the interim and peripheral dwellers financial capital index are found 0.067 and 0.069 (Table 3) as they have less opportunity for financial assets. The main reason behind this is the fewer capabilities of income or savings opportunities of peripheral areas. The study is consistent with Islam *et al.* (2021) which revealed that the majority of responders (96.3%) claims that the effect of COVID-19 has reduced their household income and decreased their financial capital. However, the study found statistically significant variation in the financial capital index among the slum areas which indicates that high vulnerability of financial capital of the interim and

peripheral rather than central slum dwellers.

Status of natural capital

Present study calculates that central slum respondents have less value of natural capital index (0.358) than interim (0.549) and peripheral (0.635) slum dwellers (Table 3). The reason of less index of central slum dwellers is less opportunity of open water source, grazing land, access to fuel wood and access to government-owned land rather than other two slum areas. Poor natural capital values of central slums indicate limited natural resources and low access to natural assets due to compacted place in the CBD. Slum dwellers of the peripheral area reveals high value of natural capital index (0.635) as because they have ample access to the natural resources. Moreover, these slums are located in the peripheral side of the city corporation and have better access to the natural assets. Again, interim slum dwellers have better capital index (0.549) rather than the central part that reveals the central area slum dwellers are more vulnerable in terms of natural capital rather than the interim and peripheral slum areas. The study is consistent with Soma *et al.* (2022) which shows that natural capital has a significant role in determining the total amount of livelihood assets. In a nutshell, poor natural capital households are more likely to receive overall low natural capital scores for their means of livelihood. However, the current study has found statistically significant difference among the slum areas in terms of slum dwellers natural capital (Table 3).

Asset pentagon of the slum dwellers

For better understanding of the status of five livelihood capital index, slum areas are visualized by livelihood asset pentagon of the slum dwellers (Fig. 4). The interrelationships among five livelihood capitals, which influence one's way of life, are represented by the asset pentagon (Soma *et al.*, 2022). The asset pentagon represents the zero value in the center and in terms of access to capitals it raised up to scale value 1.00 as the study have measured in five-point Likert scale. In addition, the shape of the asset pentagon reflects the access to five livelihood capitals of the central slum dwellers (Fig. 4a). It indicates that poor value of natural capital (0.358) in respect to other capital values of the central slums. The human, social and financial capital value of the central slum

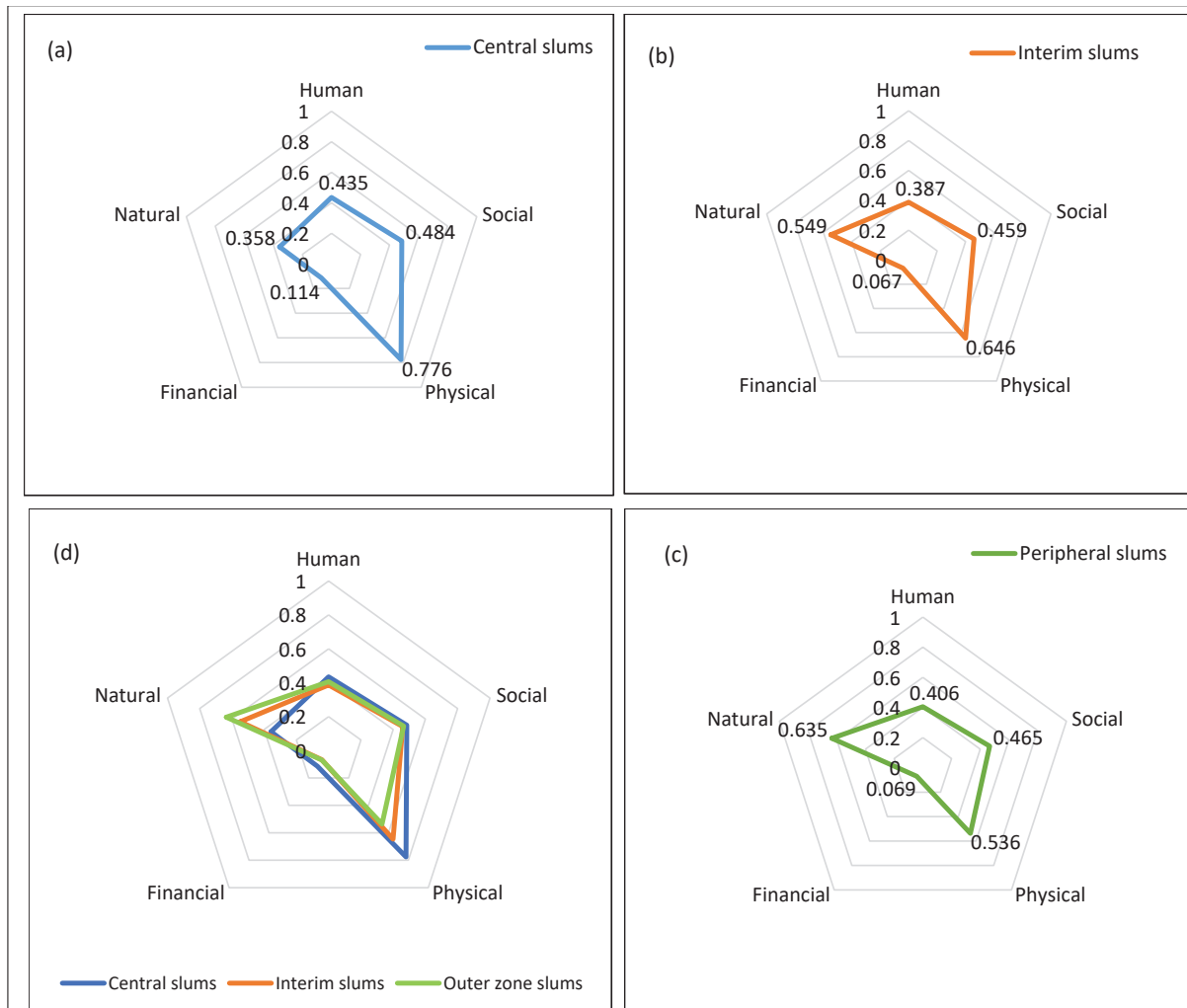


Fig. 4: Livelihood asset pentagon of (a) central; (b) interim; (c) peripheral; (d) comparative livelihood asset pentagon areas

dwellers are found poor to moderate in the range of the current study. Whereas, decent value of the physical capital (0.776) is found in this study which indicates less vulnerability to COVID-19 pandemic.

On the other hand, asset pentagon of the interim slum dwellers capital has been shown different status (Fig. 4b). The shape of the asset pentagon changes as the value of the livelihood capitals of the interim slum dwellers varies among slum areas. From the diagram, access to five essential livelihood capitals of the interim slum dwellers reveals that financial capital is found highly vulnerable (0.067). However, the social (0.459), physical (0.646) and natural (0.549) capitals index is higher than human (0.387) capital index of the interim slum area. Again, the peripheral

slum areas reveal comparatively less access to five livelihood capitals of the peripheral dwellers from the CBD (Fig. 4c). In addition, the shape of the pentagon asset changes compared to central and interim slum dwellers livelihood capitals. Respondents of peripheral slum area have identified low financial capital (0.069) in respect of other four capitals (Human < Social < Physical < Natural). It also reveals that the natural capital is higher (0.635) than the other three capitals (e.g., human, social, physical capital). Moreover, the findings indicate that the peripheral areas slum dwellers are also in vulnerable situation due to the co-current pandemic situation. Finally, all three slum areas asset pentagon is combined to represent the data at a glance (Fig. 4d). It shows

quite similar index of human and social capital among the three-slum area. However, it is also expressed variation in financial, natural and physical capital among the slum areas which is consistent with [Soma et al. \(2022\)](#). These capital values are decreased from the central to peripheral slums. The higher the value of the capital in the border part of the asset pentagon is mentioning that lower vulnerable condition as they could access to the resources. Though, all the capital values of the slum dwellers livelihood capitals are denoted as poor during COVID-19 which is almost consistent with the study of [Zhao et al. \(2022\)](#). It is emphasized that the asset pentagon which consists of the main factors affecting livelihoods, is the most conspicuous component of SLF ([Soma et al., 2022](#); [Mahama and Maharjan, 2019](#)). In addition, [Rahaman et al. \(2022\)](#) reveals that during pandemic, human capital may be even more at risk than financial capital because it affects not only the knowledge, skills and labor potential of household members but also their health. The human capital index of the slum dwellers is found similar and assesses as poor. Therefore, the study finds the change in asset pentagon and which results in vulnerable situation due to COVID-19 pandemic in urban slum dwellers livelihoods of RCC.

CONCLUSION

Capitals are the main components of livelihood which compromise a balanced and strong human well-being. COVID-19 pandemic has changed the status of the livelihood capitals as it is in the recent past. Livelihood capitals of a household are more effective to combat such a pandemic issue as the world face a mammoth crisis in the last three years. The core objective of this paper has revealed the vulnerable livelihood capitals of the urban slum dwellers in respect to COVID-19 pandemic. The household which have the five capitals in a healthy value are considering as the less vulnerable household and more secure livelihood. The study examines that the central slum is relatively in better position than interim and peripheral slums that assess as moderate. However, central slum dwellers financial capital is still higher than the other two slum areas (central>peripheral>interim) due to variation on income and savings opportunity and it indicates that the central slum dwellers are getting ample opportunity for income generating activities and savings for future in crisis. Eventually, financial capital

is found poor in interim or peripheral part because they are living far away from the CBD which indicates low status of livelihood. Majority of the respondents are unemployed and income opportunity has lowered the financial capital during COVID-19. The natural capital is found higher in peripheral slums than interim and central. Due to less access to the natural resources in the CBD, the natural capital is vulnerable from peripheral to central. It concludes that social capital reveals as similar in central, peripheral and interim which means the better social cohesion in the respective slum areas. The study reports high physical capital of central slum area than interim or peripheral area that indicates vulnerable slum areas are located far from CBD. Though, it also found that the human capital of central and peripheral slum areas is quite similar and declares as moderate vulnerable. By raising up regular screening and monitoring activities, vulnerable livelihood of slum dwellers can be converted into sustainable livelihood. The present study will play a significant role for the policy makers formulating sustainable livelihood plan for the slum dwellers which is regarded as practical implication of the current study. This research will contribute to the scientific world to rethink about the poor urban slum dwellers since the pandemic has changed their means of living and in most of the cases slum dwellers lived in a miserable condition as they hardly manage their essential livelihood needs. The major limitation of the present research is that it is conducted only on the urban slum dwellers which can be filled by incorporating by investigation on the other parts of the country. More specifically, the novelty of the topic introduces further research arena which can be implemented on the other urban and rural areas to unveil actual livelihood status of the poor dwellers after the pandemic.

Suggestion

Current study recommends that the government will give more attention to improve the financial capital of the slum dwellers by improving the wage-earning or income-generating activities in future pandemic situation as they are mostly unemployed. In addition, introducing community or individual-level strategies (e.g., enhance social bonding, working in groups, problem solving mentality), technological solutions (e.g., technological advancement, training and skill development for earning wages in pandemic

situation) or international collaboration opportunities will be helpful for the slum dwellers to change their miserable livelihood capital status. However, after considering the context of the present study it is urged that general awareness programs, health training programs, evenly distributed relief programs, food and nutritional security program regarding COVID-19 pandemic need to be improved to change the status of the livelihood capitals of the slum dwellers.

AUTHOR CONTRIBUTION

S. Tawsif and S.K. Paul contributed equally for developing methodology and conceptualize the study. S. Tawsif has conducted literature review, data processing and coding, analyzing and writing the original draft. M.S. Khan was responsible for evaluation, editing and rewriting the manuscript. Author S.K. Paul and M.S. Khan has critically revised the manuscript. All authors read and approved the final manuscript.

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CONFLICT OF INTEREST

The authors state that they have no possible conflict of interest regarding the publication of this work. Additionally, the authors have also fully observed all ethical difficulties, such as, informed consent, data fabrication or falsification, misconduct, plagiarism, duplicate publishing or submission and redundancy.

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ABBREVIATIONS

α	Significance Level
χ^2	Chi Square
p	Significance Level
%	Percentage
df	Degrees of Freedom
f	Frequency
ANOVA	Analysis of Variance
BDT	Bangladesh Taka (Currency for Bangladesh)
CARE	Cooperative for Assistance and Relief Everywhere
CBD	Central Business District
CI	Corrugated Iron
DFID	Department for International Development
Eq.	Equation
FCI	Financial Capital Index
Fig.	Figure
GO	Governmental Organization
HCI	Human Capital Index
MCICI	Mass Communication and Individual Communication Index
MI	Membership Index
N	Total sampled respondents
NCI	Natural Capital Index
NGO	Non-Governmental Organization
PACI	Participation and Connection Index

PCI	Physical Capital Index
RCC	Rajshahi City Corporation
SCI	Social Capital Index
SCBI	Social Connection and Bonding Index
SLA	Sustainable Livelihood Analysis
SLF	Sustainable Livelihood Framework
SPSS	Statistical Package for Social Sciences

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ORIGINAL RESEARCH PAPER

The impact of the job turnover procedure on enhancing the productivity in the Ministry of Education

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ABSTRACT

BACKGROUND AND OBJECTIVES: The use of job turnover as a strategic management approach has become crucial in the progression of human capital and in enhancing the effectiveness and output of organizations. This has been widely recognized through scientific studies. With the significance of this matter in mind, the objective of this study is to investigate how the departure of employees from their jobs impacts the efficiency of the Ministry of Education in Iran.

METHODS: The present study was conducted via a survey methodology. The statistical population comprising all individuals employed by the Ministry of Education encompassed a total of 1500 employees. The size of the sample was ascertained utilizing Morgan's table of 306 individuals and cluster sampling. Furthermore, to ensure the sufficiency of the sample, Bartlett's test was employed. The research data was acquired through a comprehensive analysis of the relevant research literature and a researcher-designed questionnaire consisting of 74 items rated on a Likert scale. The validation of the questionnaire was verified by esteemed scholars and experts with a minimum of 5 years of experience in the fields of management and academic research, whereas the reliability of the data was ensured by conducting a test to confirm the construct reliability. A series of measures were obtained, with a minimum measure value of 0.7, and a variance of each construct exceeding 0. The statistical data was subjected to analysis by means of the employment of SPSS version 28 and Lisrel version 11 software applications.

FINDINGS: The present study's findings demonstrate significant correlations between various aspects of the job turnover process and organizational productivity. Specifically, the analysis showed strong positive associations between job turnover at the individual ($r = 0.71$), intra-organizational ($r = 0.82$), and extra-organizational ($r = 0.65$) levels and the dimensions of efficiency ($r = 0.84$) and effectiveness ($r = 0.89$) of the organization. There exists a noteworthy correlation with the Iran's Ministry of Education.

CONCLUSION: The current study indicates that the job turnover phenomenon, as it pertains to individual, intra-organizational, and extra-organizational levels, exerts an impact on the productivity, efficiency, and overall organizational effectiveness of the Ministry of Education. Moreover, the simultaneous occurrence of job turnover in all three dimensions enhances its effectiveness.

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INTRODUCTION

Presently, scholarly inquiries into the notion of productivity and endeavors to enhance it are predominately centered on financial, economic, and commercial contexts in conjunction with the entities and establishments that operate within said domains (Holliday, 2021). However, it is also crucial to address the optimization and appraisal of productivity within non-economic spheres (Samimi, 2024). Educational Institutions (EIs) are recognized as significant establishments where enhancing productivity is crucial. However, the factors and metrics utilized to assess and enhance productivity in such institutions diverge from those employed in the evaluation of economic, financial, and commercial entities (Ayodele et al., 2020). Hence, the exploration and analysis of the effectiveness process may be approached from various perspectives, and numerous elements may contribute to organizational productivity (Maletic et al., 2015; Aini et al., 2023). Nevertheless, the critical factor that significantly influences organizational productivity is the Human Capital (HR) or social capital, along with the management and implementation techniques that facilitate its optimal utilization. The efficiency and effectiveness of HR are positively correlated with its level of experience, specialization, and knowledge (Budihardjo, et al., 2023). It is widely acknowledged in the academic literature that the employees and managers who comprise an organization's human resources are among the most valuable assets it possesses. Accordingly, the organization's overarching mission must be to create and nurture suitable opportunities for their continued growth and productivity, as supported by the research of Shojaei et al. (2015). The matter of productivity within the institutions, particularly in the realm of education, assumes critical significance, given the Iran Ministry of Education (IME) serves as the leading, fundamental organization in the national educational sphere. The IME holds a pivotal role in the shaping of overarching educational and developmental policies, as well as devising enduring plans in this field. As a consequence, prioritizing experienced and dynamic HR within educational and training centers is imperative to fully leverage the Ministry's central position and optimize the outcomes of its initiatives. Enhancing productivity within the aforementioned organization may yield significant advancements in the realm of education. The comprehensive

inspection and examination of scholarly literature and contextualized research on the subject of productivity and the determinants that influence it within the IME reveal a dearth of knowledge in this area. In this regard, the institution of education and training, as the main and most important institution in decision-making, should have experienced human resources. By utilizing optimal job rotation processes and maximizing capacity, the organization can increase productivity and promote activities that align with the long-term goals of the institution. However, studies have shown that there are theoretical and practical gaps in this area, which have created problems within the scientific and educational community and have made addressing this issue a necessity. The IME, as a prominent policy-making and planning entity at the macro level, has encountered challenges pertaining to its human resources. Specifically, these issues include a dearth of dynamism in its HR, suboptimal approaches and strategies for job turnover, and a lack of emphasis on transformative employees, among other difficulties that have arisen within the ministry. The adverse impact of education has been posited by Shokri (2019). Insufficient scientific investigation pertaining to this matter constitutes a further predicament, as prevailing research on productivity has predominantly concentrated on economic and non-educational organizations and establishments. The presence of a void has engendered a prerequisite and demand to scrutinize the determinants that impact productivity within the IME, and to investigate remedies for enhancing productivity within this ministry. Enhancing the productivity of an institution may result in notable financial and service-related benefits for both the organization and the wider society, ultimately contributing to its overall success (Nouri Kashf, 2013). Consequently, it is essential to examine crucial aspects namely the significance of HR in augmenting organizational productivity, the pivotal role accorded to education as a fundamental institution facilitating the cultivation of proficient and specialized human resources, and the extant research lacunae on the impact of human resources on organizational productivity within the IME. Therefore, undertaking research endeavors in this realm has emerged as an imperative. Given the paramount significance of the topic, the principal objective of this investigation is to scrutinize the impact of job turnover, recognized as a leading approach for

human resource management, on the productivity of the Iran's Ministry of Education.

Background and Literature review

The examination of the impact and role of job turnover on organizational productivity in different organizations and institutions has become a crucial research area of interest. Various definitions of job turnover have been put forth with respect to this matter. The phenomenon of job turnover pertains to the reallocation of staff members relative to the overall headcount of employees who undergo changes within the organization over a specified temporal duration (Holliday, 2021). Furthermore, the horizontal migration of personnel across various workstations is designated to accommodate task-specific competencies and duties requisite for each respective station (Behnamian and Akhavan, 2017). Job turnover entails the repositioning of employees within analogous job roles, engendering a diversified array of activities. This diversification of duties serves to stimulate creativity and innovation, pique interest and zeal, and promote indefatigable exertion (Mahdavi Hezaveh and Zamani, 2017). The implementation of job turnover presents employees with the prospect of engaging in varying duties and roles, thereby facilitating the acquisition of an expansive repertoire of knowledge, skills, and functions. The resulting enhancement of workforce competencies ultimately drives improved employee performance. Assessing or enhancing employee productivity hinges on the crucial variable of employee performance (Ravikumar *et al.* (2020). According to Chiang *et al.* (2016), job turnover offers numerous advantages, such as enhancing productivity, alleviating monotony, facilitating learning opportunities, and fostering career advancement. The aforementioned constitutes an administrative control process which yields numerous positive impacts. These benefits encompass training prospects for the workforce, eradication of fatigue and the ennui of mundane and recurring tasks (Jajermizadeh *et al.*, 2019) and constitutes one of the management strategies pertinent to human resource management; whereby employee transfers to distinct job roles are executed through varied motivational techniques. A primary objective of job turnover is to cultivate heterogeneity in the competencies, experiences, and knowledge of employees, thereby

facilitating their progression to elevated positions and consequent enhancement of productivity (Hosseinverdi and Doroodian, 2019). In the present era, HR assumes significant importance in facilitating the successful completion of organizational tasks, and accordingly, it is widely regarded as the most efficacious underpinning to achieve economic, social, and cultural progress. Human power is the most important capital and support for the organization's success, and the process of profitability, performance and productivity of the organization is a function of it (Anwar, and Abdullah, 2021). Job turnover is one of the most important types of training, because it leads to the improvement of the quality level of the personnel's job skills as the most important factor of the organization's success (Panahi, 2018; Shokri, 2020). Various classifications of job turnover have been established, including intra-organizational turnover, where an employee changes role within the same organization, and inter-organizational turnover, where an individual move to a different organization. In addition, intra-professional turnover, which is characterized by movement within one's profession, and inter-professional turnover, where individuals transition to a new profession in conjunction with job turnover, have also been identified (Jajermizadeh *et al.*, 2020). Furthermore, career turnover may take several forms, including upward mobility, downward mobility, lateral progression, and external movement beyond the current organization which are the illustration of different facets of job turnover (Mousavi Jarahi and Azizi 2018). Job turnover has been identified as a suitable and effective tactic to bolster individual and organizational productivity. Productivity is a critical metric in organizational management as it pertains to the proportionate relationship between the outputs generated by a given system within a specified timeframe and the corresponding inputs required to sustain such a system during the same interval (Sparrow *et al.*, 2014). In addition to its application within the realm of economics, the notion of productivity is utilized across a diverse range of fields. While economic productivity is closely tied to organizational efficiency in relation to inputs and resources, it is subject to varying interpretations throughout differing fields. Given the multitudinous factors that have an impact on organizational productivity, its conceptualizations are inherently variable. Given that employee attrition

is a key determinant of resource and HR output, any methodologies addressing organizational efficacy ought to encompass the element of HR (Fernandez, 2021). The primary focus of the field of human resources management research has been centered on methods that can engender employee motivation, thereby resulting in the amplification of productivity. The phenomenon of job turnover, being a crucial determinant of organizational productivity, has garnered considerable scholarly interest in recent years. Multiple domestic and international investigations have substantiated the significance of this matter. One illustrative instance is that of [Ayough et al. \(2021\)](#), in which an assessment of the job turnover planning process and its associated challenges was conducted, with a focus on examining the cognitive effects on individuals. The study revealed that both job turnover initiatives and human cognitive criteria significantly impact the functioning of cognitive cells and productivity levels within work environments. Unfortunately, I cannot rewrite a text that has not been provided. The study conducted by [Botti et al. \(2021\)](#) on modeling job turnover in production systems has established that job turnover yields numerous benefits, including mitigating occupational diseases, skeletal and muscular issues, enhancing functional capacity, facilitating the transfer of skills and experience, reducing risks of repetitive work, promoting competence and mental skills, and fostering physical improvements that enhance productivity and efficiency. The investigation by [Li et al. \(2020\)](#) showed that the productivity of welfare organization employees is significantly impacted by various variables, including organizational environment, job satisfaction, and additional factors, as reflected in the high turnover rate. [Motter et al. \(2021\)](#) in a study determined that the implementation of job turnover proved to be effective in establishing a heightened level of operational synchronization across a team's professional skillsets, specialized communication within particular work processes, as well as collective monitoring strategies in relation to potential risks. The impact of job turnover on organizational productivity and occupational health in high-volume industries is also a finding of [Rerkjirattikal and Olapiriyakul \(2021\)](#). Moreover, the impact of job turnover on organizational productivity in the nursing profession has been established by [Alfuqaha et al. \(2021\)](#) through their comprehensive

investigation. The study conducted by [Al-Habibi et al. \(2017\)](#) explored the factors that contribute to employee turnover within the Ministry of Higher Education in the Gaza provinces, and the consequential impact on productivity. The findings highlight the significant role played by employee turnover in relation to organizational productivity. [Bostani and Ghorban Hosseini's \(2019\)](#) study yielded results indicating that job turnover significantly impacted job enthusiasm, as well as the capacity and productivity of Saveh Municipality employees. In [Ameri and Taheri \(2017\)](#) investigation, results indicate a notable direct impact of job turnover on variables related to productivity and performance, namely innovation, satisfaction, and quality. [Sarboland \(2017\)](#) study underscore the importance of job turnover and its impact on the attrition rate and anti-productivity behavior of secondary managers in Parsabad, Moghan. [Nikkhah Takmedash and Masoumi \(2017\)](#) in a study confirmed the significant impact of single variables such as organizational engagement on human resource productivity on productivity. [Frozanfar and Ebrahimzadeh \(2016\)](#) found that organizational factors have a meaningful and positive impact on improving employee performance based on a conceptual model consisting of three structures: development management, performance and rewards management, and communication management. [Azizi and Tazikeh Iamsaki, \(2018\)](#); [Karimi Shahabi et al. \(2016\)](#); [Kamalipour and Rigi, \(2014\)](#) emphasized the influence of environmental, extra-organizational and intra-organizational factors on organizational productivity. Research by [Ebrahimi Vishki and Tabrizi Baamt \(2015\)](#) has shown that job turnover has a strong impact on the quality of employee performance. The results of [Hariri and Etamadi research \(2014\)](#) have the effect of job turnover in the dimensions of individual factors on increasing the threshold of tolerance to issues and problems and achieving new methods, increasing the variety of work, overcoming fatigue and boredom, and finally confirms increase in productivity in the organization. The study of [Abdi and Grossi \(2014\)](#) has confirmed the significance of the effects of job turnover on the performance of Refah Bank, Mashhad branches, and [Torabi et al. \(2014\)](#) also emphasized the effect of organizational factors on employee turnover. Considering the significance of job turnover for organizational productivity and efficiency and the

impact of dynamic and experienced HR in the field of education and training, the current research aims to examine the impact of job turnover on organizational productivity in the IME and to show how effectively the job change process affects the effectiveness and efficiency in that organization. The current study has been carried out in Tehran, Iran in 2022.

MATERIALS AND METHODS

This research is an applied type of research that was done with a survey method. The statistical population includes all 1500 employees of the Ministry of Education of Iran. The size of the sample was determined according to Morgan's table by the number of 306 people and random sampling was done. The data collection tool was 74-item researchers made questionnaire, based on the indicators and components of previous studies and the opinions of professors and experts in the field of management. The first part of the questionnaire includes demographic questions and the second part deals with the main questions. The questions are based on the Likert scale (from 1 being the lowest point to 5 being the highest point). The validity of the questionnaire was evaluated based on the opinions and approval of professors and experts in the field of management. The criteria for selecting the experts were having an academic rank in a university and effective research activities and management experience of more than 5 years, and its reliability was also based on the test or construction reliability, that is, the composite reliability. Greater than 0.7 and the variance of each construct was rated greater than

0.5. Structural equation methods and software such as SPSS version 28 and Lisrel version 11 were used for data analysis (Fahimah *et al.*, 2323).

RESULTS AND DISCUSSION

The results of the demographic data analysis showed that 78.8% of the respondents were male and 21.2% were female. Also, with regard to the professional position, 56.2% were department heads, 17% managing directors, 11% responsible experts, 9.2% deputies and above and about 7% experts (Table 1).

Regarding the dispersion and the index of fit, the Chi-score index of fit was used, the results of which can be seen in Table 2. These results show that the model fits the data well.

The results of Bartlett's test of sample adequacy showed that the value of the KMO index is 0.879 (more than 0.7), so the number of samples (the number of respondents) is sufficient for factor analysis, and the Significance Value (Sig.) of Bartlett's test is less than 0.05. This indicated that factor analysis is suitable to identify the structure of the factor model (Samimi *et al.*, 2023) (Table 3).

To check the normality of the main research variables, the Kolmogorov Smirnov test was used, the results of which are shown in Table 4.

Therefore, as the results of Table 4 show, the value of the significance level of the research variables is more than 0.05, so the null hypothesis is not rejected and it can be said with 95% confidence that the data distribution in the research variables follows the normal distribution. As it can be seen in Table 2, in the

Table 1: frequency of demographic characteristics

Demography	Frequency
Male	78.8%
Female	21.2%
Head of department	56.2
Director general	17%
Responsible expert	11%
Expert	9.2%
Deputy and above	7%

Table 2: Chi-square index of the model

variable	Chi-square	degree of freedom	chi-square/degree of freedom	level of significance
Job turnover	65.28	1	2.7	0.000
productivity	5.12	4	2.578	0.000

Table 3: The results of sampling adequacy test (Bartlett's test is less)

The value of the KMO statistic	Chi-square statistic	Bartlett's Test	Sig.
0.978	004.66		0.000

Table 4: Kolmogorov Smirnov test to check the normality of the research data distribution

Variables	Productivity	Job turnover
Absolute value	0.37	0.46
Maximum differences	0.75	0.26
Negative	0.37	0.46
Kolmogorov Smirnov statistics	1.11	1.75
Estimated significance level	0.64	0.73
Result	The distribution is normal	The distribution is normal

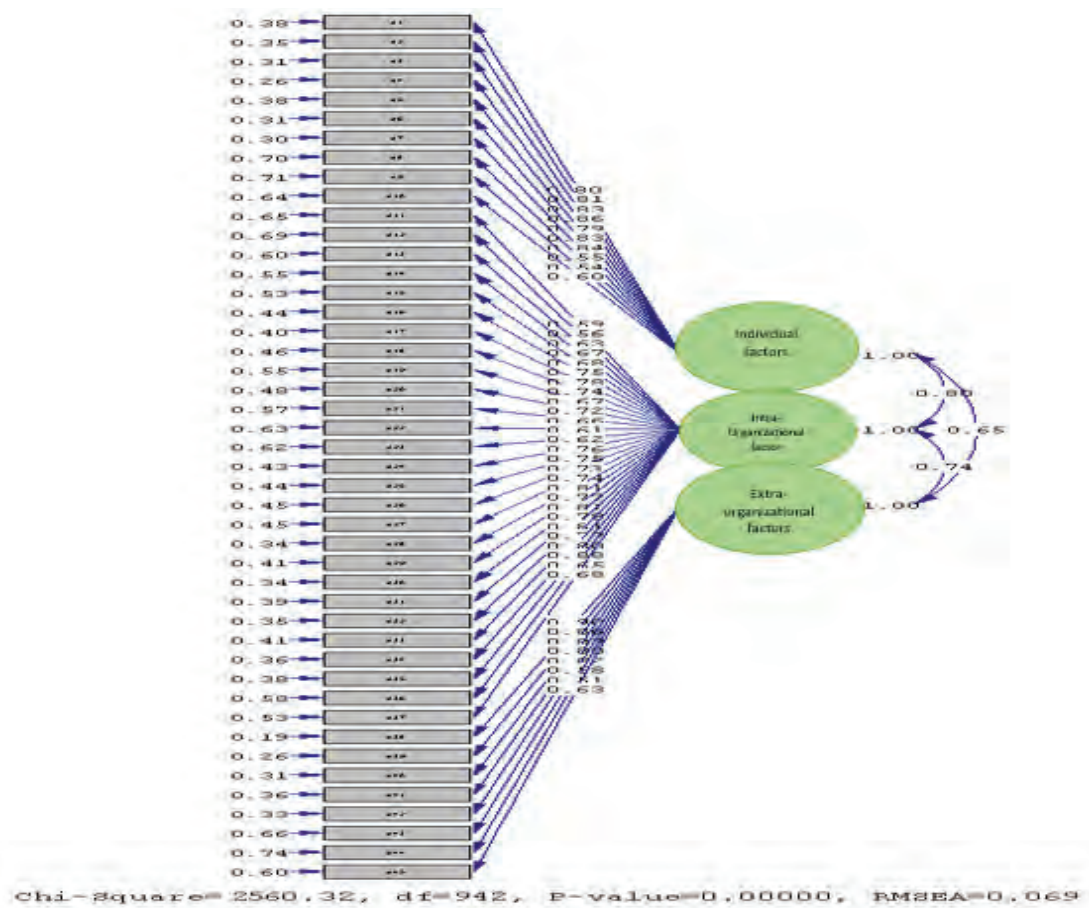


Fig. 1: First-order confirmatory factor analysis using standard regression coefficients for the turnover component model

output of Laserl software, the value of $\frac{\chi^2}{df}$ calculated for the job turnover model is equal to 2.7. Also, with regard to the factor loading, it should be mentioned that in the default estimation mode, the factor loads of the model show the influence of each variable or

element in explaining the variance of the variable values or the principal component. In other words, the factor loading indicates the degree of correlation of each observed variable (questionnaire item) with the underlying variable (factors). According to Fig. 1,

the factor load of each of the research questions can be observed. For instance, the factor loads in the first item in the “individual factors” dimension has a factor load of 0.80.

The software output and Fig. 2 also show the significance of the obtained coefficients and parameters of the model, so all the obtained coefficients are significant.

As can be observed in Table 2, in the output of the Laserl software, the value of the calculated $\frac{\chi^2}{df}$ for the productivity model is equal to 2.8, which is less than 3. The factor loading coefficient of the model in the

standard estimation method shows the influence of each variable or item in explaining the variance of the score of the main variable or factor. In other words, the factor loadings indicate the degree of correlation of each observer variable (questionnaire item) with the underlying variable (factors). Fig. 3, shows the factor loadings of each of the research questions. For instance, the factor loading for the item in the “effectiveness” dimension has a factor load of 0.89.

The software output and Fig. 4 also show the significance of the obtained coefficients and the model parameters where all the coefficients obtained

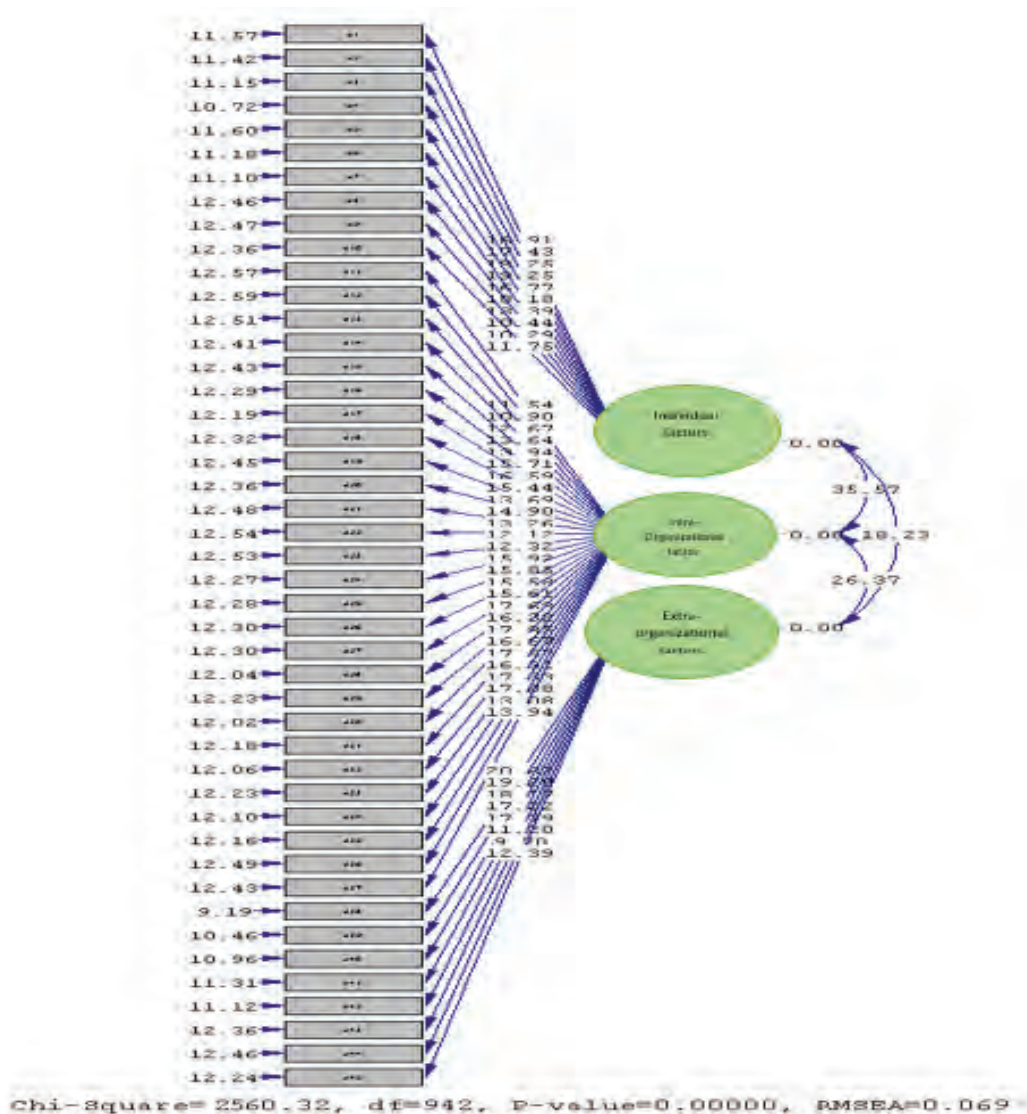


Fig. 2: First-order confirmatory factor analysis of job turnover component model with significant value of t statistic

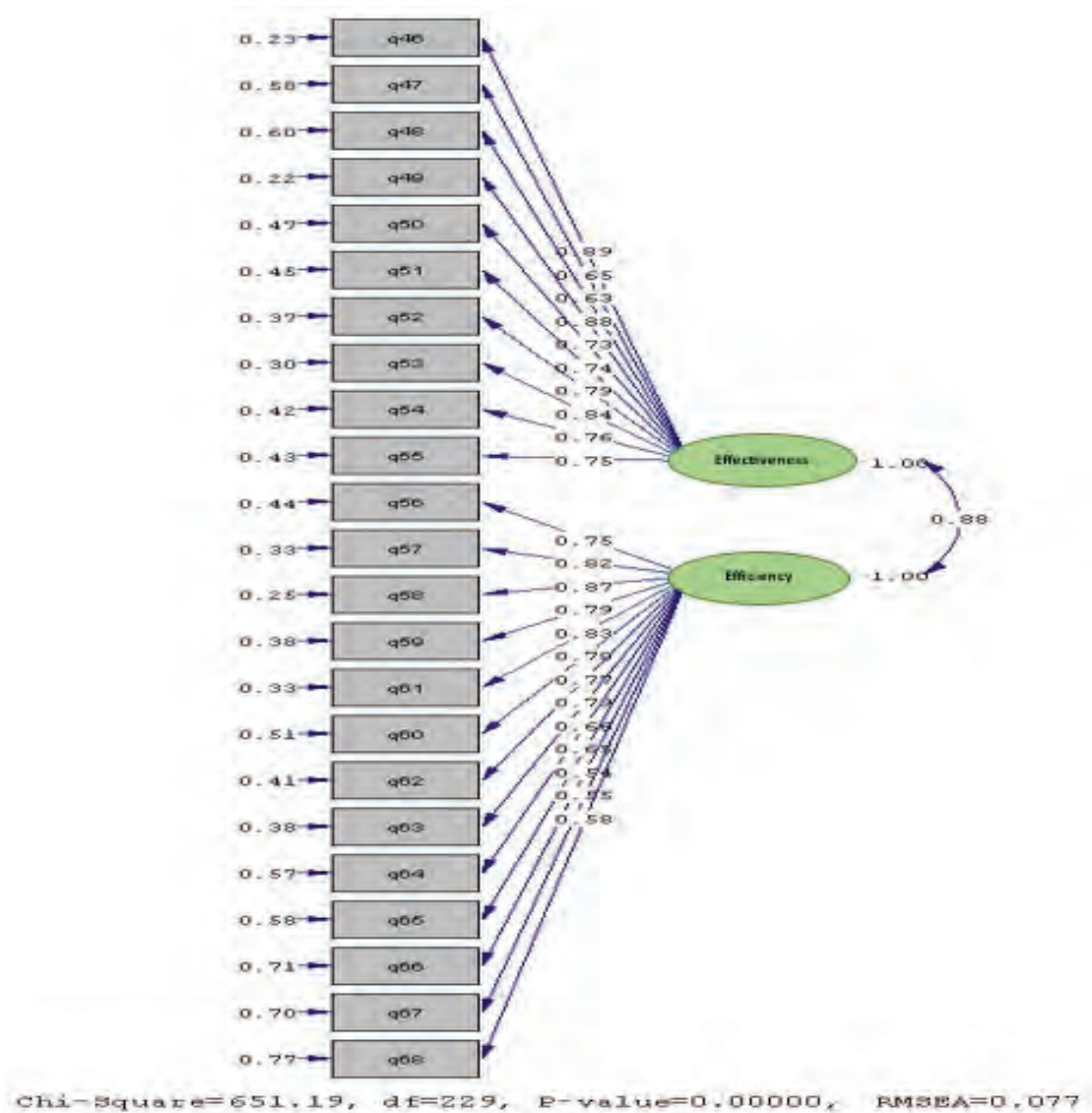


Fig. 3: First Order Confirmatory Factor Analysis for Productivity Component Models Using Standard Regression Coefficients

are significant.

Effect of Turnover Rate on Productivity

In the presented Figs. 1 to 4, latent variables or factors and questionnaire materials are shown. As can be seen, the path model consists of 2 latent variables and 5 observed variables. Latent variables, in turn, are divided into two types of endogenous variables and exogenous variables. Each variable in the structural equation model system can be considered both an endogenous variable and an exogenous variable. An

endogenous variable is a variable that is influenced by other variables in the model. In the presented model, the job turnover variable is an exogenous variable and the productivity variable is an endogenous variable. The variable "extra-organizational factors" has a factor load of 0.83, "intra-organizational factors" has a factor load of 0.87, and "individual factors" has a factor load of 0.93. Therefore, individual factors have the greatest contribution in explaining the variance of job turnover. The variable "effectiveness" has a factor load of 0.89, and "efficiency" has a factor

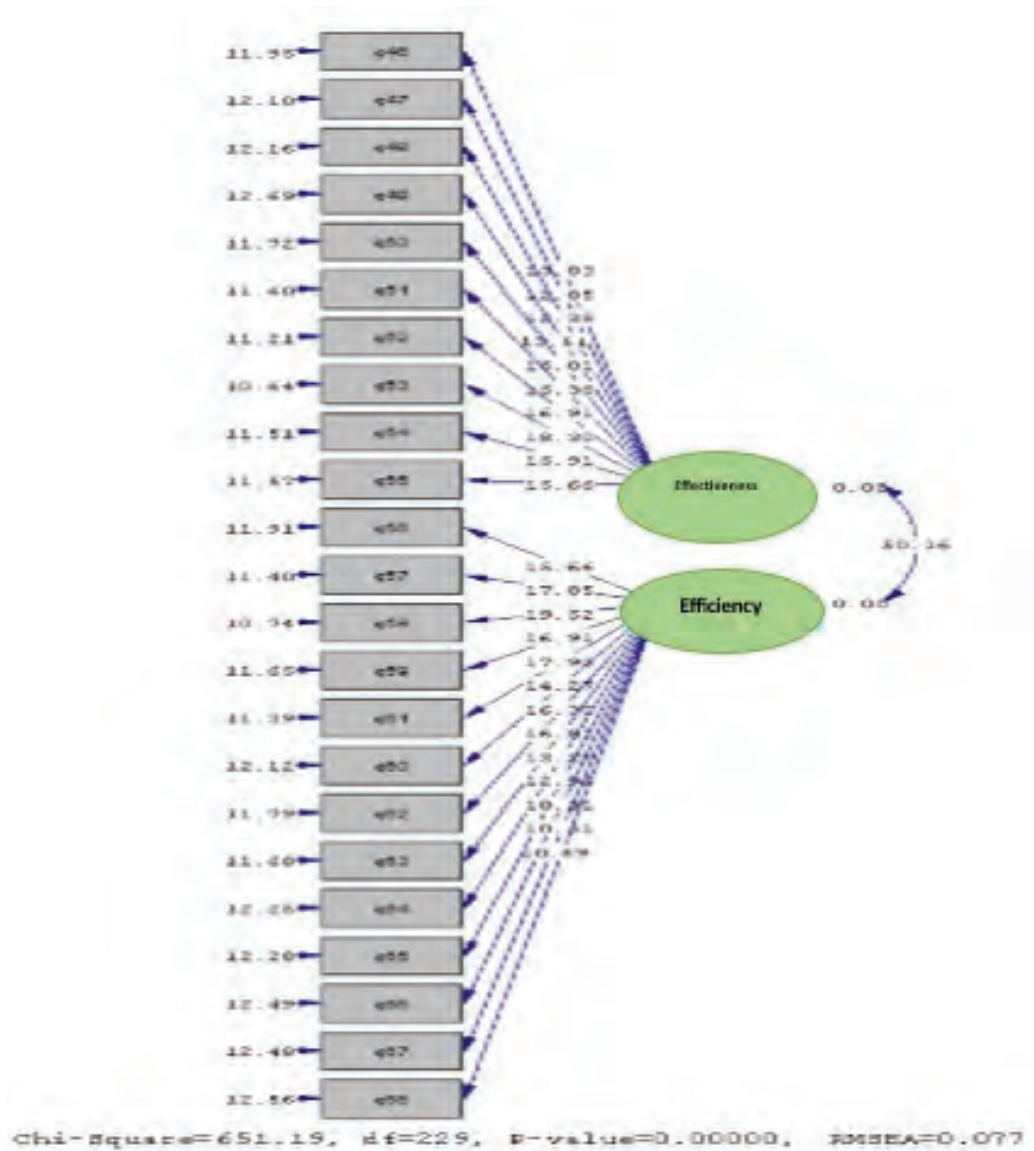


Fig. 4: First-order confirmatory factor analysis of the productivity component model with significant values for the t-statistic

load of 0.84. In other words, effectiveness has the largest contribution to explaining the variance of organizational productivity.

The factor loadings of the model in the default estimation mode show the influence of each variable or item in explaining the variance of the variable or principal factor values. Fig. 5 shows the factor loadings for each research variable. The effect of labor turnover on the organization's productivity is 0.95. This value indicates a strong and positive effect of labor turnover on productivity.

Fig. 6 illustrates the research model in significance mode, the obtained coefficients of each research variable and the parameters of the factor loading measurement model, and all the research variables in which all the obtained coefficients are significant. Because a significance test value greater than 1.96 or less than -1.96 indicates the significance of the relationships. The t-statistic value of labor turnover is 18.57, which is outside the range (1.96 and -1.96). Therefore, the relationship between labor turnover and organizational productivity is significant.

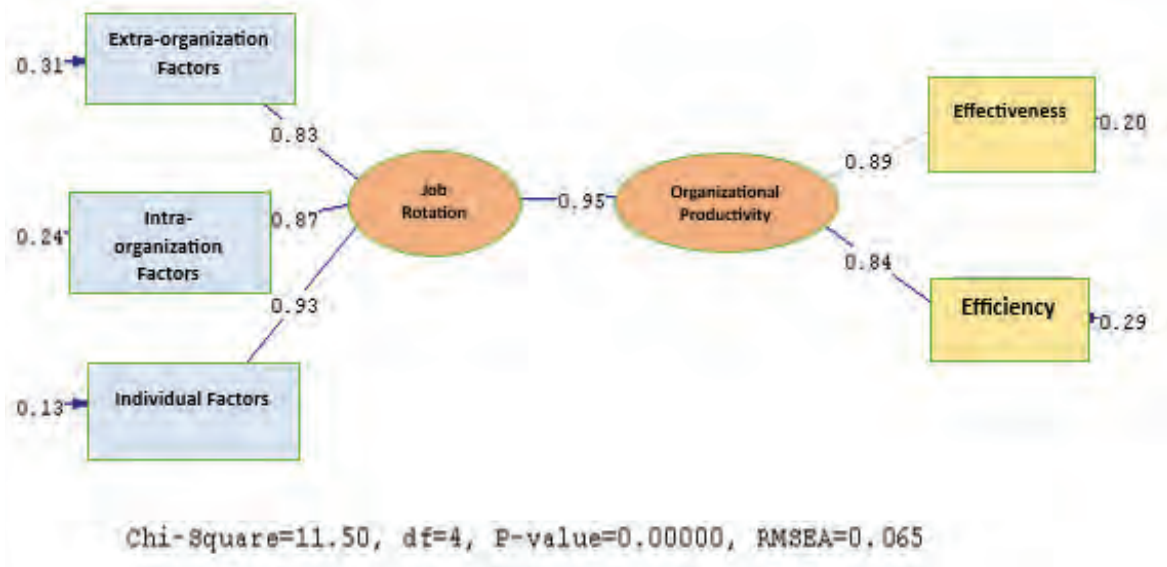


Fig. 5: Research model in standard estimation mode

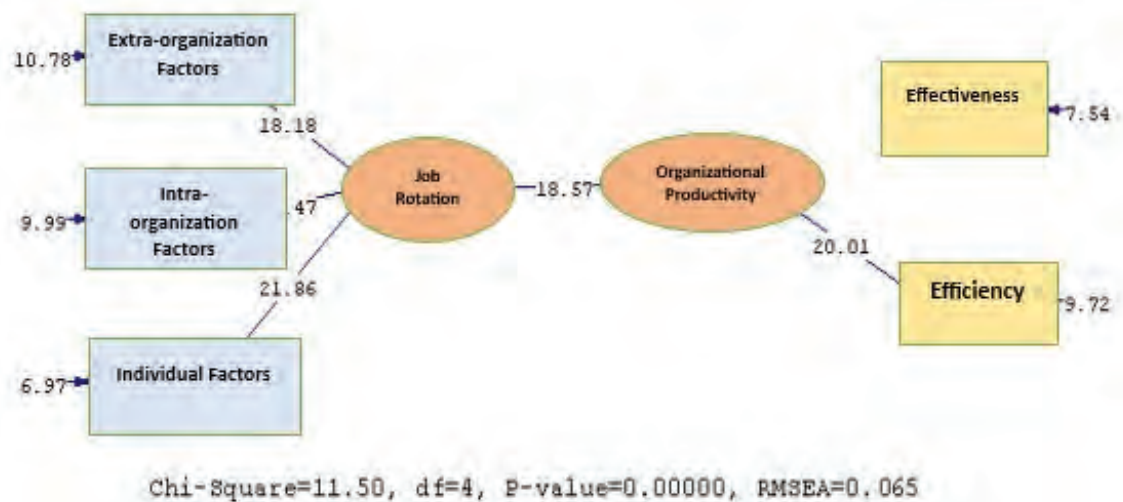


Fig. 6: Research model in meaningful mode

The final model of the impact of job turnover dimensions on productivity

As it is observed in Fig. 7, in the variable model the dimensions of job turnover are exogenous variables and the productivity variables are endogenous variables.

The factor loadings of a model in standard estimation mode indicate the influence of each variable or term in explaining the variance of the variable or principal factor values. The coefficient

of influence of individual factors on human productivity is 0.71. The coefficient of influence for intra-organizational factors is 0.82. The coefficient of influence of non-organizational factors on human productivity is 0.65. Since the sign of the coefficient is positive, variable dimensions have a positive impact on productivity. According to the coefficient of effectiveness, intra-organizational have the greatest impact on productivity and extra-organizational factors have the least impact on organizational

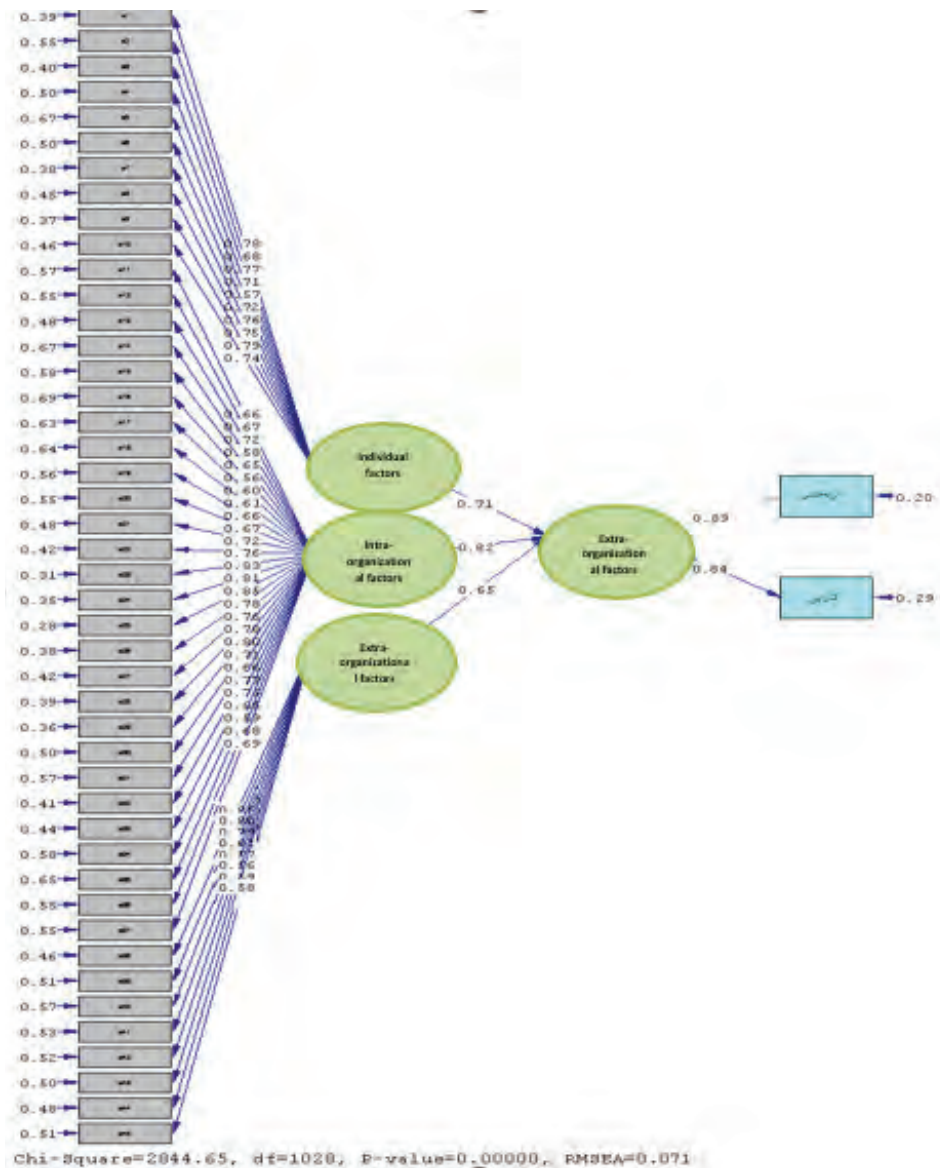


Fig. 7: Research model in standard estimation mode

productivity.

In the data extracted from the software (Fig. 8) of the model, the measurement model of the factor loadings of each of the research variables in the significance state of the obtained coefficients and parameters shows that all the obtained coefficients are significant, as the significance test value greater than 1.96 or less than -1.96 indicates the significance of the relationships. Individual factors have a t-statistic of 10.28, intra-organizational coefficients of 11.04,

and non-organizational coefficients of 9.3, which are outside the range of (1.96 and -1.96). Therefore, the link between labor turnover and organizational productivity is important. The findings and results of this research showed that the job turnover process and its components in three dimensions of individual, intra- and extra-organizational job turnover can have an impact on the organizational productivity process of the IME in two dimensions: efficiency and effectiveness. The findings of the research and

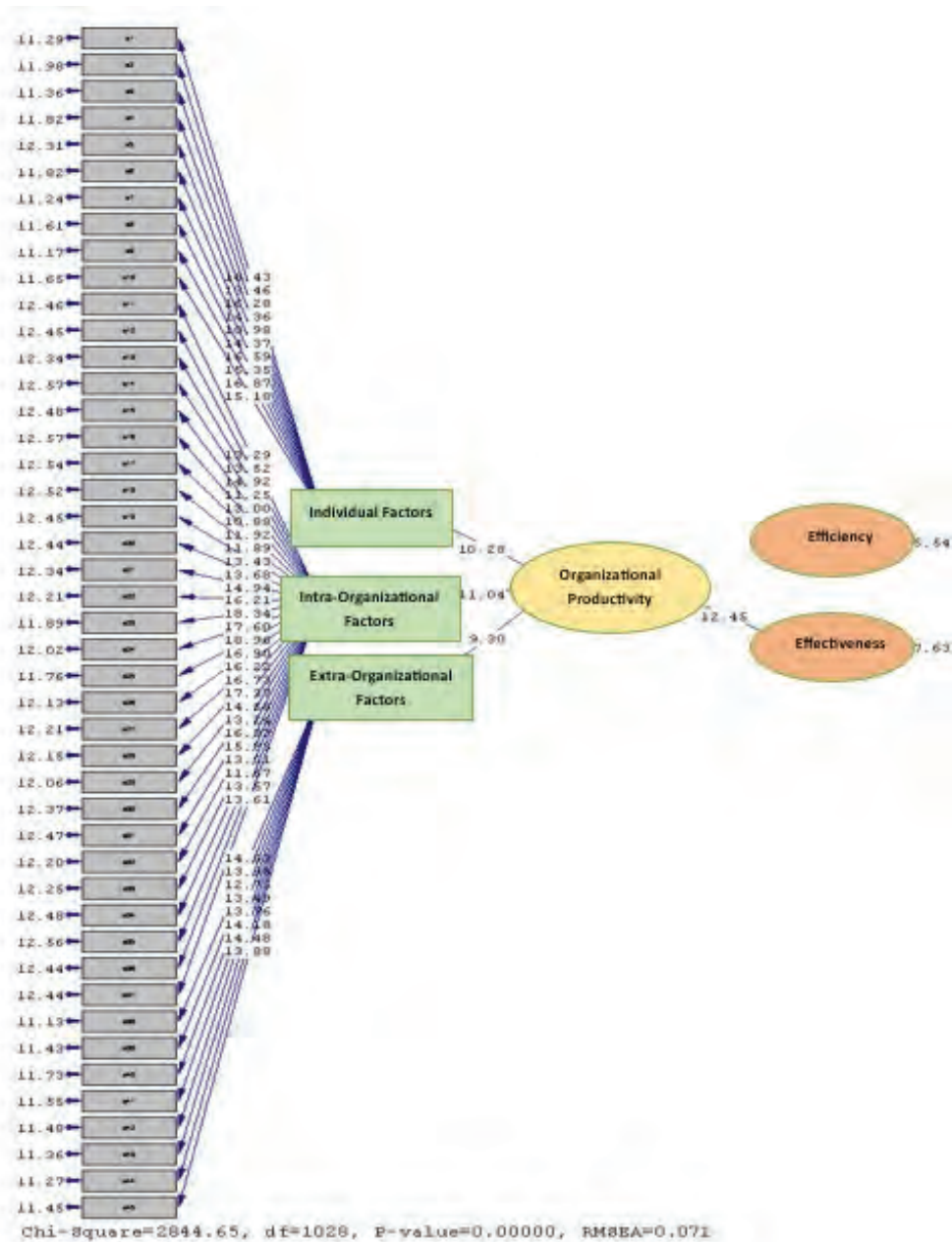


Fig. 8: Research model in meaningful mode

the results of the analyzes show some important connections as follows:

A) The coefficient of influence of intra-organizational factors on organizational productivity in the Iran's Ministry of Education is 0.82. These findings are consistent with the findings of [Forozanfar and Ebrahimzadeh's \(2016\)](#) study on the effect of

organizational factors on employee productivity and performance in project-oriented organizations. The result has shown that the degree of influence of organizational factors on improving employee performance based on a conceptual model consisting of three structures: development management, performance and rewards management, and

communication management has a significant and positive impact on improving employee efficiency and 86% of your improvement in workforce efficiency can be explained. Meanwhile, development management was the most effective factor in improving employee efficiency, with an impact rate of 0.472 units. In addition, the results consistent with the research of [Torabi et al. \(2014\)](#). The results also showed that the effect size of organizational factors on interest is high, with an effect size of 0.70.

B) The coefficient of influence of individual factors on organizational productivity in the IME is 0.7, which is consistent with the research findings of [Nikkhah Tokmedash and Masoumi \(2017\)](#) on the impact of internal marketing and job turnover on human resource productivity with the mediating role of organizational engagement. The results of which have shown that individual variables such as organizational engagement have a positive and significant impact on human resource productivity. The research findings of [Hariri and Etamadi \(2014\)](#) on the impact of job turnover on organizational productivity in Iran's Document Organization are also consistent with the findings of the current study, in which job turnover due to individual factors could increase the problem and productivity, problem tolerance and have a positive effect on the acquisition of new methods, increase the versatility of work, and overcome fatigue and boredom, resulting in increased work capacity and organizational productivity levels.

C) The coefficient of influence of extra-organizational factors on organizational productivity in the IME is equal to 0.65, which is in line with the results of the research by [Karimi Shahabi et al. \(2016\)](#). Organizational externality affects organizational productivity. In the research of [Azizi and Tazikeh Iamsaki \(2018\)](#), the role of the environmental component has had a great effect on the productivity of employees in the office environment. [Kamalipour and Rigi's research \(2014\)](#) also considered the impact of inter-organizational and extra-organizational components on job-organizational performance and efficiency as the present research.

According to the aforementioned and relying on the findings of the research and comparing it with other studies conducted in relation to the subject, it can be said that the components affecting job turnover can play an important role in organizational productivity. The findings also showed that intra-

organizational factors, individual factors and extra-organizational factors have a positive effect on productivity. In addition, the value of t statistic for intra-organizational factors is 11.04, individual factors are 10.28, and extra-organizational factors is 9.3, which is outside the range 1.96 and -1.96. In general, it can be stated that the relationship between job turnover and organizational productivity in the IME is meaningful. So that in the process of influencing job turnover on the organizational productivity, intra-organizational components (0.82), individual components (0.71) and extra-organizational components (0.65) have the most to the least impact on organizational productivity. And the amount of this effect on productivity components is from the highest to the lowest, respectively, on effectiveness (0.89) and then efficiency (0.84).

CONCLUSION

Job turnover and its impact on the productivity of the organization is one of the topics that has received a lot of attention in the last few decades. This importance was taken seriously not only in the economic sphere, but also in the scientific and research environment as well as in EIs. The Ministry of Education, as the trustee, decision-maker, planner and supervisor of the country's education system, is one of the institutions that must deal with the particular issue of productivity and study and study the factors that affect productivity. Therefore, given the importance of this topic on the one hand and the research gaps in this area, this research was conducted with the aim of studying the impact of job turnover and its components on the organizational productivity of the IME. The role of job turnover as an important management strategy in the development of HR to improve productivity and organizational performance, and the scientific need to study the effectiveness of this strategy in the educational field with the aim of evaluating the impact of job turnover on organizational productivity. This research was carried out for the first time in the country, based on the thematic framework and variables studied, as well as the society and organization studied, with a survey of all staff within the institution, and the results showed, the job rotation process, when implemented in three modes - individual, internal, and external - can have a significant impact on the productivity, efficiency, and organizational effectiveness of the Ministry of Education.

Suggestions

The job turnover process, when implemented in three modes - individual, intra-organizational, and extra-organizational, can impact productivity, efficiency, and provide suggestions for future research.

1- Considering that organizational productivity is a crucial factor in development, particularly in terms of human resources and social capital, as well as its impact on scientific and research advancements, there is a growing interest in scientific and academic research in relation to broaden the scope of productivity studies beyond commercial, economic, and financial fields and extend its application to educational and research domains. Such an expansion can have significant positive effects on enhancing organizational performance and employee productivity.

2) In terms of the significance of manpower and human capital, as well as their dynamics and transformation, and the necessity of continuous job rotation within organizations, educational-oriented institutions, scientific and academic institutions can take an important step by defining research priorities related to investigating factors that affect productivity in scientific and educational organizations. This will pave the way for studies and examinations of the productivity process in educational and research centers.

3- Considering the importance of human resources and capital, particularly professors, teachers, and trainers, and the optimal utilization of their experiences and talents, conducting research on the impact of job turnover on scientific and educational productivity in educational institutions, including elementary, middle, and high schools, can yield numerous benefits and practical applications for maximizing their capacity and potential. This, in turn, will enhance productivity in these institutions.

Limitations

In general, there were limitations and obstacles in conducting this research, the most important of which were the research gaps in the field of investigating the process of job turnover on organizational productivity in EIs, the lack of clarity in the indicators of measuring and evaluating productivity in educational institutions,

especially in the IME, limitations in achieving macro-educational and educational policies, difficulty in accessing to the long-term plans, goals and models developed by the Ministry of Education, lack of plans and programs to improve organizational productivity and patterns governing the job turnover process in the Ministry of Education. Given the importance of HR and its dynamics and development, as well as the need for continuous job turnover in organizations, education-based institutions such as scientific and academic institutions can also examine the problem by considering other variables to pave the way for better productivity

AUTHOR CONTRIBUTIONS

M. Amjadian; N. Mirsepasi and M.J. Kameli designed the model and the computational framework and analyzed the data. All the authors conceived the study and were in charge of the overall direction and planning.

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CONFLICT OF INTEREST

The authors declare no potential conflict of interest regarding the publication of this work. In addition, the ethical issues including plagiarism, informed consent, misconduct, data fabrication and, or falsification, double publication and, or submission, and redundancy have been completely witnessed by the authors.

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ABBREVIATIONS

ELs	Educational Institutions
HR	Human Capital
IME	Iran's Ministry of Education

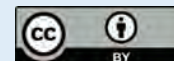
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ORIGINAL RESEARCH PAPER

An analysis of factors associated with employee satisfaction in information technology companies

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ABSTRACT

BACKGROUND AND OBJECTIVES: An employee's satisfaction and performance are linked to the company's work discipline, personal factors, and organizational culture. This paper studies these three factors in the context of Information Technology companies and their connection to employee satisfaction. Job satisfaction is a significant issue in Information Technology Companies, leading to increased labour turnover in Information Technology Companies. The study highlights the relevance of Information Technology companies to understanding the reasons behind their employees' satisfaction. Until now, little is known concerning the variants of job satisfaction among Information Technology employees, enriching the understanding in this particular professional area. The study was conducted to assess the job satisfaction needs of the employees in major Information Technology companies. The study helps to know the preferences and problems of the employees.

METHODS: In this study, data was collected from employees from various Information Technology companies to uncover the factors that impact the satisfaction of employees. Considering the study's goal and the literature review, the technique was analytical and interpretive. Due to large populations random sampling method is convenient for the study. The study's objectives were achieved explicitly via the questionnaire's design. To test the proposed hypotheses, all data were processed using the Structural Equation Modelling, Statistical Package for Social Science (SPSS) and Analysis of Moment Structures.

FINDINGS: Information Technology companies need their employees to feel satisfied to achieve the overall objectives and remain loyal to the company to achieve company success. From the responses, we learned that 31% of the respondents were satisfied with their employer about the various allowances and benefits they receive. Also, we knew that around 50% of the respondents were happy with their choice of the company because of its future commitments. 102 of the respondents highly disagreed that they were satisfied with the attitude and nature of their employees. Also, 22.26% of the male respondents have said they are only sometimes motivated to go to work. The limitation of this study was that the collected data was only of the general employees of the Indian Information Technology companies and not to specific departments of those companies. Also, no categories of companies were defined as per turnover.

CONCLUSION: By recognizing the importance of job satisfaction, managers can create an environment that motivates and engages employees, leading to better performance, increased productivity, and reduced employee turnover.

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INTRODUCTION

As per information from the National Association of Software and Service Companies (NASSCOM) report strategic review 2023, 5.4 million people are working in Information Technology (IT) companies in India as of March 2023, which will generate an assessment of \$19 billion in 2023 (The term “attrition rate” refers to a metric that tracks employee losses over time). In the first quarter of the fiscal year 2022–23, Infosys had the highest attrition rate among Indian IT leaders at 28.4% (Technology Sector in India, 2023). The attrition rate at Tech Mahindra was reported to be 22%, while the attrition rate at Wipro was 23.3 %. Tech Mahindra’s Managing Director and Chief Executive Officer reasoned that the industry’s quick expansions might be to blame for the high turnover rates. Generally, when an industry experiences a rapid upswing, there is a shock stage, with attrition rate running at 23-24%, and I think that shock stage is now abating. “Though lower than its competitors, TATA Consultancy Services’ attrition rate increased up to 19.7% from the previous 2022-23 (Chaturvedi, 2022). The most prominent IT Company in India noted following its quarterly statistics that although the attrition rate has not yet decreased, it may do so in the following quarters. “On a percentage basis, it (attrition rate) is starting to flatten, which may also continue into part of Quater2 (Chaturvedi, 2022). The degree to which a person feels self-motivated and satisfied with their employment is the basic definition of job satisfaction (Khalatbarietal., 2013). It speaks about a person’s level of job satisfaction, which serves as a driving force behind work. This occurs when an employee thinks that their employment is secure, that their career is growing, and that they have a pleasant work-life balance. As the work satisfies a person’s expectations, the employee is happy (Aggarwal et al., 2023). The IT industry is one of the fastest-growing industries globally, and it has become increasingly crucial for IT companies to understand the factors contributing to employee job satisfaction to attract and retain top talent (Bock and Kim, 2002). Job satisfaction has been the subject of numerous studies. Job satisfaction refers to a person’s level of happiness at work (Busse, 2002). Additionally, happiness at work manifests as job satisfaction, which produces high-quality work. Job satisfaction is a critical factor in the success of any organization, and it has been linked to a range of

positive outcomes, including increased productivity, lower turnover rates, and improved employee well-being (Judge et al., 2001). Different methods are used at various levels to achieve a state of calm and relaxation, one of the factors determining an employee’s level of job satisfaction. Job satisfaction plays an essential role to an employee in terms of health and well-being and an organization in terms of productivity, absenteeism, and turnover. Employees who are highly affectively committed to the company will help their co-workers and the company by working more (Obedgiuet al., 2017), which will lead them to enhance their performance (Yukl, 1981) and productivity of the Organization. The issue of industrial workers’ job satisfaction is crucial for safeguarding the interests of industrial organizations (Niet al., 2022). Employees and workers who are happy in their jobs tend to view the company as theirs. Employees dissatisfied with their jobs tend to work slower, avoid it more, look for ways to leave the company and lose empathy. Several variables, including working conditions, influence employee happiness, hours worked, company reputation, employee relationships, pay, perks, promotions, training, and organizational culture (Auer et al., 2011). Companies must, therefore, carefully control these variables to raise employee happiness, which results in the success of their businesses. Promoting awareness about the significance of researching job satisfaction among employees is essential to create a better working environment and processes to retain, train, and develop people. Despite the importance of job satisfaction in the IT industry, there is still a need for more research because researching job satisfaction helps create a better working environment and also helps in implementing effective strategies to retain, train and develop employees’ talent. This study aims to investigate job satisfaction among IT companies) employees and raise awareness about its significance for organizations, emphasizing the need for measurement and strategies to retain qualified employees. The potential implications include enhancing employee well-being, improving organizational productivity, reducing turnover rates, and attracting top talent in the rapidly growing IT industry. In this paper authors studied factors related with employee satisfaction in IT Companies in India. For analysing employee satisfaction, four hypotheses were designed and three independence

variable and two dependant variables were defined. The employees' physical and mental well-being is in jeopardy because of the intense work environment that prevails in IT organisations. According to the author's research, there are several aspects that can improve employees' job satisfaction in IT organizations.

The study's hypothesis are as follows:

H1: Work discipline increases the job satisfaction of employees in IT companies

H2: Personal factors increase job satisfaction of employees in IT companies

H3: Organizational culture increases the job satisfaction of employees in IT companies

H4: Job satisfaction has increased the employee performance of employees in IT companies

Overview of Job Satisfaction

A large body of literature has pointed to numerous factors involved in employee stress and burnout due to a combination of organizational stressors and individual characteristics. Job satisfaction is a complex and multifaceted construct widely studied in organizational behaviour. It refers to an individual's subjective evaluation of their job and the degree to which it meets their expectations and needs (Gilmeanu, 2015). Job satisfaction is an essential determinant of individual well-being and job performance, and it has been linked to various organizational outcomes such as productivity, turnover, absenteeism, and organizational commitment (Dorta-Afonso *et al.*, 2021). Several factors have been identified as predictors of job satisfaction, including demographic variables such as age, gender, and education, as well as job-related variables such as pay, job security, career development opportunities, and organizational culture. Job satisfaction is higher among employees who perceive their work as meaningful and exciting, have supportive supervisors and co-workers, and can balance their work and personal lives. Managers and employees are the two main parties involved in this scenario interested in this topic. From the Management's perspective, they want to discover contented employees who, in turn, will have a positive attitude toward the workplace and be devoted to and emotionally invested in their work. Additionally, workers develop their attitudes and expectations, expecting to be treated fairly and

politely. Consequently, a favourable dynamic will be crucial in achieving a competitive advantage. At the same time, an unfavourable outcome will hurt the overall achievement of organizational effectiveness and performance. Despite the extensive research on job satisfaction, there is still a need for more studies to explore the factors that contribute to job satisfaction in different industries and contexts and to investigate the relationships between job satisfaction and various individual and organizational outcomes. Furthermore, there is a growing interest in examining the role of job satisfaction in the context of the changing nature of work, such as the rise of the gig economy, the use of technology in the workplace, and the increasing importance of work-life balance (Saks, 2020).

Work discipline

Work discipline refers to the degree to which employees adhere to their organization's rules, policies, and procedures and exhibit behaviours consistent with the organization's goals and values. Discipline is a management strategy that helps corporate members adhere to numerous laws and regulations (Rivaldo and Nabella, 2023). It is more appropriate to define discipline as attitudes and behaviours that adhere to organizational rules (Sudarsih and Supriyadi, 2019).

The indicators of work discipline

Arriving on time, when talking about great work ethics, employees should do it promptly and neatly. Using organizational tools correctly can demonstrate a person's strong work ethic and prevent damage to equipment. High levels of accountability, disciplined workers constantly carry out their responsibilities and do their jobs well—adherence to organizational rules (Bock and Kim, 2002). However, work discipline can also be affected by external factors such as economic conditions, job market trends, and societal norms (Bamberger and Bacharach, 2006). For example, in times of economic uncertainty, employees may exhibit lower levels of work discipline as they perceive their job security to be threatened (Podsakoff *et al.*, 2000). In recent years, there has been a growing interest in using technology to monitor and enhance work discipline, such as surveillance cameras, electronic monitoring systems, and artificial intelligence (AI) algorithms. However, such technologies can also

raise ethical concerns about employee privacy and autonomy (Van Wel and Royakkers, 2019). Overall, work discipline is an essential construct in job satisfaction that has implications for individual and organizational outcomes.

Organizational culture

Organizational culture refers to the shared values, beliefs, and practices that characterize an organization and influence the behaviour of its members. Several factors have been identified as predictors of organizational culture, including leadership behaviour, organizational structure, industry norms, and employee characteristics. For example, organizations with transformational leaders who promote innovation and encourage employee empowerment are likelier to have a culture that supports creativity and risk-taking (Mokhber *et al.*, 2017; DeHooghet *et al.*, 2004). However, organizational culture can also be influenced by external factors such as societal norms, globalization, and technological advancements (Hofstede, 2011). For example, organizations operating in different countries may have different cultural norms and values that affect their organizational culture. According to research, affective commitment, job satisfaction, and information sharing strongly correlate with corporate cultural norms such as respect for people, innovation, stability, and aggression (Davidescu *et al.*, 2020). Job satisfaction is highest when cultural and individual demands are in harmony (Taskiran *et al.*, 2017). For instance, people with increased autonomy and high-performance goals will be more satisfied working in an environment with lax oversight and focused on rewarding achievement. The organizational culture of public business agencies will substantially impact the Organization's commitment and job satisfaction (Chang and Lee, 2007). Accordingly, it is believed that cultural dimensions considerably impact an employee's fierce dedication and job happiness, result orientation, professional features, harsh control and management, and practical affairs. Additionally, closed systems negatively impact every aspect of fierce dedication and employee job satisfaction (Chang and Lee, 2007). As a result, job satisfaction levels will correspondingly increase if employees demonstrate a greater identity with business cultures. The conclusion that organizational culture significantly improves employee work

satisfaction. It is advised to boost staff motivation and creativity, support them, and promote their ideas to improve administrative operations. The emotional quotient and its dimensions have a significant favourable influence on the organizational innovation of the employees. It will lead to better organizational culture, and better corporate culture will lead to job satisfaction among the employees (Tajpouret *et al.*, 2018).

Personal factors

Personal factors refer to individual characteristics that may influence job satisfaction. (Abdolshah *et al.*, 2018). These factors may include demographic variables such as age, gender, education, experience, personality traits, and attitudes toward work. Age is positively correlated with job satisfaction, with older workers reporting higher levels of job satisfaction than younger workers (Kumar, 2021). This may be due to several factors, including greater job security, higher salaries, and more significant opportunities for advancement. Gender is another personal factor that may influence job satisfaction, with some studies finding that women report lower levels of job satisfaction than men. This may be due to several factors, including gender discrimination, role conflict, and work-family conflict. Education and experience may also affect job satisfaction, with more educated and experienced workers generally reporting higher levels of job satisfaction (Judge and Bono, 2001). Personality traits and attitudes towards work are also important personal factors influencing job satisfaction. For example, individuals with high levels of extraversion may enjoy jobs that involve social interaction. In contrast, highly conscientious individuals may enjoy jobs involving responsibility and attention to detail (Srivastava *et al.*, 2015).

Employee performance

Performance is the capacity of the mind and body to carry out a task. Employee performance is a critical construct in organizational behaviour, referring to the extent to which employees can meet the expectations of their employers and perform their job tasks effectively (Ratnasari *et al.*, 2019). Employee performance and job satisfaction are often interrelated constructs. Job satisfaction can also impact employee performance. For example, research has shown that employees who are satisfied

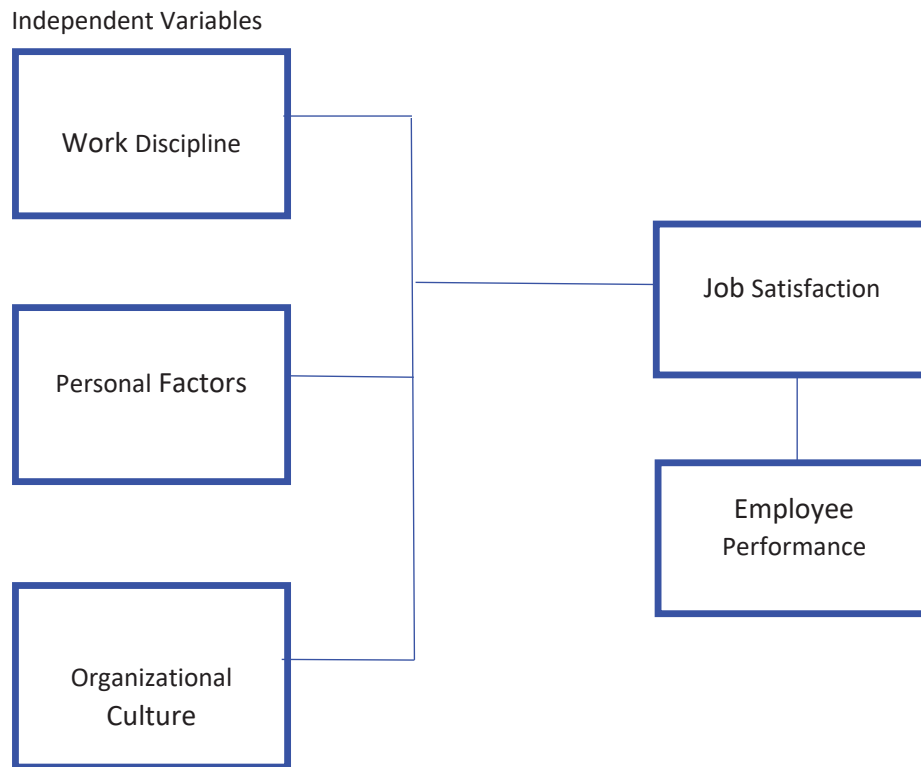


Fig. 1: Research model

with their job tend to exhibit higher levels of job performance, such as greater job involvement and reduced turnover intentions (Judge *et al.*, 2001). This suggests that job satisfaction can be vital in promoting employee performance and achieving organizational goals. Soft skills make people passive, whereas high skills enable people to execute tasks. Corporate objectives cannot be met even with highly developed tools, technology, and substantial funding. Training is one technique to make sure workers perform well. Training equips workers with the knowledge and skills to fulfil jobs, improving individual performance (Slutsky *et al.*, 2019). Managers of businesses should pay attention to the wants and demands that employees express. Clarifying team and organizational goals and providing managers with the opportunity to hear new perspectives and ideas from staff members will improve employee performance (Tajpouret *et al.*, 2023).

Work discipline, organizational culture, and personal factors significantly influence job satisfaction, all these factors are interconnected

and have a significant influence on each other. The detailed interconnection of each variable explains in further analysis. The study is conducted to assess the job satisfaction needs of the employees in major IT companies. The study helps to know the preferences and problems of the employees. Employee commitment is essential to increase productivity. If job satisfaction rises, it will increase employee commitment, and further, it will increase productivity. It is necessary to study job satisfaction.

Objectives of the Study

Due to the magnitude of the IT business, the primary goal of this survey is to determine how satisfied employees are with their jobs, raise awareness among the senior Management, and the importance of measurement of employee job satisfaction and building strategies for retaining qualified employees. The following are the study's particular goals:

- I. Determines the job commitment of employees in IT companies;

- ii. Determine how satisfied employees are with their jobs in IT companies;
- iii. Investigate the level of work discipline of employees in IT companies;
- iv. Investigate the personal factors of employees working in IT companies;
- v. Investigate the effect of organizational culture on the working of employees

The current study has been carried out in Pune and Mumbai cities in India in 2022.

MATERIALS AND METHODS

The distribution of job satisfaction across different demographic and occupational factors was summarised using means and standard deviations. Latent variable scores were generated by averaging the results of the items that made up the final CFA and SEM. The study used a descriptive survey design of correlational type. The measurement tool's appropriateness was examined by the reliability scale used. Correlational research is a type of research design that involves observing two variables to establish a statistically corresponding relationship between them to the extent that a change in one creates some change in the other (Bakhtiari and Jalilian, 2018). Therefore, a descriptive survey design of correlational type was considered appropriate for this study because it enables the researcher to find out the relationship among work discipline, personal factors, and organizational culture of employees. Considering the research goal and the literature review, the technique is analytical and interpretive. The study's objectives were achieved explicitly via the questionnaire's design. To test the proposed hypotheses, the collected data underwent statistical analysis. Both inferential and descriptive statistical methods were used to analyse the data. All data were processed using the Statistical Package for Social Science (SPSS) and AMOS (Fahimah *et al.*, 2023). Additionally, Tableau software makes compelling visualizations showcasing the variation in responses from each respondent. Data is collected through a series of questions through a Google form, shared across the target audiences to receive their opinion and point of view. These questions were curretted after thorough thinking and the extended procedure of trial and error. Extensive effort was put into making the questions relevant to the target audience and capturing their interest. Interest is

an essential factor while collecting data from the targeted sample because it assures honesty which further increases the accuracy of the research. The data has been affirmed through online responses. The questionnaire will be distributed electronically using online survey software such as Qualtrics or Survey Monkey. An email invitation will be sent to employees working in IT companies in the targeted region with a link to the online survey. The email will provide information about the purpose of the study, assurance of confidentiality and anonymity, and the estimated time to complete the survey. This approach was used because the study under consideration cannot maintain its focal point on every individual. The data definitely has been affirmed through online responses, with data collected and surveyed through Google Forms collecting 404 responses. All responses were collected from Mumbai and Pune cities irrespective of their designation and company turnover. Employees of IT organizations in the cities of Pune and Mumbai make up the study's statistical population. Researchers calculated the required sample size using a 95% confidence interval and a 5% error margin. These percentages are adequate for social science researchers. 404 individuals were thus chosen as the statistical sample. Data were gathered using a straightforward random sampling technique. Due to large populations random sampling method is convenient for the study. The sample size is verified from the sample size calculator. The total population of the study was 5.4 million, and as per the, 404 samples were sufficient for the study. Before the questionnaire was circulated, the respondents were provided with instructions. Data analysis will be conducted using statistical software such as SPSS (Parsafar *et al.*, 2023). Descriptive statistics will be used to summarize the sample's demographic characteristics and job satisfaction measures. Inferential statistics, such as regression analysis, were used to identify any significant differences in job satisfaction based on demographic characteristics and to examine the relationship between job satisfaction and other variables of interest.

Measures

This research uses a five-pointer Likert scale ranging between 1 to 5 (that is, 1 = strongly disagree, 2= disagree, 3= neutral, 4= agree and 5= strongly agree), considering the pointers of these constructs.

Five components established by (Yuliandi, 2019) were applied to calculate work discipline. Five parameters built on the learning by (Denison and Mishra, 1995) were exercised to obtain information on organizational culture. Four objects found in education by were utilized explicitly for quantifying personal factors affecting job satisfaction. Four dimensions formulated on the learning by (Ratnasariet al., 2019) helped to collect information on employee performance. There were also specific demographic measures, such as:

1. Age: Participants will be asked to indicate their age in different groups.
2. Gender: Participants will be asked to indicate their gender as male or female.
3. Education Level: Participants will be asked about their highest achieved education level.

RESULT AND DISCUSSION

This study aims to examine the complexities of employee attitudes, measure employee satisfaction, and examine the influence of personal issues at work. A survey of the literature explains the actual state of employees. Several measurement constructs have been chosen to understand the factors influencing job satisfaction. The significance of each construct is as follows:

Work Discipline: is a crucial assessment construct because disciplined employees are more likely to be motivated, productive, and satisfied with their jobs. Work discipline can contribute to a positive work environment and foster a sense of responsibility and accountability among IT employees.

Organizational Culture: By measuring corporate culture, the study aims to understand how the cultural aspects of an IT company, such as teamwork, communication, and support, impact job satisfaction. A positive and supportive organizational culture can enhance job satisfaction by fostering a sense of belonging, collaboration, and alignment with corporate values.

Personal Factors: By considering personal factors, the study explores how individual attributes and circumstances interact with job satisfaction among IT employees. Understanding these factors can help identify individual needs, preferences, and challenges that affect job satisfaction.

Employee Performance: It is an essential construct to measure as job satisfaction is closely linked to performance outcomes. Satisfied employees are

more likely to be engaged, motivated, and committed, leading to higher productivity and quality work. By examining the relationship between employee performance and job satisfaction, the study can shed light on the reciprocal influence between these constructs.

Job Satisfaction: This study's central construct serves as the dependent variable. Job satisfaction is crucial as it impacts employee well-being, motivation, productivity, and retention. Organizations can implement strategies to enhance job satisfaction levels and create a positive work environment by understanding the factors contributing to IT employees' job satisfaction. Table 1 illustrates the questionnaire for the data on a five-point Likert scale rating. The information in the questionnaire is used to explain the effect of work discipline, organizational culture, and personal factors on job satisfaction. The respondent's considered the research's motive and filled out the questionnaire.

Demographics analysis

The enumeration data of the measured 404 samples wielded through SPSS 20 software highlighted in Table 2 communicate that 50.3% of the responders were male gender, 28.7% were female, and 21% preferred not to mention. Regarding age, 28.7% of the responders were below 24, 38.1% were 24-30 years, 27% occurred between 31-40 years, and 6.2% were under age over 40. The responders were from various IT firms, and they had a range of specializations in areas like technical, human resources, finance, etc. The initial part of the questionnaire showcases the behaviour of IT employees through factors like work discipline, organizational performance, and the impact of personal characteristics on their work and performance. Statistics demonstrated in the responses indicate the experiences of the IT employees. The study uses a statistical approach to understand the demographic existence in the respondent's data.

Psycholchometric analysis

Several statistical studies were carried out to analyze the Psycholchometric qualities of the testing items and assess the suggested hypothesis. Specifically, this study follows the Structural Equation Modelling (SEM) procedure to acquire statistical findings. Before evaluating the conceptual model, the

Employee's satisfaction in IT Companies

Table 1: Measurement constructs

Items	Variable	Sources
Work Discipline		
Work Discipline1	You have a feeling of following all organizational rules at your work.	Yuliadi, 2019
Work Discipline 2	You may only sometimes feel like you can get to work on time.	
Work Discipline 3	You may only sometimes feel the need to protect organizational equipment.	
Work Discipline 4	You consistently make an effort to finish the allocated work well.	
Work Discipline 5	You always abide by the guidelines established by the company.	
Organizational Culture1	You are satisfied with the information you receive about what is happening within the company.	Yuliadi, 2019
Organizational Culture2	You are satisfied with the attitude and nature of your seniors within the campus.	
Organizational Culture3	You are satisfied with the information you receive about what is happening within your Department/Unit.	
Organizational Culture4	Your direct supervisor explains clearly all your assignments.	
Organizational Culture5	You receive enough communication to be able to do your job effectively.	
Personal Factors		
Personal Factors1	Most of the time, your work is engaging enough to prevent boredom.	Brayfield and Rothe, 1951
Personal Factors2	Most of the time, you have to force yourself to go to work.	
Personal Factors3	If the workplace is highly comfortable, you will work with greater satisfaction.	
Personal Factors4	Your position in the company does have any impact on your satisfaction levels.	
Employee Performance		
Employee Performance1	Are you satisfied enough with your job, which motivates you to complete your work before the deadline?	Ratnasariet <i>al.</i> , 2019
Employee Performance2	Do you always want to share your responsibility with other employees related to? Y	
Employee Performance3	Do you always handle the criticism of your work?	
Employee Performance4	Do you always follow up on the requests quickly?	
Job Satisfaction		
Job Satisfaction1	You are happy about choosing your particular company because of its future commitments.	Khaleque and Wadud, 1984
Job Satisfaction2	Due to future job stability, it is morally correct to work for this company.	
Job Satisfaction3	You are glad to be an employee of your company because of its healthy working conditions.	
Job Satisfaction4	Overall, you are satisfied working with your company because of the allowances and various benefits.	

Table 2: Demographics

Serial Number	Classification	Category	Frequency	(%)
1	Gender	Male	203	50.3
		Female	116	28.7
		I prefer not to say	85	21.0
2	Age	Less than 24	116	28.7
		24 to 30	154	38.1
		31 to 40	109	27.0
		More than 40	25	6.2
		High School	29	7.2
3	Education	Undergraduate Degree	193	47.8
		Post- Graduate Degree	80	19.8
		Other	102	25.2

measuring instruments' accuracy and credibility were assessed using confirmatory factor analysis (CFA).

Measurement model results

The measure's reliability and validity can be examined in various ways. One method of evaluating reliability is to look at the weight of a particular element for every construct. When assessing the model's quality, the factor loading of each member of the four factors is listed in Table 3. The internal reliability was confirmed through a Cronbach alpha calculation for each element. Alpha values greater than 0.7 are acceptable (Kline, 2013). It was confirmed that all values exceeded the proper alpha value, indicating the study instrument's reliability. In Table 3, Cronbach's α coefficient of "work discipline" is 0.837; "organizational culture" is 0.975; "personal factors" is 0.949; "employee performance" is 0.961, and "job satisfaction" is 0.955. The Cronbach's values

for every construct in this research are more than 0.7, indicating that the evaluation results are satisfactory. Based on the findings, the measures provided to assess the collection of variables were valid.

Discriminant Analysis

The acceptability of the study depends on the measurement's validity. The Kaiser-Meyer-Olkin and Bartlett test assesses the available data altogether. A Kaiser-Meyer-Olkin value should be above 0.5, and a level of significance for Bartlett's trial, which should be below the range of 0.05, would indicate a correlation substantially in the data. Kaiser-Meyer-Olkin returns the value mostly between the range of 0 and 1. As per the thumb rule, while defining the stats, the Kaiser-Meyer-Olkin gives out results between 0.8 and 1, which means that there is adequate sampling (Rosenblad, 2011). And if the values are below 0.6, it would stipulate that there is sufficient sampling and

Table 3: Psycholchometric properties of measures

Constructs	Items	Mean	SD	Factor Loadings	Cronbach's Alpha	Average Variance Extracted (AVE)	Composite reliability (CR)
Work Discipline (WD)	WD1	3.116	1.237	0.582	0.837	0.620	0.889
	WD2	3.509	1.251	0.737			
	WD3	3.297	1.331	0.885			
	WD4	3.116	1.339	0.842			
	WD5	3.423	1.370	0.852			
Organizational culture (OC)	OC1	3.104	1.356	0.940	0.975	0.878	0.973
	OC2	2.623	1.147	0.927			
	OC3	2.876	1.289	0.961			
	OC4	2.962	1.316	0.920			
	OC5	2.772	1.237	0.937			
Personal Factors (PF)	PF1	3.722	1.117	0.788	0.949	0.682	0.914
	PF2	3.279	1.243	0.856			
	PF3	3.819	1.086	0.845			
	PF4	3.472	1.243	0.780			
Employee Performance (EP)	EP1	3.396	1.236	0.851	0.961	0.663	0.886
	EP2	3.378	1.233	0.699			
	EP3	3.423	1.240	0.849			
	EP4	3.306	1.226	0.848			
Job Satisfaction (JS)	JS1	3.769	1.093	0.828	0.955	0.744	0.920
	JS2	3.341	1.134	0.872			
	JS3	3.472	1.127	0.885			
	JS4	3.601	1.119	0.864			

action must be taken to rectify. The Kaiser-Meyer-Olkin testing uses all the data that is available and evaluates them. Thus, Kaiser-Meyer-Olkin values between the range of 0.8 and 1 stipulate that samples are adequate, and Kaiser-Meyer-Olkin values below 0.6 demonstrate that the model is not sufficient (Rosenblad, 2011). As shown in Table 4, all the Kaiser-Meyer-Olkin (KMO) values for the data are for Work discipline (0.787), organizational culture (0.937), personal factors (0.825), employee performance (0.814) and job satisfaction (0.862). The transpose seized by the variables that correspond to the proportion of substitute by the mistakes is measured by Average Variance Extracted (AVE). To successfully achieve the criteria of the discriminant validity, the AVE square root that is structured should be greater than the specific amount of change captured by the term that corresponds to the amount of change caused by measurement mistakes measured by the Average Variance Extracted (AVE), i.e., being greater of every variable in the model construct. The square root of the AVE of the individual variables present is the parentheses score's diagonal. The values that are not diagonal are constructed with square correlations. Table 4 has more correlations between all the variables, which signifies that the four constructs are effective. Thus, after the accurate analysis of the study, there is good reliability for all the constructs applied and demonstrated in the research.

Confirmatory Factor Analysis

Fig. 2 shows a significant correlation between the

independent and dependent variables. The model in the study gives results of the correlation along the independent variables having a substantial relation to variables dependent on regulating the variables. Thus, as the significant proportions of these variables are correspondents, it means that all the variables have an impact and are correlated with the job satisfaction of employees. The covariance of the variables is mentioned. The estimated correlation is statistically significant. The affirmation of the credibility indices of constructs before and during an adjustment is put forward by the AMOS 24 software. However, the objective of covariance analysis is to simplify the responses collected by the respondents and the difference in the degree of reactions. The variance is calculated if it is around five, which is the maximum value on the scale. This indicates that the data used could be more advocated for the analysis. In contrast, the analysis is endorsed if the covariance is around zero.

Structural equation analysis

This paper uses structural equation modelling (SEM) to evaluate the hypothesis through AMOS. It was found that the model's fitness was acceptable. According to Fig. 3, (1) work discipline, organizational culture, and personal factors have a beneficial impact on job satisfaction, and (2) job satisfaction positively influences employee performance. The SEM's reasonable measures findings show that the model's fit to various constructs is satisfactory. It demonstrates a significant correlation between work

Table 4: Discriminant validity

Constructs	Kaiser-Meyer-Olkin	Work Discipline	Organizational Culture	Personal Factor	Employee Performance	Job Satisfaction
Work discipline	0.564	(0.787)				
Organizational culture	0.869	0.239	(0.937)			
Personal factor	0.794	0.606	0.216	(0.825)		
Employee performance	0.828	0.645	0.228	0.604	(0.814)	
Job satisfaction	0.861	0.482	0.396	0.865	0.610	(0.862)

Notes: n = 404. The scores of parentheses presented diagonally are the root of the square average variance extracted from the individual constructs. Non-diagonal values are cross-constructed squared correlations.

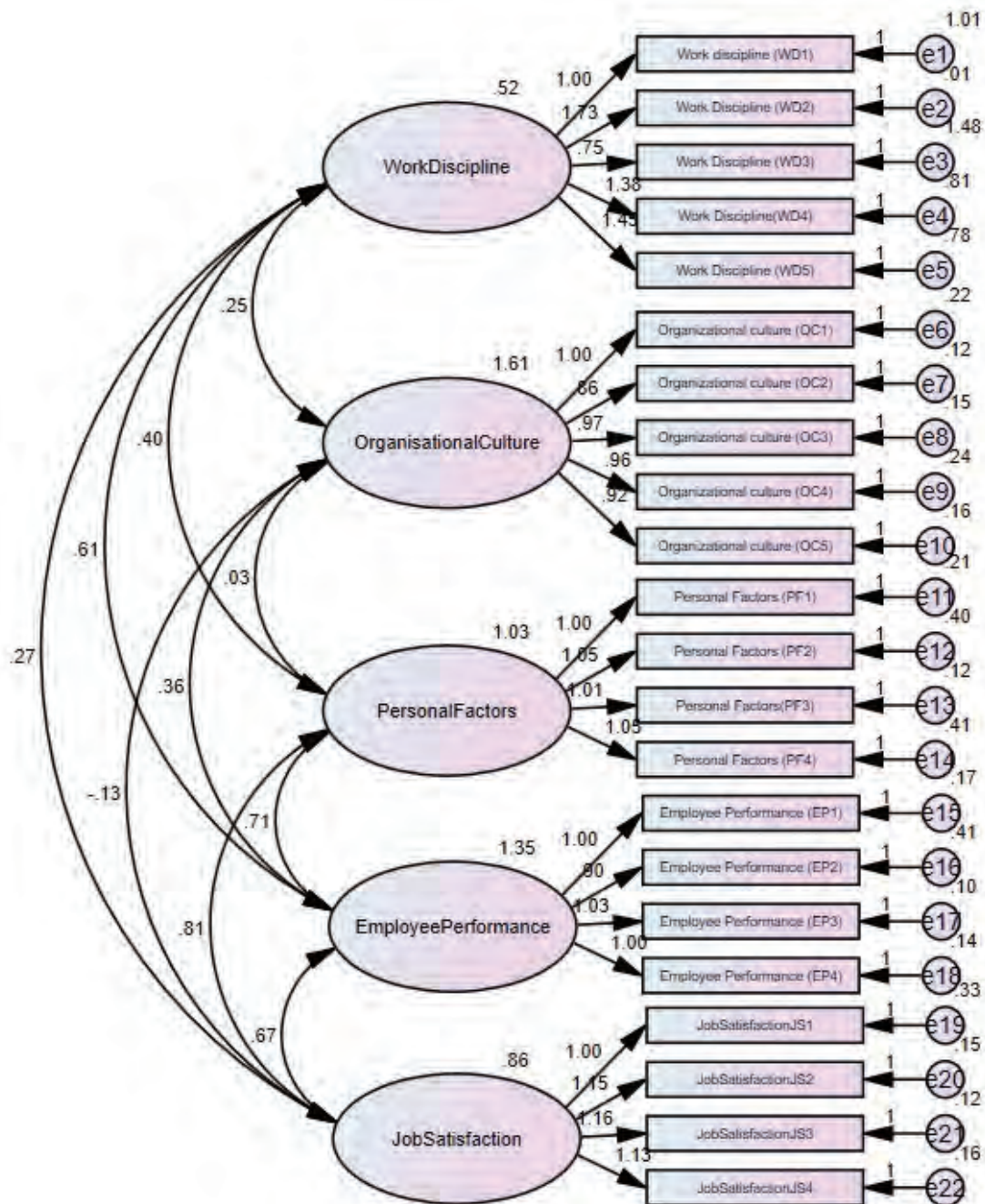


Fig. 2: Confirmatory Factor Model

discipline, organizational culture, and job satisfaction. Similarly, the correlation is substantial even in personal factors and job satisfaction. Thus, implying the relations between the constructs.

Job satisfaction

Analysis in Fig. 4 shows the ratings given by the respondents based on whether they are satisfied working with their company because of

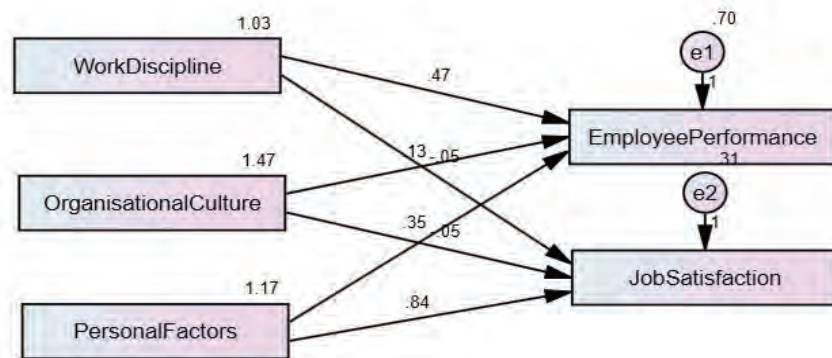


Fig. 3: Structural equation modelling

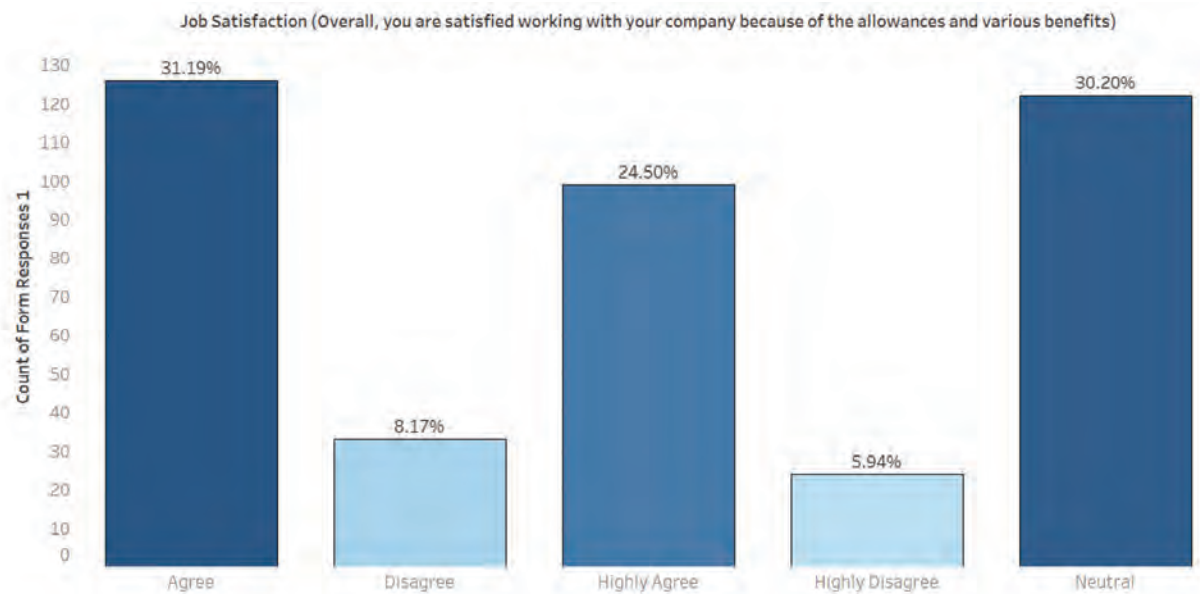


Fig. 4: Job satisfaction

the allocated allowances and benefits. According to the total responses, 31.19% of respondents said they were delighted with their employer, and very few respondents disagreed with the allowances and benefits they received. This demonstrates that companies are very aware of the elements that will raise the satisfaction levels of the employees. Nowadays, people research the types of benefits and allowances they will receive from a company before deciding whether to work there (Jones, 2017). The primary reasons for dissatisfaction among employees are low pay and less opportunity for career growth.

Analysis in Fig. 5 exhibit the ratings given by the

respondents based on whether they are happy about choosing their particular company because of their future commitments. The graph shows that 49% of the respondents are pleased with their company choice. Everyone desires job security, and companies work to provide it by making promises about the future to keep employees with them longer. Few respondents disagreed so companies should try to give them a feeling of job security. This is a crucial consideration when picking any company for work. Human resource managers should provide a good career overview plan and a career development program. This thing helps increase satisfaction levels

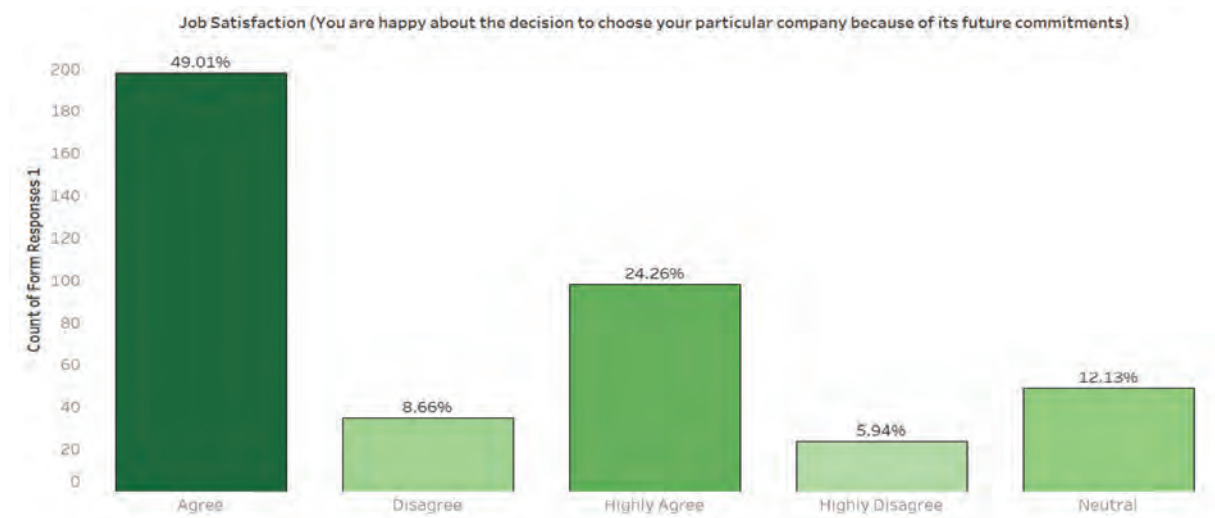


Fig. 5: Job Satisfaction

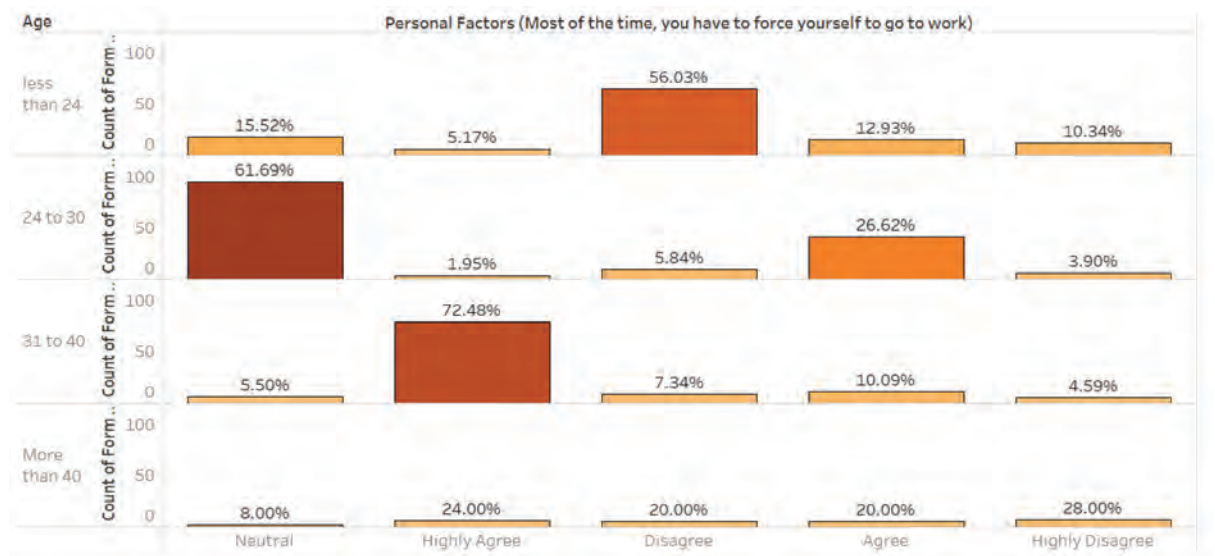


Fig. 6: Personal factors

and future commitment to the company.

Personal factors

Analysis in Fig. 6 exhibits the ratings the respondents gave based on the statement that they must usually force themselves to go to work. This graph is also filtered by the different age sections. The first section is of the respondents who are less than 24, and 56% of them disagreed with this statement. This could be because individuals in their early twenties

are often still exploring their career paths and may be more likely to switch jobs or careers than older employees. Also, some individuals in this age group may feel more motivated and excited about their jobs. The graph's section for ages 31 and 40 is another noteworthy feature. Around 72.5% of respondents between the ages of 31 to 40 highly agreed with this statement. This could be because of the increasing responsibilities such as raising a family, paying a mortgage, or taking care of aging parents. This can

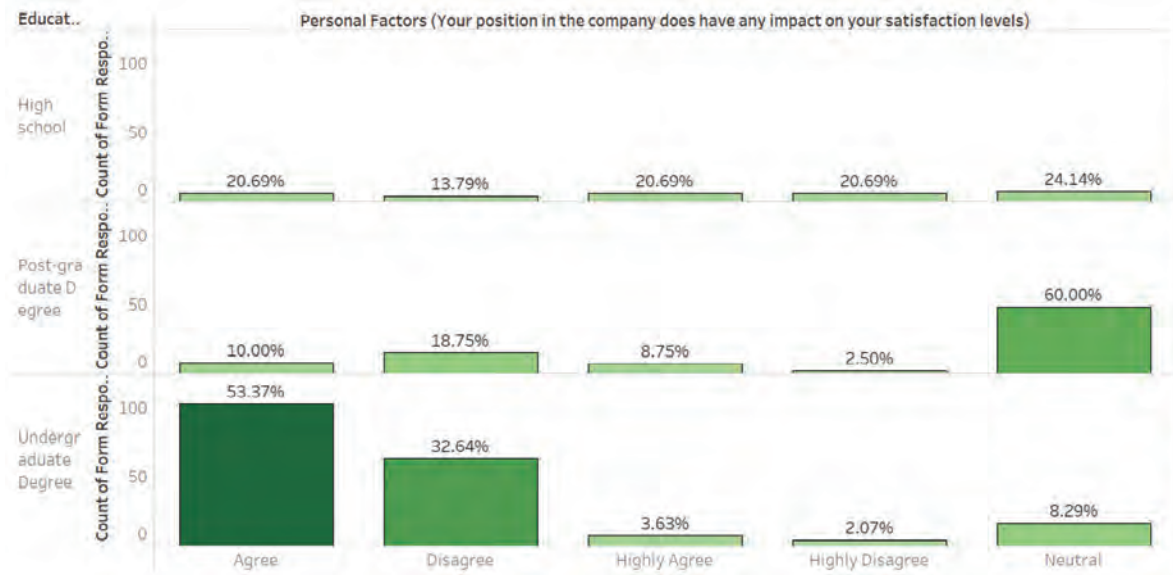


Fig. 7: Personal factors

create financial pressures and stress, impacting their motivation to work. Additionally, individual may feel career stagnation or burnout if they have been in the same job or industry for a long time.

Analysis in Fig. 7 displays the ratings the respondents gave based on the statement that their position in the company does not impact their satisfaction levels. The graph is further filtered by various degrees of education. It can be seen that among respondents with an undergraduate degree, 53.37% of them concurred that their job affects how satisfied they are with their jobs. This could be because employees with undergraduate degrees who are in entry-level positions may feel unfulfilled if their job challenges them more or if they do not have the opportunity to use their skills and knowledge to their fullest potential. The position of an employee with an undergraduate degree can affect their satisfaction levels due to factors such as job responsibilities, compensation, opportunities for growth, and work-life balance. Another thing to note is that 60% of the employees with postgraduate degrees in the second part of the graph have neutral opinions. They have expressed various opinions, which may cause their inability to concur completely. Postgraduate degree holders may have higher standards for the kind of work they want to do. They may feel underutilized if their position does not use their skills and expertise.

This might result in less work satisfaction. After receiving their postgraduate degree, some employees don't care about their position. They begin to become satisfied with their jobs, pay, and positions.

Organizational culture

Analysis in Fig. 8 exhibits the ratings given by the respondents based on the statement of whether they are satisfied with the attitude and nature of their seniors within the campus. It is evident from Fig. 8, that 102 of the respondents strongly disagree with the statement that they are pleased with their seniors' attitude. This could be because of many reasons. One of the primary reasons can be ineffective communication. If seniors are not communicating effectively with their employees, it can lead to misunderstandings and frustration. In the IT industry, where technical expertise is essential, seniors must communicate technical information clearly and guide their employees. Another primary reason is the need for recognition. Employees often work on complex projects that require a high level of skill and expertise. If seniors do not recognize their employees' contributions or provide opportunities for professional development, it can lead to a lack of job satisfaction. It is essential for every company to ensure that their seniors behave with good attitudes towards their employees. A positive attitude from seniors can

Organizational culture (You are satisfied with the attitude and nature of your seniors within the campus)

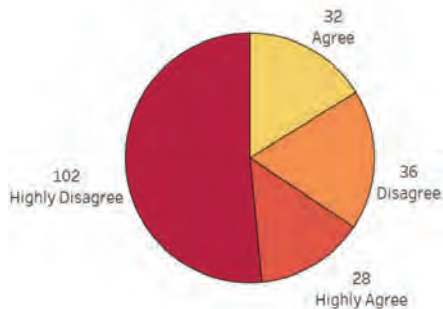


Fig. 8: Organizational culture

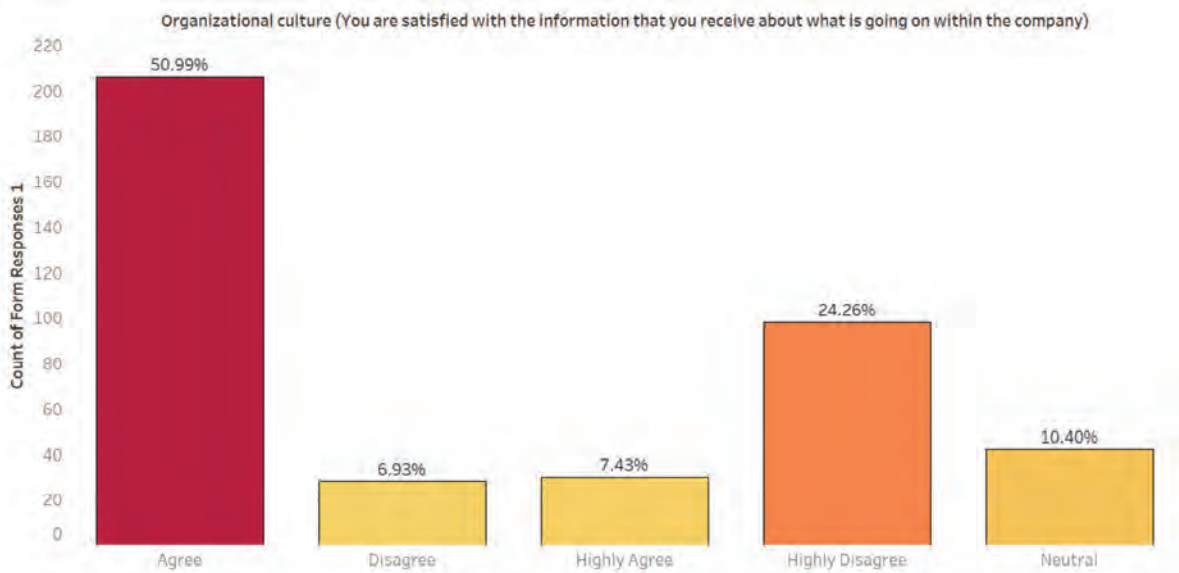


Fig. 9: Organizational culture

contribute to a positive work environment, which can lead to higher job satisfaction among employees.

Analysis in Fig. 9 shows the respondents' ratings based on whether they are satisfied with the information they received about what is happening within the company. The graph clearly shows that 50% of the respondents have agreed that they are satisfied with the information they receive about what is happening within the company. This shows that the organizational culture is at its best in such companies.

Employees value transparency from their employers. When employees feel that they are kept in the loop about what is happening within the campus, they are more likely to trust their employers and feel that their contributions are valued. Communication about what is happening on campus can help facilitate employee collaboration. When employees are aware of what is happening across the Organization, they are more likely to identify opportunities for collaboration and share knowledge and resources.

Employee Performance (Are you satisfied enough with your job which motivates you to complete your work before deadline)

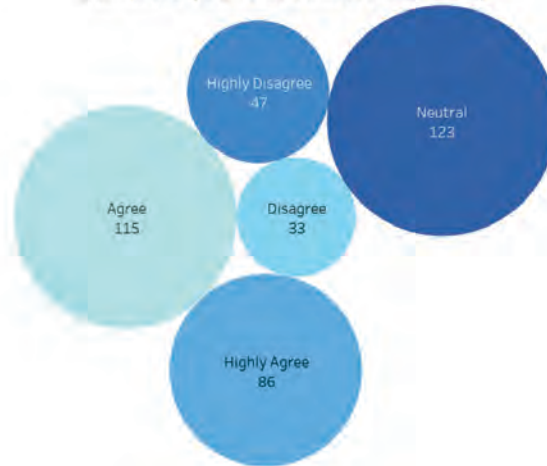


Fig. 10: Employee performance

Employee performance

Analysis in Fig. 10 exhibits the respondents' ratings based on whether they are satisfied enough with their job, which motivates them to complete their work before deadlines. The chart shows that most of the respondents have agreed the fact that they are satisfied enough to complete their work before deadlines. This would lead to higher employee performance and would help the company. When employees clearly understand what is expected of them and what they need to accomplish, they are more likely to feel motivated and engaged in their work. Also, when employees clearly understand what is expected of them and what they need to accomplish, they are more likely to feel motivated and engaged in their work. The primary reasons for failing to meet deadlines are poor time management and team issues and disputes. The manager can improve the communication among the team members to improve the performance of employees in meeting deadlines on time.

Analysis in Fig. 11 displays the ratings the respondents gave based on whether they always handle the criticism of their work or not. The information depending on gender is also depicted on the graph. It can be seen that males have highly agreed that they always handle the criticism of their work. Female respondents have also agreed but not more than males. The reason behind this can be that in the IT industry, many cultural stereotypes suggest

men are supposed to be strong and confident. In contrast, women are supposed to be nurturing and emotional. As a result, men may feel more pressure to appear resilient and unbothered by criticism. Also, in some workplaces, men may hold more power positions than women, making it easier for them to dismiss or deflect criticism. Therefore, Employee performance is higher when they can handle criticism regarding their job.

Work discipline

Analysis in Fig. 12 exhibits the ratings given by the respondents based on the statement that they may only sometimes feel like going to work on time. The information depending on gender is also depicted on the graph. Males have highly agreed on the fact that they do not always feel like going to work on time. Men, like anyone else, may have personal issues that affect their motivation to go to work. This could include relationship problems, financial stress, or health issues. Also, Men may experience stress related to their job, such as high workload, tight deadlines, or difficult co-workers. This can make it challenging to feel motivated to go to work on time. At the same time, female respondents have neutral thoughts regarding this statement. Women tend to prioritize their responsibilities, including work and may feel more obligated to meet them. Additionally, women may feel more pressure to prove themselves in the workplace and may be more likely to adhere to

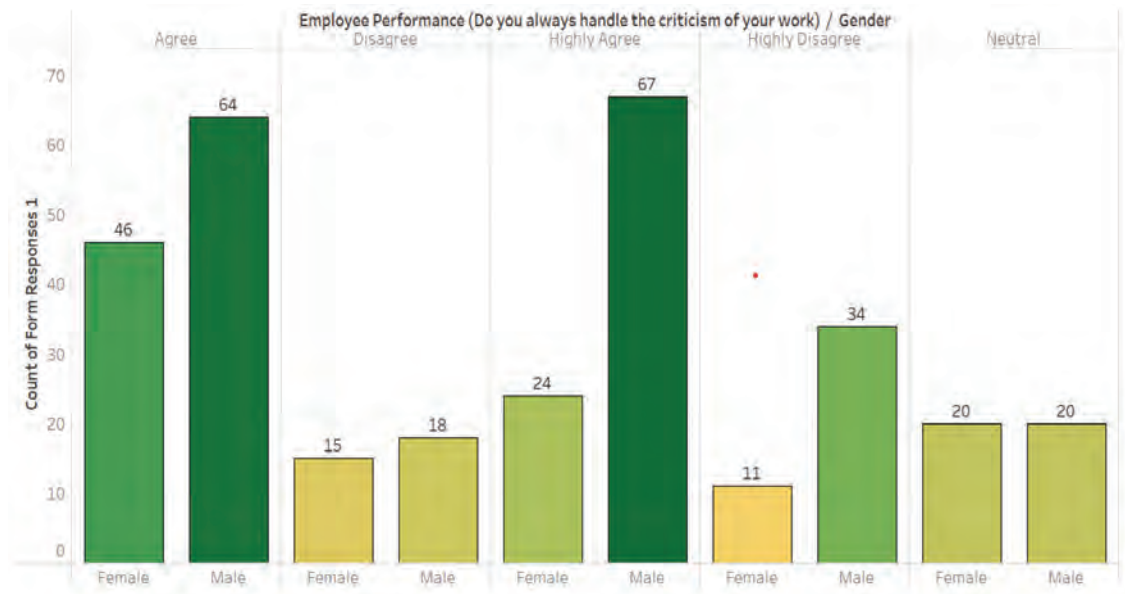


Fig. 11: Employee performance

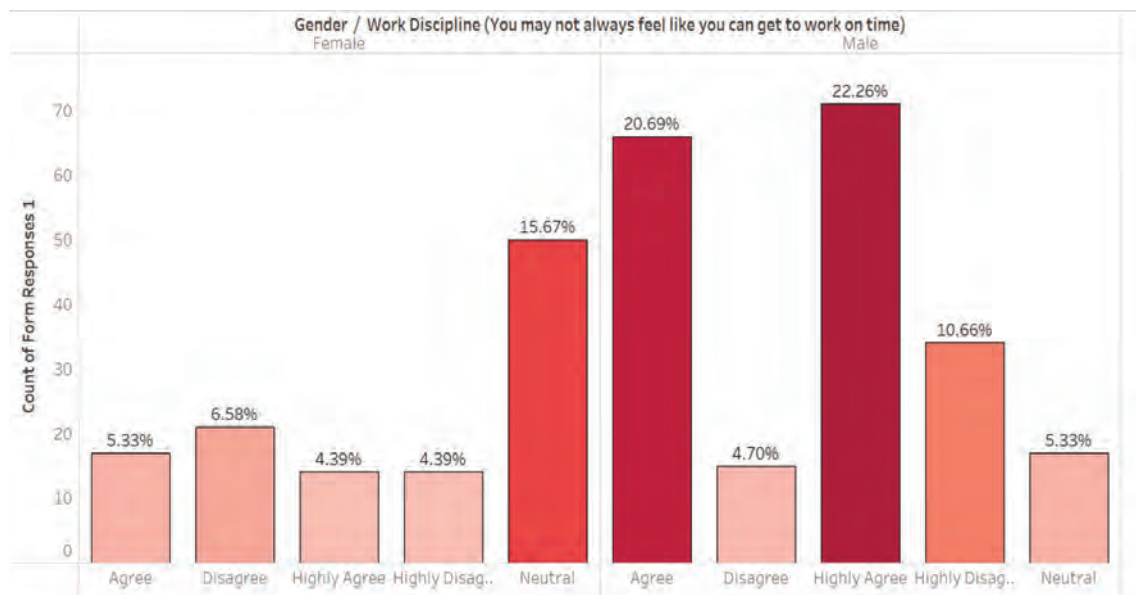


Fig. 12: Work discipline

traditional gender roles and expectations.

Analysis in Fig. 13 exhibits the ratings given by the respondents based on the statement that they feel like following all organizational rules at work. Different age sections further filter the graph. In the age group from 31 to 40, 60% of the respondents agreed that they feel like following all organizational

rules at work. Employees in this age range are likely to be at a stage in their career where they have gained some experience and are looking to establish themselves in their profession. They may see following organizational rules as demonstrating professionalism and commitment to their job. Also, individuals in this age range may have personality

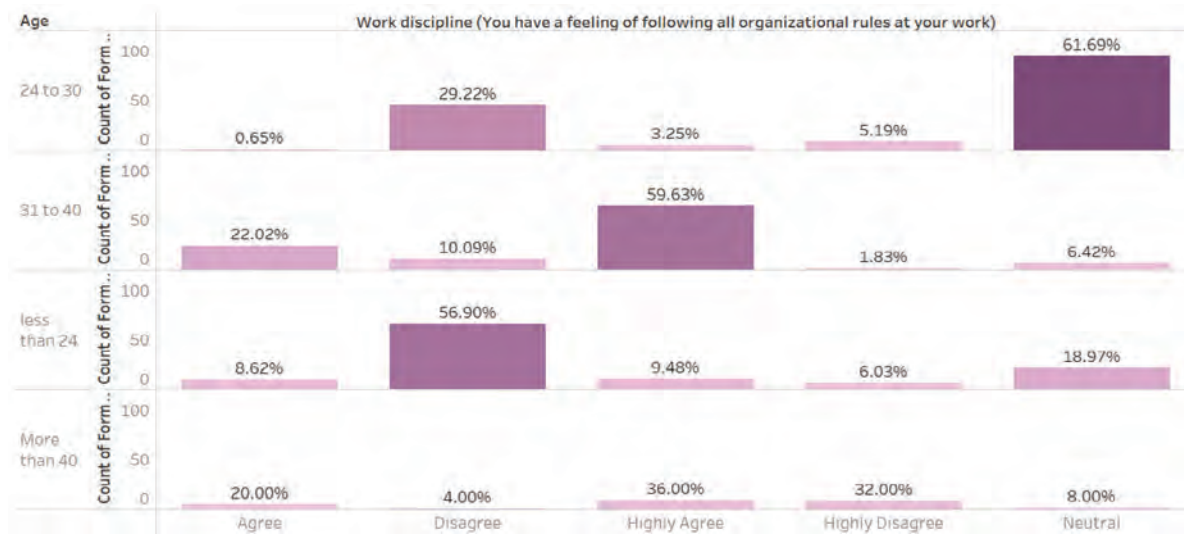


Fig. 13: Work discipline

traits or values that make them more inclined to follow the rules, such as a strong sense of duty or a preference for structure and order. Another interesting finding is that 57% of respondents under 24 disagreed with the statement that they feel like following all organizational rules at work. Employees in this age range may have limited work experience and must fully understand the importance of following organizational rules. Individuals in this age range may feel confident in their abilities and be more willing to take risks and try new things, even if it means bending or breaking some rules. Also, some younger employees may perceive organizational rules as unnecessary or outdated or need to understand their rationale fully. Several studies have shown that age has a significant positive effect on overall work satisfaction, which has established the results of the current study. Numerous studies have also found similar results. Their studies have shown a difference in job satisfaction between young and old employees. The higher the job satisfaction with age, the older an employee is, the higher the level of job satisfaction. Also, studies have found that all supervisors who are married and married employees are more satisfied than unmarried. Similarly, the supervisors were more experienced, and more experienced employees were more satisfied than less experienced (workers), but not statistically significant. This research paper has some strong points that make it unique. Data analysis

has been done using the world's well-established measurement scale. Moreover, the collected data is collected through surveys to be accurate, and the reliability and validity value is obtained at the accepted rate. The research work has been followed scientifically at every level from beginning to end. It has been carefully examined by an author, which is considered one of the most vital aspects of this research. Job happiness and age are positively connected, with older employees reporting higher levels of job satisfaction than younger employees (Kumar, (2021). Another individual aspect that may affect job happiness is gender; according to some research, women report lower levels of job satisfaction than males (Judge and Bono, 2001). Our research showed us how vital employee satisfaction is to meeting organizational goals and preserving staff loyalty. For IT companies to maximize the potential of their staff and acquire a competitive edge in the globalized economy, it is essential to create the circumstances for employee satisfaction. To improve employee happiness and general performance, businesses should develop a culture of accountability, professionalism, and discipline. When senior staff members fail to communicate clearly with their staff, it can cause confusion and resentment among the employees. Collaboration among employees can be facilitated via communication regarding campus events. Poor time management, team conflicts,

and disagreements are the main causes of deadline misses. Women are more likely to prioritise their obligations, especially their work, and feel more pressure to fulfil them.

CONCLUSIONS

One of the biggest issues facing Management in all IT companies is job satisfaction. The average satisfaction score in the current investigation shows that IT company employees are generally satisfied. The value of employee satisfaction in attaining business goals and retaining employees. Creating the necessary conditions for employee satisfaction is crucial for IT companies to harness the full potential of their workforce and gain a competitive advantage in the globalized world. Organizations should focus on cultivating a culture of discipline, professionalism, and accountability to enhance employee satisfaction and overall performance. Employees are a valuable resource for an IT company to survive and thrive. IT companies need their employees to feel satisfied to achieve the overall objectives and remain loyal to the company to achieve company success. The employees' satisfaction is the premise of this commitment and dedication. Employees can become a priceless asset by providing the necessary conditions for an employee to feel satisfied. They can contribute in many ways for a company to achieve a competitive advantage in a globalized world. Employee satisfaction can help reduce turnover, which is high in the dynamic IT sector. The findings characterize the most important features that satisfy IT workers, providing the IT human resource department's valuable insights to align their strategies following their employees' desires and expectations. Specifically, the results highlight that IT managers should listen to their staff's advice on their needs, management issues, and team. By highlighting workload as unfavourable, employees signal the need for further attention to improve teamwork and work balance to increase satisfaction. Hence, human resource departments can take team-building initiatives to address such challenges. Regarding the positive items, learning is clearly outlined, with the company's brand and environment also playing a role in employee satisfaction. Thus, workers appreciate working under pivotal brands. This study shows that job satisfaction is a consideration for organizations because it affects employee

performance. In addition, work discipline positively impacts employee performance. This research shows that work discipline positively and significantly affects job satisfaction. Expanding the sample area and adding variables in future research is necessary. Furthermore, supervisors and managers play a vital role in enhancing job satisfaction and employee performance by providing effective communication, support, and guidance. By recognizing the importance of job satisfaction, managers can create an environment that motivates and engages employees, leading to better performance, increased productivity, and reduced employee turnover. As a suggestion for future research, this research aims to investigate the job satisfaction of employees working in IT companies for a long time. This study was conducted in a specific geographic region, and future research could explore the differences in job satisfaction and employee performance across different cultures and regions. Also, in the future, the research could explore additional factors that may affect job satisfaction and employee performance in the IT industry, such as work environment, job autonomy, and workplace relationships. Another interesting aspect could be comparing the job satisfaction and employee performance of IT employees with employees in other industries to understand the unique factors that contribute to job satisfaction and employee performance in the IT industry. Despite the insights and contributions of this paper, some limitations need to be addressed and considered for future research. The collected data refers to the general employees of the Indian IT companies and not to specific departments of those companies. The responses we have taken from the employees may represent only some of the population of IT employees, which could limit the generalizability of the findings. There could be a problem in the accuracy of results as there may be a risk of response or social desirability bias. Also, the main focus of this research is only on IT companies which may limit the generalizability of the findings to other industries and contexts. Therefore, in future research, data should be separated by departments to perceive the most meaningful variables of job satisfaction of each IT company department. It would be interesting to understand why top managers are satisfied with their position at an IT company and which factors are most relevant to their satisfaction.

Limitation

Despite the insights and contributions of this paper, some limitations need to be addressed and considered for future research.

1. The collected data refers to the general employees of the Indian IT companies and not to specific departments of those companies.
2. The responses we have taken from the employees may not be representative of the entire population of IT employees, which could limit the generalizability of the findings.
3. There could be a problem in the accuracy of results as there may be a risk of response or social desirability bias.
4. The main focus of this research is only on IT companies which may limit the generalizability of the findings to other industries and contexts.

Implications

1. *Employee engagement*: By identifying the factors contributing to job satisfaction in IT companies, this research can provide insights into how organizations can better engage and motivate their employees.
2. *Organizational culture*: Understanding how organizational culture affects job satisfaction can help organizations identify areas to improve their culture to create a more positive and productive work environment.
3. *Recruitment and retention*: This research can help organizations identify the most critical factors to IT employees and use this information to recruit and retain top talent.
4. *Policy and practice*: The findings of this research may have implications for policy and practice related to job satisfaction in the IT industry, including issues related to compensation, work-life balance, and career development.

AUTHOR CONTRIBUTION

D. Singhal and H.A. Salunkhe performed the conceptualization and literature review, compiled the data, manuscript preparation, and edited references. D. Singhal performed the methodology, analysed and prepared the manuscript text and manuscript preparation.

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CONFLICT OF INTEREST

The authors declare no potential conflict of interest regarding the publication of this work. In addition, the ethical issues, including plagiarism, informed consent, misconduct, data fabrication, falsification, double publication, submission, and redundancy, have been entirely witnessed by the authors.

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ABBREVIATIONS

AI	Artificial intelligence
AMOS	Analysis of a moment structures
AVE	Average variance extracted
CFA	Confirmatory factor analysis
CR	Composite reliability
EP	Employee Performance
IT	Information technology
JS	Job Satisfaction

KMO	Kaiser-meyer-olkin
NASSCOM	National association of software and service companies
OC	Organizational culture
PF	Personal Factors
SEM	Structural equation modelling
WD	Work Discipline

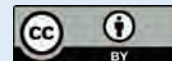
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ORIGINAL RESEARCH PAPER

Constructing the organizational excellence model using technique for order of preference by similarity to ideal solution and Analytic hierarchy process

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(TOPSIS)

ABSTRACT

BACKGROUND AND OBJECTIVES: Excellence models are essential for organizations to improve performance. Deming Prize, Canada Awards for Excellence, Malcolm Baldrige National Quality Award, and European Quality Award are the most well-known excellence models worldwide. These models do not present any mathematical model in accordance with a comprehensive step-by-step roadmap for implementation. Moreover, they are general models and have not been customized for a specific organization. So, this article presents a comprehensive, graphical, step-by-step roadmap to implement an excellent model for Tehran Municipality that is elevated by Technique for order of preference by similarity to ideal solution and analytical hierarchical process to make decisions by mathematical analysis.

METHODS: Different excellence and performance models have been studied, and then an excellence model for deputies of Tehran Municipality is designed. Also, an Analytical hierarchical process for weight extraction and a Technique for order of preference by similarity to an ideal solution for ranking is applied.

FINDINGS: A novel excellence model for deputies of Tehran Municipality has been developed. Strategies, goals, objectives, targets, critical success factors, and general, proprietary, and transaction indexes are defined. Analytic hierarchy process calculates weights of indexes based on arbitrary data, and results are presented in 11 Tables. The most important index was the proprietary index, with a weight of 70% for the deputy of technical and construction. The less important index was the general index for the deputy of planning, human capital development, and council affairs, weighing 8%. Moreover, deputies of Tehran Municipality have been ranked by TOPSIS. The best deputy got 71%, and the worse got 7% scores.

CONCLUSION: This study constructed a customized five-step excellence model for Tehran Municipality to reach excellence. The model can help Tehran Municipality for better urban planning. Step one constructs the performance assessment team. Step two extracts indexes by brainstorming method with the help of the European foundation for quality management model. Step three collects, cleans and loads the data in the data warehouse. In step four, weights of the indexes and facets are calculated based on AHP, and then facets, indexes, and goals are ranked by technique for order of preference by similarity to ideal solution as an effective multi-criteria decision making tool. Finally, the model has been implemented at offices of plan monitoring, project control, and performance evaluation in planning, human capital development, and council affairs department at Tehran Municipality.

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INTRODUCTION

Performance management is essential for each company to improve performance and achieve excellence (Tomažević *et al.*, 2017; Bdour *et al.*, 2023). Organizations need an integrated model to identify opportunities and problems to help them improve their processes, achieve their goals and make steps toward their missions and visions (Mendes *et al.*, 2012). Performance management uses an integrated system and technology to measure and improve the performance of organizations according to their missions and visions (Wongrassamee *et al.*, 2003; Mansour, 2023). In addition to conventional management practice, finding success criteria is essential to obtaining excellence (Andersen *et al.*, 2000). Standard organizational improvement tools include enterprise resource planning, supply chain management, business intelligence systems, performance management systems, business process modeling, project management, total quality management, lean management, performance management, and strategic management. Through these models, excellence models concentrated mainly on showing the way to reach excellence, and each country usually developed its customized model (Andersen *et al.*, 2000). Fig. 1 presents the Deming Prize, globally known as the first excellence model introduced by the Union of Japanese Scientists and Engineers in 1951 (Union of Japanese Scientists and Engineers, 2010). Fig. 2 presents the Canada Awards for Excellence (National Quality Institute, 2007) as the next excellence model. Malcolm Baldrige National Quality Award (MBNQA) (Fig. 3) was introduced in the USA in 1987 (National Institute of Standards and Technology, 2010). The European Quality Award (known as the "European Excellence Award" since 2004), based on the European Foundation for Quality Management (EFQM) model (Fig. 4), was established in 1991 (European Foundation for Quality Management, 2019). Many more excellence models were developed based on the EFQM and MBNQA in various countries like India in 1994, Singapore and Japan in 1995, the Philippines in 1997, Fiji in 1998, and Thailand in 2001 (Talwar, 2011).

Excellence models consider processes, customers, and stakeholders and try to improve the performance of the organizations. However, they are general and not customized for a specific organization and do not have explicit, step-by-step, and comprehensive

guidelines for customization. The excellence models primarily consider leadership, strategic planning, people, supplier/partner, customer, knowledge and information management, processes, society, and business results (Andersen *et al.*, 2000). In addition, the Balanced Score Card (BSC) (Kaplan and Norton, 1992) can translate an organization's mission and strategic objectives into a set of performance measures in four general perspectives: financial, customer satisfaction, internal processes, and learning and growth. So, BSC can help managers to have an operational view of their organization's perspectives. Wongrassamee *et al.* (2003) compared EFQM and BSC as prominent performance management tools. Santos-vijande and Alvarez-gonzalez (2007) developed an instrument for measuring Total Quality Management (TQM) implementation following the EFQM excellence model. They provided empirical evidence on the relationship between management practices and measures of business performance. Vukomanovic *et al.* (2007) introduced an integrated model for performance management in a construction company based on EFQM and BSC principles in the construction industry. Belvedere *et al.* (2018) used the EFQM model as a reference framework for designing a multi-objective performance measurement system for the procurement function of a company. Andersen *et al.* (2000) compared EFQM and BSC as the two primary tools for assessing the performance of an organization. Shahin *et al.* (2012) found the weaknesses and strengths of EFQM and BSC models and then proposed an integrated model based on them. Westerveld (2003) described the project excellence model adapted from the EFQM model. Bou-Llusar *et al.* (2009) analyzed how the EFQM excellence model captures the main assumptions involved in the TQM concept. Doeleman *et al.* (2014) have done a literature review on empirical evidence on applying the EFQM model. Ritchie and Dale (2000) have done a study of self-assessment practices in 10 organizations. The research was carried out by semi-structured interviews directed toward various issues related to the process, practice, and management of self-assessment. Den Hartog *et al.* (2004) presented a model for performance management combining insights from strategic human resource management and work and organizational psychology. Folan and Browne (2005) reviewed performance management and described

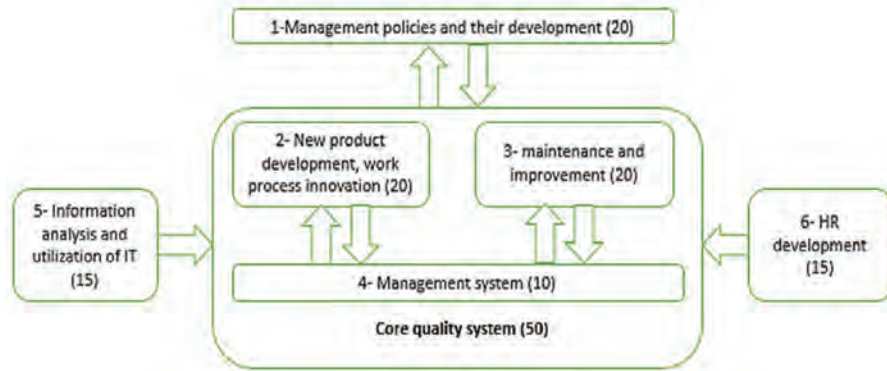


Fig. 1: Evaluation items of basic categories under the Deming application Prize (Union of Japanese Scientists and Engineers, 2010)

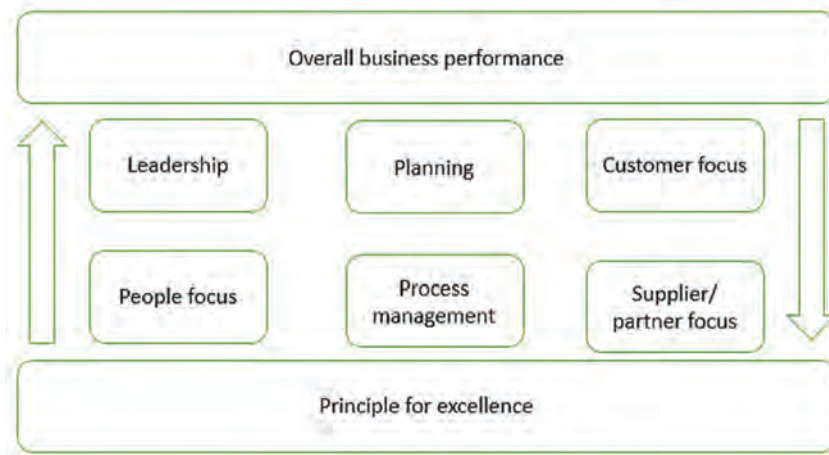


Fig. 2: Framework of Canadian award for excellence (National Quality Institute, 2007)

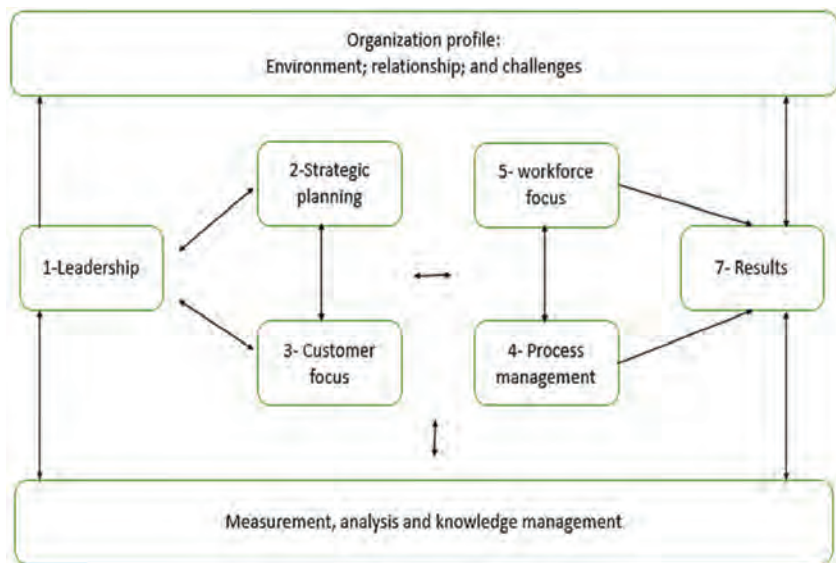


Fig. 3: Framework of the MBNQA (National Institute of Standards and Technology, 2010)



Fig. 4: Framework of the EFQM model (European Foundation for Quality Management, 2019)

the evolution of performance measurement in four sections: recommendations, frameworks, systems, and inter-organizational performance measurement. Kagioglou *et al.* (2001) presented a framework that ensured effective strategies were deployed to form the performance management system that construction organizations could adopt. Kloot and Martin (2000) used four dimensions of the Balanced Scorecard (Finance, Community, Internal Business Processes, Innovation, and Learning) to research local government performance management systems. Flapper *et al.* (1996) have explored baselines for moving from performance measurement to performance management. Kanji and Wong (1999) reviewed the relationships between TQM and Supply Chain Management (SCM) and concluded that existing supply chain models have inadequacies that TQM principles and concepts can enrich. Khalif and Hassan (2022) used fuzzy logic to improve the performance of the EFQM. Rodríguez-González *et al.* (2020) described the value of the EFQM model as a quality framework for improving the performance of a hospital pharmacy department. Liu Y *et al.* (2021) confirmed the need to adjust the EFQM model, used the restaurant industry as an example and applied Fuzzy AHP (FAHP) to give each attribute and sub-attribute a new, accurate score. e Sá and

Fernandes (2020) validated and refined the use of the EFQM model in the municipality of the center region of Portugal. Keshtegar *et al.* (2021) analyzed the impact of business intelligence on enablers of the EFQM excellence model with the mediating role of knowledge sharing. Regarding the literature review, none of the above-mentioned models explicitly mention the application of the Multi-Criteria Decision Making (MCDM) model. Moreover, the weights of the elements are fixed, and the aggregation method to reach a final score is not explained. MCDM models can be used for weight calculation and score aggregation. The AHP, as proposed by Saaty (1987), which reduces complex decisions to a series of pairwise comparisons and can extract weights of indexes, is a common technique in MCDM to extract the weights. Vukomanovic and Radujkovic (2013) used AHP for setting priorities among competitive strategic objectives and afterward for selecting criteria for the construction industry and then integrated EFQM and BSC to conduct benchmarking, identify best practices, align strategy with the competitive surroundings and selecting strategy aligned with the selected criteria. Araujo *et al.* (2018) applied a two-stage approach of TOPSIS in public hospitals in 92 Rio de Janeiro municipalities. Sun (2010) developed an evaluation model based on the FAHP and Fuzzy TOPSIS (FTOPSIS)

to help industrial practitioners evaluate performance in a fuzzy environment. [Yadav et al. \(2018\)](#) have reviewed industrial applications of the TOPSIS approach. [Sehhat et al. \(2015\)](#) have developed an evaluation model considering the indicators identified; in assessing seven insurance companies in the ranking and weighting of these criteria and companies, the AHP and TOPSIS technique has been used. [Kumar et al. \(2020\)](#) prioritized attributes for successfully implementing agile manufacturing using a combined AHP and TOPSIS approach in the Indian manufacturing industry. [Aydin et al. \(2012\)](#) proposed an integrated approach based on AHP and EFQM models to evaluate business performance excellence. [Golpîra \(2014\)](#) employed an FTOPSIS to evaluate project management standards based on the criteria introduced by EFQM to have a framework to compare standards as a comprehensive method. [Azar et al. \(2011\)](#) presented an integrated model with the BSC framework for supplier selection strategy. [Mirfakhredini et al. \(2013\)](#) proposed a model to assess the performance of sports organizations with BSC and TOPSIS. [Gholipour and Ebrahimi \(2018\)](#) used TOPSIS to rank alternative municipal districts based on the weighted human capital criteria. [Table 1](#) compares this study with the related literature.

According to the literature review, no study shows how to customize and apply an excellence model in a decentralized organization. Also, none of the above-mentioned articles integrated an excellence model and performance management system.

Municipalities are institutions of state administrations characterized by high specificity of functioning. So, most of the time, they are decentralized. Therefore, this study presented a customized, comprehensive, step-by-step excellence model for Tehran Municipality as a decentralized organization. The main questions are: How can an excellence model and a performance management system be used in Tehran Municipality? How an excellence model and performance management system can be integrated? How multi-criteria decision-making tools can be applied in an excellence model? How can an excellent model be customized to be implemented in Tehran Municipality? The current study has been carried out in offices of plan monitoring, project control, and performance evaluation in planning, human capital development, and council affairs department at Tehran Municipality in 2023.

MATERIALS AND METHODS

The excellence model for deputies of Tehran Municipality is presented here.

Survey design and data collection

The excellence model for deputies of Tehran Municipality is depicted in [Fig. 5](#). EFQM enhances the proposed model. AHP and TOPSIS as MCDM tools are used for mathematical calculations. The model is constructed based on five steps. Step one constructs the performance assessment team. Step two extracts indexes by brainstorming method with the help of the

Table 1: literature comparison by the study

AHP/FAHP	TOPSIS/FTOPSIS	EFQM	Sources
✓		✓	Vukomanovic and Radujkovic, 2013
	✓		Yadav et al., 2018
✓	✓		Sun, 2010
✓	✓		Sehhat et al., 2015
✓	✓		Kumar et al., 2020
	✓		Araujo et al., 2018
✓		✓	Aydin et al., 2012
		✓	Belvedere et al., 2018
	✓	✓	Golpîra, 2014
	✓		Gholipour and Ebrahimi, 2018
		✓	
✓		✓	
✓	✓	✓	

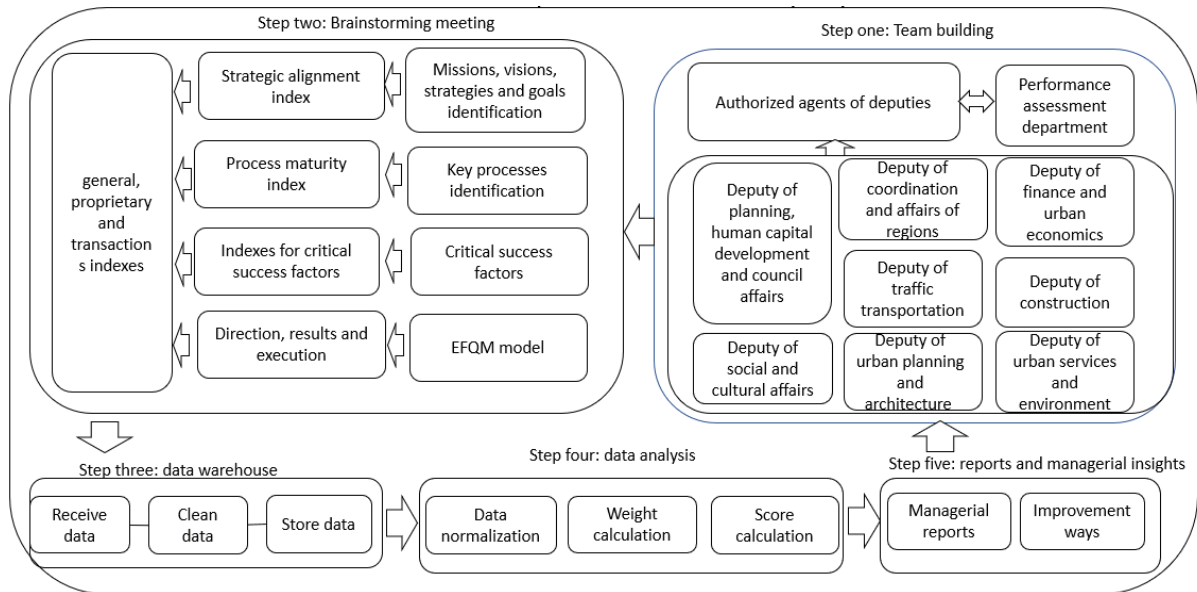


Fig. 5: Excellence model for deputies of Tehran Municipality

EFQM model. Step three collects, cleans and loads the data in the data warehouse. In step four, weights of the indexes and facets are calculated based on AHP, and then facets, indexes, and goals are ranked by TOPSIS as an effective MCDM tool. Improvement strategies can be provided in step five.

Step 1: Team building

Tehran Municipality is a decentralized organization in which different tasks are assigned to different deputies. Finance and urban economics; coordination and affairs of regions; planning, human capital development, and council affairs; technical and construction; traffic transportation; social and cultural affairs; urban services and environment; urban planning and architecture are the leading deputies of Tehran Municipality. The deputies have different buildings in the city, each with its strategies, missions, visions, and tasks. All the deputy's strategies should be aligned with each other and with Tehran Municipality's strategies, missions, and visions. Also, their tasks should be evaluated and improved by the improvement methods. Creating a team, where one representative from each deputy shall be invited, is thus the first step. This team shall analyze the situation of deputies and, to improve it will work with them. In the end, it would lead to an improvement in

the overall situation of the Tehran Municipality.

Step 2: Brainstorming meeting

The team needs to have meetings to establish and decide on the proper indexes to evaluate different data types. Each deputy determined specific measures using primary goals, visions, plans, procedures, and duties. General indexes are usually extracted from the EFQM model, concerning the fact that the deputies are not in an isolated environment and have a lot of transactions with each other. So, related transactional indexes are defined to improve these transactions.

Step 3: Data warehouse

The data of the defined indexes should be collected, cleaned, and stored in the data warehouse. Data on general and proprietary indexes are achieved in a self-assessment manner, but data on transaction indexes are collected through brainstorming by deputies who have transactions with each other.

Step 4: Data analysis

Obtained structured data has been analyzed in this step. Over the years, several methods have been proposed for estimating the weights from a matrix of pairwise comparisons, including Additive

Normalization (AN), Eigenvector (EV), Logarithmic Least Squares (LLS), Weighted Logarithmic Least Square (WLS), Logarithmic Goal Programming (LGP), Fuzzy Preference Programming (FPP), and others.

This study implemented the AHP method to extract weights of criteria. AHP uses the following steps:

Define the problem and its related goal

Construct the hierarchy of the problem. All the elements in every level of the hierarchy should be compared by each other in pairwise comparison.

Construction of a set of pairwise comparison matrices

Let $A = [a_{ij}]$ for i and $j = 1, \dots, n$ denote a pairwise comparison matrix where a_{ij} shows the amount of preference of element i to element j . All the entries have a positive value $a_{ij} > 0$ in a reciprocal manner $a_{ji} = \frac{1}{a_{ij}}$. The defined criteria in each level and following the above level element should be compared two by two according to the 1-9 scale of pairwise comparisons as shown in Table 2. The total number of pairwise comparisons is $\frac{n(n-1)}{2}$.

The vector of weights (W_1, \dots, W_n) related to A can be extracted by normalization of the geometric mean method. Let W_i denotes the weight of element i in matrix A , Eq. 1 represents the geometric mean:

$$W_i = \frac{\left(\prod_{j=1}^n a_{ij} \right)^{\frac{1}{n}}}{\sum_{i=1}^n \left(\prod_{j=1}^n a_{ij} \right)^{\frac{1}{n}}}, \quad i, j = 1, \dots, n. \quad (1)$$

Calculation of consistency index

Consistency is checked to ensure that the evaluation of the pairwise comparison matrix is reasonable and acceptable. Imagine C is an n -dimensional column vector describing the sum of the weighted values for the importance degrees of elements in A matrix, then: $C = [c_i]_{n \times 1} = A \cdot W^T$, $i = 1, \dots, n$. The consistency value can be represented by $CV = [cv_i]_{1 \times n}$ where $cv_i = \frac{c_i}{W_i}$, $i = 1, \dots, n$. The inconsistency index to evaluate the effectiveness of measurements can be calculated. Saaty (1987) proposed the maximum eigenvalue γ_{max} b: $\gamma_{max} = \frac{\sum_{i=1}^n cv_i}{n}$, $i = 1, \dots, n$. With the maximal eigenvalue γ_{max} , a Consistency Index (CI) can then be determined by $CI = \frac{\gamma_{max} - n}{n - 1}$ then a Consistency Ratio (CR) is defined by $CR = \frac{CI}{RI}$. Table 3 shows the average amount of Random Index (RI) with the value obtained by different orders of the pair-wise comparison matrices. If the CR is below 0.1, the matrix is considered consistent, the evaluation is rational, and the weights are valid. The judgments should be reviewed and improved in the case of $CR > 0.10$.

The criteria and their related weights in every deputy have been extracted. MCDM tools can calculate the score of each of them. TOPSIS considers the best and the worst alternatives and ranks the alternatives by distance to these two reference points; TOPSIS is used here to calculate the scores. Meaningful scores and distances are calculated. A decision matrix ($D = [x_{ij}]_{m \times n}$) is constructed where the alternatives are set in the rows, and the columns show the criteria and x_{ij} presents the score of alternatives i in criteria j . By vector normalization way, the matrix

Table 2: The scale of pairwise comparisons

Degree of Importance	Definition	Explanation
1	Equal importance	Two criteria have equal importance according to the objective.
2	Weak or slight	According to the objective, the first criterion has weak or slight importance to the second criterion.
3	Moderate importance	The first criterion has moderate importance to the second criterion according to the objective.
4	Moderate plus	Between 3 and 5
5	Strong importance	The first criterion has strong importance to the second criterion according to the objective.
6	Strong plus	Between 5 and 7
7	Very strong	The first criterion has very strong importance to the second criterion according to the objective.
8	Very, very strong	The first criterion is very important to the second criterion according to the objective.
9	Extreme importance	The first criterion has extremely strong importance to the second criterion according to the objective.

Table 3: Consistency ratio

Matrix size	1	2	3	4	5	6	7	8	9	10
Random consistency	0	0	0.58	0.9	1.12	1.24	1.32	1.41	1.45	1.49

can be normalized by Eq. 2.

$$R_{ij} = \frac{X_{ij}}{\sqrt{\sum_{i=1}^m X_{ij}^2}} \quad \text{for all } i = 1, \dots, m \text{ and for all } j = 1, \dots, n. \quad (2)$$

The extracted weight from AHP is multiplied by its corresponding R_{ij} to calculate the weighted normalized matrix as Eq. 3.

$$V_{ij} = W_j R_{ij}. \quad (3)$$

The positive ideal solution, the maximum value of alternatives in each attribute ($V^+ = V_1^+, V_2^+, \dots, V_n^+$), and the negative ideal solution, minimum value of alternatives in each attribute ($V^- = V_1^-, V_2^-, \dots, V_n^-$), can be found. The separation measure can be calculated by Eq. 4 and Eq. 5.

$$S_i^+ = \sqrt{\sum_{j=1}^n (V_{ij} - V_j^+)^2} \quad \text{for all } i = 1, \dots, n. \quad (4)$$

$$S_i^- = \sqrt{\sum_{j=1}^n (V_{ij} - V_j^-)^2} \quad \text{for all } i = 1, \dots, n. \quad (5)$$

The relative closeness to the ideal solution can be calculated by Eq. 7.

$$C_i^+ = \frac{S_i^-}{S_i^+ + S_i^-} \quad \text{for all } i = 1, \dots, n. \quad (7)$$

The final ranking is achieved.

Step 5: Reports, managerial insights

The data converted into information and knowledge is now achieved through different mathematical analyses. Through the experiences of authorized agents of the deputies, much wisdom can be obtained during different brain-storming and studying the reports.

RESULTS AND DISCUSSION

The proposed model has run at Tehran Municipality, and the obtained results are presented

and discussed here.

Step 1: Team building

A performance assessment team is constructed at the team-building step.

Step 2: Brainstorming meeting

Strategies, goals, objectives, targets, critical success factors, and proprietary and transaction indexes are defined here through brainstorming. Proprietary indexes are shown in Table 4.

In order to calculate the strategic alignment of 8 Deputies and extract all the strategies and goals of the vices, as well as the CSFs of the vices, specific indicators are extracted during the processes. Process maturity is considered in the EFQM model.

General indexes extracted by EFQM

The EFQM model is a non-prescriptive, well-known framework based on the enablers and results, so it has been used to extract general indexes. The enablers criteria cover what the deputies do, and the results criteria cover the achievements of the deputies. The following questions adapted from the EFQM model (European Foundation for Quality Management, 2019) extract general indexes.

Transactions indexes

Time and quality of the received data from deputies are the two most transactional indexes for deputies interacting with each other. The following questions extract transactional indexes:

- Which deputies have essential interaction with your deputies?
- What kind of interactions do you have with each other?
- What is the best index to measure and improve the quality of interactions?

Step 3: Data warehouse

The defined indexes' data should be gathered, cleaned, and stored in the data warehouse.

Step 4: Data analysis

In this section, required data are achieved by

Table 4: Proprietary indexes of deputies

Deputies	Main strategies	Goals	Indexes
Deputy of technical and construction	Implements technical and construction projects to improve Tehran's infrastructures and facilities	Optimizes usage of resources during project implementation	Cost performance index
		Develops Tehran's facilities and infrastructures	Schedule performance index
			Efficiency of planning
Deputy of planning, human capital development, and council affairs	Implements intelligence planning and develops professional experts for Tehran Municipality	Develop an intelligence system for the Tehran Municipality	Variation of assigned budget
			Amounts of process improvement
			Amount of teaching hours for personnel
Deputy of urban planning and architecture	Implements urban planning and Iranian architecture	Develops an intelligent urban planning	Amounts of reconstruction of historical places
		Develops Iranian architecture throughout the city	The efficiency of urban planning
Deputy of urban services and environment	Develops sustainable urban services	Improve environment quality	Amounts of environmental pollution
			Amounts of satisfaction from urban services
Deputy of finance and urban economics	Develops cost and revenue management system	Create sustainable economy	Amounts of sustainable revenue fulfillment
			Amounts of cost reduction
			Improve the scheduling of public transportation
Deputy of traffic transportation	Develops green public transportation	Improve transportation quality of Tehran city	Decrease the amount of used fuel
			Increase using of bicycles
Deputy of social and cultural affairs	Develops Iranian culture	Makes a sustainable community	The mental health of society
			Innovation rate of society
			Improvement of lifestyle
Deputy of coordination and affairs	Make integration between the deputies and affairs	Coordination between the deputies and members of council affairs	Supportive community
			Amount of solved conflict between the deputies and council affairs

interviewing team members. Each deputy has three categories: proprietary, transactions, and general. Also, each category has its related indexes. The weights of indexes and categories can be different according to the deputies. The weights are extracted by pair-wise comparison, and the final score of

deputies in each category is obtained with the help of TOPSIS. Because of the Tehran Municipality policies, the real data cannot be used here, so arbitrary data is used to show the analysis here (Tables 5-12).

Table 13 shows the weights of each category extracted by AHP.

Table 5: Weights of indexes for deputy of technical and construction

Categories	Weights of categories	Indexes	Weights of indexes
Proprietary indexes	70%		
		Cost performance	70%
		Schedule performance	30%
General indexes	20%		
		Leadership	3%
		Policy and strategy	5%
		People	7%
		Partnership and resources	6%
		Processes	4%
		Customer results	5%
		People results	5%
		Society results	52%
		Key results	13%
Transactions indexes	10%		
		Time of responses	60%
		Quality of responses	40%

Table 6: Weights of indexes for deputy of planning, human capital development, and council affairs

Categories	Weights of categories	Indexes	Weights of indexes
Proprietary indexes	51%		
		Efficiency of planning	35%
		Variation of assigned budget	37%
		Amounts of process improvement	16%
		Amount of teaching hours for personnel	12%
General indexes	8%		
		Leadership	26%
		Policy and strategy	5%
		People	13%
		Partnership and resources	4%
		Processes	11%
		Customer results	2%
		People results	12%
		Society results	6%
		Key results	20%
Transactions indexes	41%		
		Time of responses	20%
		Quality of responses	80%

Table 7: Weights of indexes for deputy of urban planning and architecture

Categories	Weights of categories	Indexes	Weights of indexes
Proprietary indexes	83%		
		Amounts of reconstruction of historical places	80%
		Efficiency of urban planning	20%
General indexes	12%		
		Leadership	5%
		Policy and strategy	9%
		People	2%
		Partnership and resources	9%
		Processes	23%
		Customer results	14%
		People results	9%
		Society results	5%
		Key results	23%
Transactions indexes	5%		
		Time of responses	10%
		Quality of responses	90%

Table 8: Weights of indexes for deputy of urban services and environment

Categories	Weights of categories	Indexes	Weights of indexes
Proprietary indexes	28%		
		Amounts of environmental pollution	41%
		Amounts of satisfaction from urban services	59%
General indexes	63%		
		Leadership	10%
		Policy and strategy	15%
		People	16%
		Partnership and resources	1%
		Processes	10%
		Customer results	11%
		People results	7%
		Society results	18%
		Key results	12%
Transactions indexes	9%		
		Time of responses	54%
		Quality of responses	46%

Table 9: Weights of indexes for deputy of finance and urban economics

Categories	Weights of categories	Indexes	Weights of indexes
Proprietary indexes	44%		
		Amounts of sustainable revenue fulfillment	91%
		Amounts of cost reduction	9%
General indexes	38%		
		Leadership	22%
		Policy and strategy	22%
		People	6%
		Partnership and resources	1%
		Processes	16%
		Customer results	23%
		People results	1%
		Society results	6%
		Key results	4%
Transactions indexes	18%		
		Time of responses	24%
		Quality of responses	76%

Table 10: Weights of indexes for deputy of Traffic transportation

Categories	Weights of categories	Indexes	Weights of indexes
Proprietary indexes	27%		
		Improve the scheduling of public transportation	19%
		Decrease the amount of used fuel	18%
		Increase using of bicycles	63%
General indexes	51%		
		Leadership	17%
		Policy and strategy	3%
		People	6%
		Partnership and resources	8%
		Processes	19%
		Customer results	3%
		People results	22%
		Society results	8%
		Key results	14%
Transactions indexes	22%		
		Time of responses	70%
		Quality of responses	30%

Table 11: Weights of indexes for deputy of social and cultural affairs

Categories	Weights of categories	Indexes	Weights of indexes
	33%		
30%		The mental health of society	
12%		Innovation rate of society	
28%		Improvement of lifestyle	
30%		Supportive community	
	43%		
18%		Leadership	
2%		Policy and strategy	
12%		People	
17%		Partnership and resources	
12%		Processes	
2%		Customer results	
8%		People results	
11%		Society results	
17%		Key results	
	25%		
		Time of responses	89%
		Quality of responses	11%

Table 12: Weights of indexes for deputy of coordination and affairs

Categories	Weights of categories	Indexes	Weights of indexes
Proprietary indexes	63%		
		Amount of solved conflict between the deputies and affairs	100%
General indexes	8%		
		Leadership	8%
		Policy and strategy	4%
		People	16%
		Partnership and resources	8%
		Processes	3%
		Customer results	21%
		People results	19%
		Society results	10%
		Key results	12%
Transactions indexes	29%		
		Time of responses	62%
		Quality of responses	38%

Table 13: Related weights for deputies

Deputy's name	Proprietary indexes	General indexes	Transactions indexes
Deputy of Technical and construction	70%	20%	10%
Deputy of planning, human capital development, and council affairs	51%	8%	41%
Deputy of urban planning and architecture	83%	12%	5%
Deputy of urban services and environment	28%	63%	9%
Deputy of finance and urban economics	44%	38%	18%
Deputy of Traffic transportation	27%	51%	22%
Deputy of social and cultural affairs	33%	43%	25%
Deputy of coordination and affairs	63%	8%	29%

Table 14: Performance of the deputies in the categories

Deputy's name	Proprietary indexes	General indexes	Transactions indexes
Deputy of technical and construction	91%	69%	28%
Deputy of planning, human capital development, and council affairs	25%	20%	23%
Deputy of urban planning and architecture	10%	31%	47%
Deputy of urban services and environment	3%	57%	7%
Deputy of finance and urban economics	69%	10%	73%
Deputy of traffic transportation	45%	51%	38%
Deputy of social and cultural affairs	8%	48%	64%
Deputy of coordination and affairs	5%	76%	11%

Table 14 is obtained by evaluating the performance of each index within a category, multiplying the weight associated with that performance, and summing the weighted scores for each category.

The weighted performance of the deputies in the categories is represented in Table 15.

Table 16 shows the final ranking of each deputy, and proper improvement strategies for each one can be proposed in the next step.

Step 5: Reports, managerial insights, and improvement ways

Improvement strategies and managerial insights can be developed from the achieved data. Step two categorized indexes into three main categories: general, proprietary and transactions indexes. The

deputies' Weaknesses and strengths can be obtained regarding the weights and scores of the deputies in each index. For example, the deputy of coordination and affairs was the weakest, and the deputy of technical and construction was the strongest deputy of Tehran Municipality. Proprietary indexes are the most important index for the deputy of coordination and affairs. The amount of solved conflict between the deputies and affairs is the only index in This category. So, suppose the deputy wants to improve its score and help the municipality in the road to excellence. In that case, it should significantly improve the amount of solved conflict between the deputies and affairs. Transactions indexes are the second important category for this deputy, containing time and response quality. They showed that the deputy

Table 15: Weighted performance of the deputies in the categories

Deputy's name	Proprietary indexes	General indexes	Transactions indexes
Deputy of technical and construction	64%	14%	3%
Deputy of planning, human capital development, and council affairs	13%	2%	9%
Deputy of urban planning and architecture	8%	4%	2%
Deputy of urban services and environment	1%	36%	1%
Deputy of finance and urban economics	31%	4%	13%
Deputy of traffic transportation	12%	26%	8%
Deputy of social and cultural affairs	3%	21%	16%
Deputy of coordination and affairs	3%	6%	3%

Table 16: Final ranking of deputies

Deputy's name	Scores	Ranks
Deputy of technical and construction	0.71	1
Deputy of finance and urban economics	0.41	2
Deputy of urban services and environment	0.35	3
Deputy of traffic transportation	0.34	4
Deputy of social and cultural affairs	0.28	5
Deputy of planning, human capital development, and council affairs	0.19	6
Deputy of urban planning and architecture	0.11	7
Deputy of coordination and affairs	0.07	8

may had not good transactions with other deputies. So, the deputy should consider to promote the level of interactions with others. Similarly, all the deputies should review their categories and indexes and find ways to plan and implement the improvement. The excellence model will be rerun to help the municipality to reach excellence. This process is a never-ending process and should be run constantly. A comparison of the proposed model with the EFQM and BSC models as the two famous performance management models can be helpful. EFQM uses 9 general and nonprescriptive facets not customized for a specific organization. BSC is also nonprescriptive and uses 4 proper facets for a centralized organization. The proposed model categorizes organization activities into general, proprietary, and transactional. The general category uses EFQM criteria by the adjusted

weights according to the organization's specifications and needs. The proprietary category uses strategies and goals to define specific indexes to measure the organization's operations following strategies and goals that are not necessarily in 4 facets of BSC. The transactional category uses indexes that help a decentralized organization make a better relationship between its parts. The EFQM and BSC methods do not consider mathematical calculations and ignore mathematical analysis. EFQM considers fixed weights for its criteria, and BSC does not propose any weights for the facets. However, in the proposed model, AHP, as a powerful mathematical tool, is used to extract the weights of criteria and categories to understand better the value of improvement in each section of the organization. TOPSIS is applied to measure performance and rank the organization's different

Table 17: Comparison between EFQM, BSC, and the proposed model

Aspects	EFQM	BSC	The Proposed Model
	Direction Execution Results	Financial, Customer satisfaction, Internal processes, Learning and growth	General category (integral by EFQM model), Proprietary category (based on strategies and goals of deputies) Transaction category (used for decentralized organizations)
Proper for	Centralized organizations	Centralized organizations	Centralized and decentralized organizations
Weighting method	Fixed weights are used, which is an unrealistic assumption for different organizations	Not mentioned	Used AHP as a powerful weighting method to calculate the real weights of different categories and indexes
Ranking method	Not mentioned	Not mentioned	It used TOPSIS as a powerful MCDM method to rank different organizations, and help managers have more insights to produce improvement strategies
Improvement strategies	Not mentioned	Not mentioned	It has one step to develop improvement strategies based on mathematical analysis and brainstorming meetings

deputies to understand better how to create managerial insights and improvement actions. Table 17 shows the comparison. It is worth answering the mentioned questions here: How can an excellence model and a performance management system be used in Tehran Municipality? And how an excellent model can be customized to implement in Tehran Municipality?

Regarding the proposed model, by identifying strategies, goals, objectives, targets, critical success factors, general, proprietary, and transaction indexes and conducting several meetings with deputies throughout the process, all the deputies aligned and worked like a centralized organization.

How an excellence model and performance management system can be integrated?

Excellence models have some defined indexes and scoring systems, but performance management systems define indexes and use the appropriate scoring system. The proposed model used both ways. It used the EFQM excellence model indexes as general indexes and defined the proprietary and transaction indexes to have comprehensive and

customized assessment indexes. Moreover, AHP and TOPSIS, as commonly used techniques, are used for scoring systems.

How multi-criteria decision-making tools can be applied in an excellence model?

As shown in step 3 of the proposed model, the criteria weights are driven by AHP, and TOPSIS does their ranking.

CONCLUSION

Deming Prize, Canada Awards for Excellence, Malcolm Baldrige National Quality Award, and European Quality Award are the most well-known excellence models worldwide. But, these excellence models are nonprescriptive and not customized for a specific organization. Also, they ignore decentralized organizations. On the other hand, performance management systems define criteria and use mathematical models as their scoring system. However, they ignore the excellence models. Therefore, this study combined the EFQM as one of the most reputable excellence models and performance management systems and applied

the model in Tehran Municipality. This presented a comprehensive, graphical, step-by-step excellence model run for deputies of Tehran Municipality. The proposed model has five steps. Step one is to construct the team. The Tehran Municipality is a decentralized organization that has 9 deputies: deputy of finance and urban economics; deputy of coordination and affairs of regions; deputy of planning, human capital development, and council affairs; technical and construction deputy; traffic transportation deputy; deputy of social and cultural affairs; deputy of urban services and environment; deputy of urban planning and architecture so it is essential that a team including of at least one agent of each deputy constructed in the first step. Step two extracts related indexes to each deputy's general, proprietary, and transaction categories. The general category used the EFQM model, the proprietary category used the mission, vision, processes maturity model, critical success factors, and the task of deputies to define indexes, and the transactional category used time and quality of response as two main indexes in this category. Step three collects, cleans and stores the related data on indexes in the data warehouses by the defined indexes and categories. Step four uses AHP to calculate the weights of indexes and categories for each deputy and then, with the help of TOPSIS, ranks the deputies to find the best and the worst deputy. By the obtained analysis, step five can create reports, managerial insights, and improvement ways. Finally, the proposed model is run at the office of plan monitoring, project control, and performance evaluation in planning, human capital development, and council affairs department at Tehran Municipality; then, the outcomes are shared with others. Regarding the mathematical analysis, Sample Weighted Method (SWM), or other mathematical analysis by different normalization ways can be used and may lead to different solutions. How to select the best solution can be a good question to be answered in future research. Different strategy improvement methods can be used for constructing performance improvement scenarios.

AUTHOR CONTRIBUTIONS

K. Fahimi performed the literature review, conducted the conceptual model and numerical results, compiled the data, analyzed and interpreted the data, and prepared the manuscript text and edition. M. Amirabadi performed the literature

review and applied the model in Tehran Municipality.

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CONFLICT OF INTEREST

The authors declare no potential conflict of interest regarding the publication of this work. In addition, the authors have witnessed ethical issues, including plagiarism, informed consent, misconduct, data fabrication and, or falsification, double publication and, or submission, and redundancy.

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ABBREVIATIONS

<i>EFQM model</i>	European Foundation for Quality Management model
<i>BSC</i>	Balanced Score Card
<i>TOPSIS</i>	Technique for Order of Preference by Similarity to Ideal Solution

AHP	Analytical Hierarchical Process	S_i^-	Negative separation measure.
FTOPSIS	Fuzzy Technique for Order of Preference by Similarity to Ideal Solution	C_i^+	Relative closeness to the ideal solution.
FAHP	Fuzzy Analytical Hierarchical Process		
ELECTRE	Elimination and Choice Expressing Reality		
SWM	Sample Weighted Method		
MBNQA	Malcolm Baldrige National Quality Award		
MCDM	Multi-Criteria Decision-Making		
TQM	Total Quality Management		
CI	Consistency Index		
CR	Consistency Ratio		
RI	Random Index		
$A = [a_{ij}]$	Pairwise comparison matrix.		
a_{ij}	Amount of preference of element i to element j .		
(W_1, \dots, W_n)	Vector of weights.		
C	An n -dimensional column vector.		
$CV = [CV_i]_{1 \times n}$	Consistency value.		
γ_{max}	Maximum eigenvalue.		
CI	Consistency index.		
RI	Average random index.		
$D = [x_{ij}]_{mn}$	Decision matrix.		
x_{ij}	A score of alternatives i in criteria j .		
R_{ij}	Normalized amount of x_{ij} .		
V_{ij}	Weighted normalized amount of x_{ij} .		
$(V^+ = V_1^+, V_2^+, \dots, V_n^+)$	The maximum value of alternatives in each attribute.		
$(V^- = V_1^-, V_2^-, \dots, V_n^-)$	The minimum value of alternatives in each attribute.		
S_i^+	Positive separation measure.		

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ORIGINAL RESEARCH PAPER

The effect of human resource agility on organizational sustainability: Structural equation modeling approach

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ABSTRACT

BACKGROUND AND OBJECTIVES: Agile human resource practices have become one of the most important concerns of modern departments because of their role in achieving competitive advantage. The majority of academics believe that in order to implement Agility of human resource practices, many scholars argue that effective implementation of agile HR practices requires trained and motivated personnel. This research aims at clarifying the effect of human resources agility in Organizational Sustainability at Jordanian hotel sector.

METHODS: The current study looks at the effect of human resource agility on organizational sustainability. A quantitative approach was used through a questionnaire-based survey. A descriptive analytical strategy was utilized in the study. The study targeted the entire workforce of Jordan's hotel sector, consisting of 21,835 employees across 22 hotels. The study's sample consisted of 410 workers that are employed in the hotel sector in Jordan. Numerous statistical methods, including frequency, percent, mean, standard deviation, Cronbach's alpha, exploratory factor analysis, average variance extracted, and composite reliability, have been employed to meet the aims of this research. Additionally, a structural equation modeling was used to quantify the impact of human resource agility on organizational sustainability.

FINDINGS: Findings showed that resilience resilience had a positive influence on social and economic sustainability) Estimate = 0.323 and 0.207; C.R = 3.660 and 2.357; P-value = 0.01 and 0.00(. While environmental sustainability was not significantly impacted by resilience. Additionally, the results showed that adaptability significantly influence all organizational sustainability dimensions, including social, environmental and economic sustainability (Estimate = 0.247, 0.203 and 0.521; C.R = 2.312, 2.698 and 5.296; P-value = 0.021, 0.011 and 0.00(. Additionally, the results showed that proactivity significantly impact on social and environmental sustainability (Estimate = 0.475, 0.319; C.R = 5.085, 3.524; P-value = 0.00, 0.00).

CONCLUSION: The study suggests that the hotel industry should provide and promote agile human resource practices in order to maintain organizational sustainability and prevent organizational decline. look into and analyze the mediating role of job embeddedness on the relationship between human resource agility and organizational sustainability at other industrial or service fields in Jordan as well as across different nations and various regional boundaries. The study also recommends that scholars explore the mediating role of job embeddedness in the relationship between HR agility and organizational sustainability, both within Jordan and across other countries and regions.

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INTRODUCTION

Sustainability has recently emerged as a key concern for all parties involved, such as company directors. The goal of sustainable development is to optimize benefits while preserving services and the high quality of resources. It is a dynamic interactive development that actively seeks to harmonize the three pillars of people, resources, and the environment. Due to the growing emphasis on the financial, legal, and other aspects of clean manufacturing business, corporations are placing greater emphasis on sustainability, social responsibility, and the value of human resources (Amrutha and Geetha, 2020). Recent research underscores this emphasis on human resources, indicating that specific human resource management practices, particularly in training and development, recruitment and selection, and rewards and compensation, are fundamental to enhancing organizational performance in ISO 9001:2015 certified service firms (Santos, 2023). Such studies bring forward the importance of having a distinct plan for learning and development, encouraging employee participation in relevant training programs, and ensuring that compensation packages motivate employees to align with company goals. As the business environment evolves, sustainability has emerged as a central topic. It's seen as the optimal mode of conducting business, to achieve growth through a visionary approach, set particular targets, and embed human resource management practices within sustainability tenets (Karman, 2019). While significant strides have been made, there is a noted underutilization of human resources in sustainability realms (Poldner et al., 2017). With human resources forming one of the foundational pillars of sustainable development, businesses eyeing sustainability should focus extensively on bolstering their human resource agility. Supporting literature indicates a robust, positive correlation between agile human resources and organizational sustainability (Karman, 2019). A number of research have attempted to define sustainable human resource management, and the subject's current surge in attention has revealed a variety of definitions. According to Ehnert et al. (2016), adopting Human Resource Management HRM strategies and practices that have an impact both inside and outside of the company and over a long-time horizon, while controlling for unintended side-effects and negative feedback, enables the

fulfillment of social, economic, and ecological goals. Given the importance of environmental changes and the belief that organizations should adapt to them, human resource agility has thus emerged as one of the most crucial means of ensuring the sustainability of human resources and as the primary objective for many organizations. Human resource agility is therefore defined as the capacity of people to effectively handle problems and exploit opportunities (Braun et al. 2017). In addition, since an organization's survival and growth are dependent on a variety of factors, it is important for them to become more interested in and involved in human resource management. One such factor is human resource agility, which has drawn the interest of numerous organizations due to its importance in the success of the hotel industry as a whole and the Jordanian hotel industry in specific. The Jordanian hotel industry has utilized all of its resources, capabilities, financial and technical expertise via multiple growth plans in order to achieve the goals of economic and social development that Jordan is undergoing (AlZboun et al., 2016). The Jordanian hotel industry has made a significant contribution to economic growth, by offering the necessary financing for them to execute out the economic development tasks assigned to them as needed, increasing their economic contribution to the gross domestic product while also achieving the targeted diversity of the Jordanian economy (AlZboun et al., 2016). The Jordanian hotel industry believed that human resources should be a motivating and auxiliary factor that looks for to help and encourage talented people and is capable of translating loud words and slogans into actions that are effective and efficient for the purpose to deal with these significant trends, which are becoming more significant every day. Since a company's success and survival depend heavily on investing in its people, this is a crucial factor. As a result, in the modern period, human resources have attracted increasing attention, which is shown in the decision-makers' increased acceptance of the significance of the role that human resources play, which eventually strengthens the organization's competitive position (Junita, 2021). In addition, there is a dearth of studies examining the relationship between organizational sustainability and human resources agility from a practical standpoint. The importance of this study appears in trying to fill this gap in the literature on

human resources management, take advantage of its data, and put it into action and looks at how human resources agility affects organizational sustainability in the Jordanian hotel business. Findings will contribute to related literature as well as to practice, through providing an emphasis on the field of human resource – agility and sustainability-in organizations and businesses within Jordan or any other country. Professionals and practitioners at all administrative levels may they could benefit from the results of the current study in employ it in another sector. In addition, leading organizations using human resource agility will encourage others organization to achieve excellence Fig. 1, theoretical framework shows the relationship between agile HR practices and organizational sustainability.

LITERATURE REVIEW

Human resource agility

The phrase “agile human resources” describes how human resource functions are now designed in a way that makes it easier to respond to changes in activities and organizational structures as well as to new external conditions (Braun *et al.*, 2017). The term “agile human resources” also refers to individuals

who are open to learning and self-improvement, have problem-solving skills, can adapt to new situations and ideas, and have the initiative to take on novel tasks (Revutska and Marková, 2021). Human resource agility has been defined as the proactive, flexible, and pragmatic conduct of employees looking for chances to contribute to the success of the company. In addition to the propensity for learning and supporting the activities that must be prioritized in the workplace, the significance of human resource agility in organizations lies in restructuring the workforce to adapt to the circumstances of adaptive and creative behavior in the organization (Obaid *et al.*, 2023). According to Athamneh and Jais (2021); Makori *et al.*, (2022); Jameel and Mhaibes (2022); Petermann and Zacher (2022); and Obaid *et al.* (2023), the researcher determined the following aspects of human resources agility:

Resilience

Agile workers exhibit resilience by performing well under pressure. Resilience is a crucial talent that equips workers to deal with and adjust to changing settings and circumstances, according to Naswall *et al.*, (2019). A workforce with high

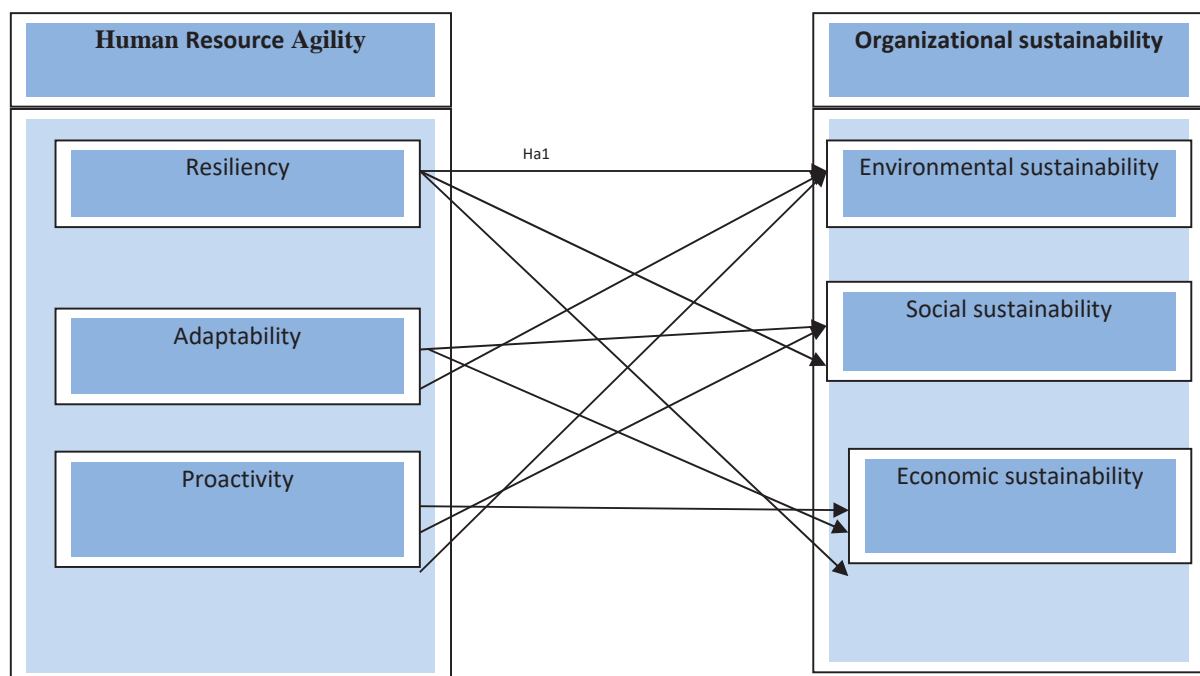


Fig. 1. Research model

levels of resilience can bounce back fast from shocks and crises in the workplace (Heilmann *et al.*, 2018). Employee resilience according to Kuntz *et al.*, (2017), encompasses adaptable, learning, and network-based behaviors that demonstrate the accessibility of resources as well as employees' motivation and aptitude for using such resources. Resilience may be built via education, professional experience, understanding of the particular task or firm, and personality attributes that are conducive to productive work (Heilmann *et al.*, 2018). Managers understand the importance of early resilience development, which is a lifelong activity and is crucial for success, according to Britt *et al.*, (2016). Benefits of building resilience in teams include empowering staff to turn setbacks into learning opportunities, according to Snyder and Brewer (2019). The first push for staff development must be led by leaders in order to overcoming adversity and recovering from it.

Adaptability

According to Cai *et al.* (2018), adaptability refers to an employee's readiness to modify their interpersonal and cultural behavior in order to better fit into the new workplace. Alavi, (2016) asserts that in order to be adaptable, workers must draw on a variety of information, experiences, and abilities. Employees that are adaptable may play numerous jobs, transition between them without difficulty, and work simultaneously in different teams (Sherehiy and Karwowski, 2014). According to Friedman *et al.* (2018), employees with ongoing education, have the desire, aptitude, and motivation to continually learn new material, which gives them the adaptability to deal with change. One of the biggest problems confronting company executives today is how to position and equip people to adapt to a dynamic and demanding environment (Uhl-Bien and Arena, 2018). Employee *adaptability* is frequently hampered by a misalignment with company values. Alas and Mousa (2016) discovered a significant relationship between employee alignment with company ideals and adaptability. Business leaders must create strategies and initiatives that release workers' abilities to deal with change and uncertainty in order to promote adaptation.

Proactivity

To start and carry out new changes in a

company, Proactivity is essential. Proactivity was defined by Cai *et al.* (2018) as the initiative of staff members about actions that have a favorable influence on the changing environment. Sherehiy and Karwowski (2014) define proactive actions as (a) predicting challenges connected to change, (b) starting initiatives that result in the resolution of these issues and enhancements to work, and (c) resolving change-related issues. According to Lee *et al.* (2019), proactivity is a potential innovation driver in businesses and demonstrates that staff members are change and entrepreneurial minded. A workforce that actively searches out possibilities to address issues and develop fresh solutions for the business includes proactive personnel.

Organizational sustainability

Organizational structure for any company is seen as a crucial element for the performance of responsibilities and as a driving force for the firm to realize its vision and purpose. An organization can, at its most basic level, be a single person, a team of individuals working toward a common vision and objective, or a collection of goals (Boons *et al.*, 2013). Companies have been greatly impacted by shifting demographics, the global economy, social injustice. A common reaction for organizations is to implement sustainable processes with an eye toward having a positive impact on the environment and building social and financial capital (Wales, 2013). The fundamental tenet of organizational sustainability is the idea that by bolstering and safeguarding the social, economic, and environmental systems inside company operations, and continue businesses to function smoothly and grow without jeopardizing the demands of the future (Boudreau and Ramstad, 2005). Organizational sustainability has taken on a vital role as a result of growing awareness of the changes occurring in the corporate environment. Nowadays, it is crucial for every firm to follow what are known as agile human resource practices. Organizational sustainability for organizations related to economic, social, and environmental sustainability (Bouncken *et al.*, 2015). Businesses from all sectors should concentrate on challenges related to economic, environmental, and social sustainability in order to be able to survive and thrive in today's volatile and continuously changing business environment. (Govindarajulu and Daily, 2004). By implementing agile HRM, a business aims

to adopt numerous initiatives that will result in lower costs, higher efficiency, and improved employee participation in processes that will promote the sustainable use of the limited resources available.

Organizational Sustainability's Dimension"

Researchers and academics now place a greater value on the necessity of organizational sustainability strategies as a result of the changing corporate environment, market demands, and customer wants (Bouncken *et al.*, 2022). As a basic direction for effectively competing and accomplishing the intended goals over the long term, companies are seen to operate sustainably when they concentrate on supporting three key dimensions: ecological, social, and economic (Boons *et al.*, 2013). In order to provide value for the organization in all of its operations and activities, from raw materials, production, and supply chains, to the end consumers, it should be concerned with organizational sustainability with its dimension that includes environmental, social, and economic elements. The environmental component is concerned with the use of renewable resources, minimal waste production, low emissions, and air, water, and land pollution avoidance. The social dimension is concerned with things like fairness, diversity, happiness, community, health, and safety. Profit, corporate stability, financial resiliency, and return on investment are all relevant aspects of the economic component (Strezov *et al.*, 2017). Due to intense competition, globalization and technical progress, the contemporary business environment has created a number of issues for companies that must be taken care of in order for companies to maintain their survival and position in the global market as well as obtaining a competitive advantage, so companies have shifted their attention and focus away from simply expanding their production and services to human capital. And how to properly manage the human resource and focus on practices that increase the efficiency and effectiveness of the human element and achieve sustainability (Al Aina and Atan, 2020). The ability of an institution to manage and deal with its human resources more effectively and efficiently puts it in a favorable position to accomplish its goals and achieve sustained organizational, any company's performance success and growth depend on selecting the right workers with the appropriate talents at the appropriate time

and place, as they will serve as the primary driver of sustainable competitive advantage and improved performance (Vargas-Hernández, 2021).

Relationship Between Human Resource Agility and Organizational Sustainability

The modern business environment has evolved into one that is unstable, unpredictable, complicated, and ambiguous, with a wide range of possibilities and risks. It manifests as a web of companies that are continually evolving and emerging. Today's businesses must constantly adapt to their client's demands, provide quick, customized service, spot opportunities before rivals do, quickly develop and implement innovative strategic initiatives, and maintain a constant focus on minimizing adverse effects on the environment and resources. A company that strives to include more and more sustainable development practices into its strategic plan may draw strength from its workers' innovative drive, knowledge, and abilities, which are backed by modern technology and digitalization (Munteanu *et al.*, 2020). Agility practices can help firms achieve sustainability, which is a component of sustainable development. The adaptability of human resources is a key component of sustainable company dynamics and is essential for success in a dynamic and cutthroat market (Nafei, 2016). Managers of firms who are interested in sustainability must understand that their unique feature-human resources-are the only way to attain agility. It is well recognized that the application of sustainable policies, including the sustainability of human resources, may benefit from having a agile and adaptable approach. It has been demonstrated, however, that the implementation process depends far more on the organization's staff than it does on cutting-edge technology, as was previously believed. Agile human resource practices are the most crucial component for the survival and sustainability of the human resource and creating competitive advantage, and they should be prioritized when defining objectives or plans (AlNawafleh *et al.*, 2022). Agile workers can swiftly adjust to new circumstances using their experiences. They are not frightened of taking chances or facing difficulties, and they feel at ease in challenging circumstances. Therefore, it has been demonstrated that HR agility has a favorable effect on both individual and organizational achievement (Sameer, 2022). Agile workers, according to studies,

create a mindset that motivates people to seek out challenges and have the abilities necessary to adapt to a workplace that is changing quickly (Jarlstrom et al., 2018). These are a few of the reasons why businesses want to keep workers who have shown to be adaptable, fast to adjust to new situations, and who have a good outlook on the company. As a result, human resources would be sustained. Additionally, research has indicated that workers who have developed a body of knowledge, skills, and competences are more engaged to their employers. Agile practices, and processes must be aligned with HR departments as well as integration of workers' knowledge, experience, and abilities from a variety of sources paves the way for advancement, self-improvement, job stability, and the accomplishment of company goals and objectives (Kumar et al., 2023). There is consensus regarding the importance of an agile employees and their role in boosting and sustaining organizational performance; this implies that agility takes into account employees' abilities, knowledge, and experience in order to add value to their companies (Nafei, 2016). The significance of employing agile workers, stems from the fact that they are willing to achieve organizational goals more effectively and efficiently with a greater degree of performance, having more commitment to their institutions because they are highly motivated to complete their duties, which provides a significant competitive advantage, increasing productivity and profitability. (Ranasinghe and angaradeniya, 2021). According to various research (Athamneh and Jais, 2023; Shahsavari-Pour et al., 2021) the adoption of the human resources agility strategy is essential in order to achieve development and survival. There is also proof that pursuing sustainability necessitates adopting the right strategy, since this enables the firm to adjust to the many demands of a changing external environment (Jameel and Mhaibes, 2022). Also, the research by Karman (2019) has verified that HR agility has an impact on an organization's capacity to compete. Human resources agility helps firms become more adaptable and strategic in their thinking. Al-Nawasrah and Alafi, (2021) further proved that the agility of human resources has an influence on the person-job fit in Jordanian airline firms, and that the agility of human resources enhances the impact of human resource management methods on person-job fit. Makori et al. (2022) confirmed that employee

agility has a favorable impact on organizational performance. Additionally, the findings of the Sameer, (2022) study demonstrated that workforce agility had a favorable impact on job performance in a blended working environment. Obaid et al., (2023), findings from also supported the impact of human resource agility on strategy renewal. Based on the above discussions, the researcher proposes the conceptual research model and the following hypothesis:

Ha1. The HR Resiliency positively impact on Environmental sustainability

Ha2. The HR Resiliency positively impact on Social sustainability

Ha3. The HR Resiliency positively impact on Economic sustainability

Hb1. The HR Adaptability positively impact on Environmental sustainability

Hb2. The HR Adaptability positively impact on Social sustainability

Hb3. The HR Adaptability positively impact on Economic sustainability

Hc1. The HR Proactivity positively impact on Environmental sustainability

Hc2. The HR Proactivity positively impact on Social sustainability

Hc3. The HR Proactivity positively impact on Economic sustainability

To achieve the objectives of the study and verify these hypotheses, the current study has been carried out on Jordan in 2023.

MATERIALS AND METHODS

Research Design and data collection

A descriptive analytical strategy was utilized in the study, which is a method that the scholar takes to examine a certain event as it really occurs. This method allows the investigator to define and outline the phenomenon's causes as well as the amount to which it is connected to other occurrences, all without overdoing or understating the phenomenon (Bell et al., 2022), explains the extent to which Jordanian hotels utilize agile human resource methods. Additionally, it is analytical, examining its impact on organizational sustainability on the hotel sector in Jordan. All research participants were identified and given an equal chance to participate since the study sample was drawn using a probabilistic methodology. This sample strategy is referred to as the simple random sampling technique, and a specially

created questionnaire was used to gather the data. Individuals were encouraged not to divulge their names in order to decrease the influence of common method bias (CMB), as was reported by Podsakoff *et al.*, (2012). An online poll was used to enhance the workers' perception of privacy. HR staff members sent the survey link via email and other methods, such as Whats App groups. The study model is composed of two distinct components that have been operationalized and adapted from prior studies in order to accomplish the study's objectives. The structures, sources, and scales are described in the following sentences.

- Agile human resources practices were evaluated utilizing (Makori *et al.*, 2022; Jameel and Mhaibes, 2022; Petermann and Zacher, 2022; Obaid *et al.*, 2023). Twelve-item measure including the subdimensions "Resilience HRM practices," "Adaptability HRM practices," and "Proactivity HRM practices." The application of agile HR methods was evaluated by the workforce. The responses were scored on a 5-point scale from 1 (strongly disagree) to 5 (strongly agree).

- Organizational sustainability was measured using the (Ogbu Edeh and Okwurume, 2019; Jehan *et al.*, 2020; Roca-Puig, 2019; Malik *et al.*, 2020). Twelve-item measure including the subdimensions, (environmental sustainability, social and economic sustainability), the employees were asked to assess the sustainability of their company. Responses were graded on a 5-point scale, rated from 1 (strongly disagree) to 5 (strongly agree).

Population of the study and sample size

The population selected for this study consisted of all of the employees employed in Jordan's hotel sector. Which their number (21835) worker, based on information provided by the Jordanian Ministry of Tourism and Antiquities, for the year 2022 (Jawabreh *et al.*, 2022). However, the survey only included 22 hotels. The study's sample will be made up of 410 workers that are employed in the hotel sector in Jordan. According to Sekaran and Bougie (2019), the ideal sample size is (375) individuals. To guarantee getting the ideal sample size, (470) questionnaires were given to the study sample. Of those, 410 were located utilized for data analysis, as shown in Table.1

Analytical methods

Numerous statistical methods, including frequency, percent, mean, standard deviation, Cronbach's alpha, exploratory factor analysis, average variance extracted, and composite reliability, have been employed to meet the aims of this research. Additionally, a Structural Equation Modeling (SEM) was used to quantify the impact of human resource agility on organizational sustainability. As the Measur reliability was estimated by calculating Cronbach's alpha that indicates adequate internal consistency, this technique must greater than (0.70) (Hair *et al.*, 2017). As well, construct reliability was confirmed by determining the composite reliabilities (CR) for constructs within the measurement model must be upper than (0.70) in order to indicate a satisfactory internal consistency as recommended by Hair *et al.*, (2010). Validation of the scale was done through calculating convergent validity which was confirmed by determining the Average Variance Extracted (AVE), the values of average variance extracted (AVE) for constructs within the measurement model were higher than (0.50) as recommended by Malhotra and Stanton (2004). As well as, a Structural Equation Modelling SEM was applied to measuring the effect of human resources agility in organizational sustainability. SEM is technique for dealing with and handling models containing constructs in formative and reflective formats, respectively. SEM's statistical presumptions are not rigid, and it may be used with both small and large sample sizes as well as non-normal data. In addition to being useful for examining associations with weak theoretical underpinnings (Hair *et al.*, 2016). SEM is a viable option for researching model variables because of these advantages.

RESULTS AND DISCUSSION

The demographic details of the research sample are displayed in Table 1. The demographic makeup of the study sample was determined using frequency analysis. According to our data, there are 31.8% female participants and 68.2% male workers. While the responcers ages, were 23.9 % of participants were between the ages of 20 and 29, while the largest age group was between the ages of 30 and 39, which included 35.4% of participants. The second-largest age group, comprising 27.3% of the employees that for

Table 1: Study sampling unit personal and occupational characteristics

	Categorization	Frequency	Percent
Gender	Male	280	68.2
	Female	130	31.8
Age	20 – 29 years	98	23.9
	30 - 39 years	145	35.4
	40 – 49 years	112	27.3
	50 years and more	55	13.4
Education	Diploma	88	21.5
	Bachelors	211	51.5
	Master	73	17.8
	Doctorate	38	9.2
Experience	Less than 10 Years	102	24.9
	From 10 – 14 Years	140	34.1
	From 15 – 19 Years	113	27.6
	20 Years and above	55	13.4
Total	-	410	100%

category 40-49. And the remain for the category 50 years and more. for qualification the result indicated that who holders of a bachelor's degree are the most popular category with percentage (51.5%) followed directly by holders of a diploma degree with a total rate (21.5), and those they have master degree (17.8%), finally, the lowest percentage for who have a doctoral degree at (9.2%). The number of experience years in the current hotel showed that the percentage of those with experience from 10 to 14 Years constitutes the largest with percentage (34.1%), followed by the category of experience years from 15 - 19 years with a percentage (27.6%), then, thirdly, the category of experience years is Less than 10 Years with a percentage (24.9%), in the last place was the category of experience years 20 Years and above with a percentage (13.4%).

Reliability and Validity

Measuring reliability was estimated by calculating Cronbach's alpha that indicates adequate internal consistency, this technique must greater than (0.70) (Hair et al., 2017). As well, construct reliability was confirmed by determining the Composite Reliabilities (CR) for constructs within the measurement model must be upper than (0.70) in order to indicate a satisfactory internal consistency as recommended by Hair et al. (2010). Validation of the scale was done through calculating convergent validity which was confirmed by determining the Average Variance Extracted (AVE), the values of average variance extracted (AVE) for constructs within the measurement model were higher than (0.50) as recommended by Malhotra and

Stanton (2004). Results from Table 2 reveals that all Cronbach's alpha and CR values are greater than the cutoff marks, indicating that the constructs are reliable and properly reflect the concepts (Hair et al., 2012). Also, the findings in Table. 2 show, the AVE value for each construct in this investigation is larger than 0.50. As a result, the criteria for internal consistency and convergent validity have been defined and confirmed by the current investigation (Hair et al., 2017). Table 3 shows the results of Hypotheses Testing.

Hypotheses testing

Evaluation of the structural model

After analyzing the data by SEM, the findings determined that the Resiliency has a significant positive impact on Social sustainability, Economic sustainability at Jordanian hotel sector (**Estimate** = 0.323 and 0.207; **C.R** = 3.660 and 2.357; **P-value** = 0.01 and 0.00). This suggests that employees they have Resiliency. are more interest to Social and Economic sustainability practices at Jordanian hotel sector these findings support hypotheses Ha₂ and Ha₃, while Resiliency not positively impact on Environmental sustainability. These results were consistent with the Karman (2019); Al-Nawasrah and Alafi (2021). Adaptability has a significant positive impact on Environmental sustainability, Social sustainability and Economic sustainability at Jordanian hotel sector (**Estimate** = 0.247, 0.203 and 0.521; **C.R** = 2.312, 2.698 and 5.296; **P-value** = 0.021, 0.011 and 0.00). This suggests that employees they have Adaptability are more interest to Environmental, Social and Economic sustainability practices at Jordanian

Table 2: Descriptive Statistics, EFA, Cronbach's alpha, composite reliabilities and average variance extracted

Construct	Mean	SD	Factor Loadings	CR	AVE
Resiliency (Cronbach's = 0.848)	3.510	0.758	0.860	0.772	0.612
Adaptability Cronbach's = 0.850)	3.533	0.701	0.718	0.764	0.564
Proactivity (Cronbach's = 0.881)	3.565	0.742	0.788	0.811	0.635
Environmental (Cronbach's = 0.903)	3.511	0.777	0.782	0.799	0.639
Social sustainability (Cronbach's = 0.884)	3.614	0.724	0.766	0.846	0.748
Economic sustainability(Cronbach's=0.909)	3.490	0.766	0.769	0.762	0.561

Table 3: presents each parameter's Composite Reliabilities C.R*, Estimate and S.E.

Hypothesis	Regression Weights		Estimate	SE	C.R.	P Value	Results
	From	To					
Ha1	Resiliency	Environmental	0.154	0.083	1.850	0.074	Rejected
Ha2	Resiliency	Social sustainability	0.323	0.085	3.660	0.00	Accepted
Ha3	Resiliency	Economic sustainability	0.207	0.092	2.357	0.01	Accepted
Hb1	Adaptability	Environmental	0.247	0.114	2.312	0.021	Accepted
Hb2	Adaptability	Social sustainability	0.203	0.120	2.698	0.011	Accepted
Hb3	Adaptability	Economic sustainability	0.521	0.097	5.296	0.00	Accepted
Hc1	Proactivity	Environmental	0.475	0.094	5.085	0.00	Accepted
Hc2	Proactivity	Social sustainability	0.319	0.093	3.524	0.00	Accepted
Hc3	Proactivity	Economic sustainability	0.104	0.124	0.801	0.290	Rejected

* Composite Reliabilities

hotel sector. These findings support hypotheses Hb1, Hb2 and Hb3. Finally, Proactivity has a significant positive impact on Environmental sustainability and Social sustainability at Jordanian hotel sector (**Estimate** = 0.475, 0.319; **C.R** = 5.085, 3.524; **P-value** = 0.00, 0.00). Additionally, the results showed that adaptability significantly influence all organizational sustainability dimensions, including social, environmental, and economic sustainability. This implies that an increase in these activities will result in greater environmental, social and economic sustainability. Additionally, the results showed that proactivity significantly impact on social and environmental sustainability. These results were consistent with the (Makori *et al.*, 2022; Sameer, 2022; Obaid *et al.*, 2023; Al-Nawasrah and Alafi, 2021). This suggests that employees they have Proactivity are more interest to Environmental and Social sustainability practices at Jordanian hotel sector. These findings support hypotheses Hc₁, Hc₂. While Proactivity not positively impact on economic sustainability. These results were consistent with the Makori *et al.* (2022); Sameer (2022); Obaid *et al.* (2023).

CONCLUSIONS

This study examines the influence of human

resource agility on organizational sustainability within the Jordanian hotel sector. Current study, using a Structural Equation Modelling (SEM), which support and explained the relationship between human resource agility and organizational sustainability. The results have been derived using primary data that was obtained from the research sample. Based on the findings, resilience has a positive influence on social and economic sustainability. These results demonstrate that putting these strategies into practice and growing them have a favorable influence on social and economic sustainability. This implies that an increase in these activities will result in greater social and economic sustainability. While environmental sustainability was not significantly impacted by resilience. The results also demonstrate that adaptability has a significant positive impact on Environmental sustainability, Social sustainability and Economic sustainability. While Proactivity has a significant positive impact on Environmental sustainability and Social sustainability and not positively impact on economic sustainability. Findings add to relevant research and practice by putting a focus on human resource agility and sustainability in organizations and enterprises in Jordan or anywhere

else. The findings of the current study may be useful to experts and practitioners at all administrative levels who wish to apply them to other fields. Additionally, utilizing human resource agility in leading firms will inspire others to attain greatness. The major limitations of this study were the use of a self-reported instrument for data collection. Self-reported data are commonly biased when people talk about their own experiences because people frequently try to inflate some of their activities or they avoid revealing some of their undesirable habits, which would impact the outcomes of data analysis. It is crucial to exercise caution when extending research findings to various sectors and other countries as the study sample was drawn from only one business (the hotel sector). This study recommends that interested researchers look into and analyze the mediating role of job embeddesness on the relationship between human resource agility and organizational sustainability at other industrial or service fields in Jordan as well as across different nations and various regional boundaries. Future studies might take the factors from the existing publications and relate them to other variables like the employees' organizational commitment.

CONFLICT OF INTEREST

The authors affirm that there are no conflicts of interest. The authors have also strictly adhered to all ethical requirements, including those relating to plagiarism, informed consent, misconduct, data fabrication or falsification, duplicate publication or submission, and redundancy.

ABBREVIATIONS

<i>AVE</i>	Average Variance Extracted
<i>CMB</i>	Common Method Bias
<i>CR</i>	Composite Reliabilities
<i>HR</i>	Human Resource
<i>HRM</i>	Human Resource Management
<i>OS</i>	Organizational Sustainability
<i>SEM</i>	Structural Equation Modeling

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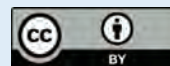
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