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#### Dedication

It is our pleasure and great privilege to present the fifty-ninth issue of the Academic Journal of Research and Scientific Publishing to all researchers and doctors who published their research in the issue, and we thanks and appreciate to all contributors and supporters of the academic journal and those involved in the production of this scientific knowledge edifice.

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# Role of Business Ethics in Raising Corporate Social Responsibility Awareness of Public Institutions (Case Study: Tayma Municipality, Tabuk Region in Saudi Arabia)

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#### ABSTRACT

The purpose of this study is to investigate the potential relationship between the social responsibility and business ethics of personnel working for the municipality of Taima. as importance, this study shows how much Saudi government employees respect work ethics, which influences social responsibility. This study should also improve organizations' ethics to promote Arab-Islamic values.

Our sample included 50 Saudi employees from various Taima Municipality departments. Our investigation relied heavily on quantitative method. A questionnaire is used to collect data in a hypothetical-deductive framework. The form of administration utilized is a self-administered survey conducted using the messaging application WhatsApp. This research's empirical findings show that corporate ethics affect economic, ethical, legal, and charitable social responsibility. These contributions strengthen the notion that Corporate Social Responsibility is inherently connected to ethics. CSR seeks to create socially responsible companies that smoothly integrate into society and operate sustainably in every way. By the end of the research, we recommend that social responsibility is essential for successful organizations to achieve their goals. In addition, conducting conferences on social responsibility, is a key aspect in sustainable development, and promoting the link between social responsibility, ethics, and institutional excellence.

**Keywords:** Ethics, Work Ethics, Work, Social Responsibility, CSR, Organizations, Public Institution



#### **1. INTRODUCTION**

The best way for a business to prosper and achieve its survival, continuity, and growth goals is to act responsibly toward the community in which it operates. This has *made* social responsibility a significant problem for today's businesses. In this way, ethics is a societal value, just like the principles of right, beauty, honesty, and others, that governs how businesses interact with their clients (Chooprayoon, 2011).

This research looks at how government agencies in the Tabuk region of Saudi Arabia practice social responsibility and work ethics. To better accomplish the Organization's long-term goals, this study highlights the significance of business ethics in educating employees and other stakeholders about their social responsibilities in the workplace. Given the dearth of research in this area, especially inside governmental organizations, the authors hope their findings will add to the growing body of literature on the topic of corporate social responsibility and its intersection with ethical business practices.

This study also intends to define the idea and aspects of social responsibility and business ethics throughout the research process. In addition, this research aims to assess the current state of social responsibility within Saudi Arabia's governmental institutions. The document also seeks to define corporate social responsibility as it pertains to addressing ethical issues in the private sector in Saudi Arabian government agencies.

Employees at several administrative levels were surveyed to gauge their opinions on how thoroughly various aspects of social responsibility and work ethics were addressed in comparison to others. Understanding how business ethics can help instill a sense of social responsibility in one's workforce, how that has an impact on productivity, and how one can see beyond immediate problems is the emphasis of this research. Is there a comprehension of the respondent's work ethic? Does the population you're looking at have a sense of their own social responsibility? When it comes to matters of ethics in the workplace and social responsibility, how far do standards go?

#### 2. Review of Literature

<u>Corporate social responsibility:</u> In the words of Howard Bowen, the "founding father" of modern CSR, "Corporate social responsibility refers to the role of businesspeople to adopt policies, make choices, and follow standards that match the objectives and values that are regarded acceptable in our society". (Belasri, Gomes, & Pijourlet, 2020)



The European Commission defines CSR as the voluntary incorporation of social and environmental issues by businesses into their operations and relationships with their stakeholders. (Akanpaadgi, 2023)

Adopting a moral lifestyle Corporate social responsibility (CSR) is seen as the driving force behind social progress and sustainability since it helps businesses meet their civic duties (Courtnell, 2022).

Also do not forget that the confidence that the policy of the company is a business policy that caters for the present and future demands of the stakeholders, hence fostering sustainability (Ajao, Adegbie, & Ogan, 2020).

That's why Corporate social responsibility (CSR) entails voluntary actions by businesses to improve their social and environmental impacts. As knowing that long-term improvements in human life, the natural world, and the economy are the results of collaborative efforts between a company's management, workers, and communities. According to Ashrafi, Magnan, Adams, and Walker (2020), incorporating CSR into corporate strategy and operations can boost an organization's overall effectiveness.

<u>CSR several stages of development:</u> First, spreading and developing the Corporate Social Yearbook: some split the evolution of corporate social responsibility into five basic stages. The second, with the creation of the Imperial Social School in the 1980s, called for social aspects to be considered in the drafting of laws and was followed by the federal government of the United States adopting laws obliging American companies to assume their social responsibilities and prevent monopolies, drug and food inspections, the establishment of legal entities, and the introduction of German economists in the 1980s and 1950s influenced organized liberalism, which revived corporate social responsibility.

After World War II, the private sector was crippled by the nationalist movement in capitalist states, the rise of socialist nations, the independence of Third World nations, and government-led inclusive development. In the early 1970s, Margaret Thatcher became Britain's governor, and the fifth phase began with the Soviet Federation's privatization program and a similar movement in the US to limit the central government and private sector. Human, labor, and environmental rights dominated the Court. Business ethics debates continue today.

Economic crises have improved living standards and increased the gap between rich and poor, both in developed and developing countries, and many factors of globalization have led multinational



companies to promote social accountability and focus fully on human rights, employee safety, environmental protection, and the preservation of natural resources. Public authorities and the public increasingly oppose laws protecting people, employees, and the environment, as well as oil company disruptions and disturbances. Finally, technological developments allowed them to compensate victims and fix defective products.

Accelerating public product and vehicle development and adapting to disadvantaged tastes. The technology revolution and democratization have made media and user and evaluator surveillance groups more accessible to underdeveloped countries (Al-Jizawi, 2022).

<u>Levels of the CSR pyramid</u>: The CSR pyramid explains how and why a corporation must fulfill its social duties. Professor Archie B. Carroll of the University of Georgia adapted the 1950s work. Economic, legal, ethical, and charitable are the levels of the CSR pyramid (Carroll, 1991).



#### Figure 1- Carrol's CSR Pyramid (1991) – Source : The CSR Journal

By looking at Carol's pyramid of responsibility (Figure 1), we can see that he organized the dimensions in a hierarchical structure. The researcher began with economic responsibility at the base of the pyramid because, as we know, businesses exist to make a profit. According to (Carol), businesses should incorporate all tiers of corporate social responsibility; economic responsibility, legal responsibility, ethical responsibility, and finally, philanthropic responsibility, which stems from a firm belief in all of the other facets of corporate social responsibility. Trust in the Organization's employees and organs, as well as the society in which it functions, is reflected in the importance placed on public office ethics. Having an understanding of public service ethics and its importance will improve its efficiency and lighten its load.



According to Trevino &Nelson (2021), ethics is "the principles, norms, and standards of conduct regulating an individual or organization" (emphasis added). We anticipate that businesses will set standards for appropriate behavior on the job, such as when employees should arrive and leave, whether or not smoking is permitted, how clients should be dealt with, and how quickly tasks should be completed.

Several sectors of society place a premium on corporate and individual commitments to ethical values and ethical conduct. Because of this, the Organization is more likely to stick to the values of hard effort and integrity, rather than viewing its interests through the myopic lens of the few criterion represented by immediate monetary gains. Companies that are committed to acting ethically will see improved long-term financial returns, whereas companies that ignore ethical norms may incur significant costs as a result of the numerous lawsuits that will be filed against them. Hence, we highlight the foundations of corporate ethics, which are the external social and moral value system, including the prevalent cultural norms, family, work, and artistic ideals. The second pillar is a person's internalized set of values and beliefs, which encompasses their theoretical and theological convictions, life experiences, degree of education, respect for personal space, and general well-being (Scarna, 2023).

Organizational business ethics can be bolstered through a number of measures, the most crucial of which is the training of internal editors. support for all oversight bodies; setting a good religious, national, and philosophical example; accountability of officials; Staff and their ongoing evaluation, composition, and training; transparency of laws, regulations, and procedures; Good example and prevention of wrongful individual jurisprudence from the State Concerns about society, the workplace, assistance, sustained impetus, and the creation of the Organization's regulatory bodies.

When it comes to moral conduct on the job, the first thing to look at is the organization's culture, which serves as a reflection of its values and beliefs. Second, the norms and foundations created by the Organization are to be upheld in good moral conduct, and anything unethical must be stopped. These rules and foundations act as laws. Last but not least, the outside public, as intended by the Government and the entities linked with the Organization, who motivate the Institution to pursue particular behavior that guarantees the attainment of its objectives in light of the rights of those parties (Jawad Mohammed, 2019). The following dimensions were identified to quantify business ethics in this study, with reference to the Ministry of Human Resource and Social Development's Guidance Handbook on Labour Ethics in the Kingdom of Saudi Arabia.



- The labour relationship, which includes the conduct and ethics of the employee the behaviour and ethics of the employer common principles between the employee and the employer (transparency, listening, participation, teamwork, cooperation, disclosure and reporting, conflict of interest, workers' relationship with each other)
- Working environment which includes what all parties must respect what must be considered by the employer and what must be considered by the employer)
- Public attitudes and morals, which include justice, equality and non-discrimination public appearance bribery, acceptance of gifts, corruption and fundraising.

Today, businesses may rest assured that they will continue to function ethically in the future thanks to the emergence of the notion of "business ethics," which has become crucial to the foundations of today's corporate world. Ethical principles, including social responsibility, are fundamental to human existence. As a result, the two are inextricably linked, as social responsibility unites all sectors of society, no matter how big or small, public or private, to ensure progress in the correct direction. Unfortunately, there has been a dearth of research into the correlation between CSR activity and the stability of the workplace. According to Peloza and Hassay (2006), workers benefit from things like increased productivity and boosted morale. Peterson (2004) showed that workers in a wide range of industries reported improvements in collaboration, communication, leadership, and project management abilities as a result of their involvement in corporate social responsibility. Employees that take part in CSR initiatives cite several positive outcomes (Brammer, Millington, & Rayton, 2007). In this research, we have to test if these result are reliable or not in Tayma municipality-Tabuk region of Saudi Arabia's.

#### **Conceptual model of research**



#### Figure 2- Source: Researcher's preparation 2023



Based on the model of the study and the changes identified, many hypothesis can be formulated to test these relationships, reach the answers to the study's question wich is : does business ethics positively influences social responsibility in public organizations or not? and therefore, achieve its objectives through the main research goal; *social responsibility positively affect business ethics*, from wich the following hypotheses derive :

- H.1: business ethics positively affect economic responsibility
- H.2: business ethics positively affect legal responsibility
- H.3: business ethics positively affect ethical responsibility
- H.4: business ethics positively affect philanthropic responsibility

### 3. Materials and Method

Research that relies on experimentation or observation is an example of empirical approach<sup>1</sup>. The researcher has the freedom to select the approach that best fits his needs and is most appropriate for the study of his topic of interest. We believe that "the positivist paradigm," which presents "a set of currents which argues that only the analysis and understanding of facts verified by experience can explain the phenomena of the world,"<sup>2</sup> is the best framework for our research. Only the evidence of science can guarantee this. D'Amboise (1996) argues that this paradigm is where our perception of the world is formed, as it provides the basis for the hypotheses we test. Given that we want to build hypotheses that correlate to each of the explanatory factors in order to arrive at the solution to our research goal, we will use a hypothetical-deductive methodology. In addition, we decided to build our scale using the Churchill Method (1979). We choose the quantitative research project that addresses our main "Business Ethics" behavior-related issues. "A quantitative study is one that collects numerical data from a statistically significant subset of a population and extrapolates those findings to the full population<sup>3</sup>. Recall that we set out to solve a problem involving "the effect of Business Ethics on the Social responsability" with the purpose of reaching out to government employees. We also conducted in-depth interviews with all managerial and supervisory municipal staff to demonstrate the positive impact that a focus on ethics in the workplace may have on a company's overall consciousness of its social responsability.

<sup>&</sup>lt;sup>1</sup> <u>http://en.wikipedia.org/wiki/Empirical</u>

<sup>&</sup>lt;sup>2</sup> <u>http://en.wikipedia.org/wiki/Positivisme</u>

<sup>&</sup>lt;sup>3</sup> <u>http://www.definitions-marketing.com</u>



Since this population is so massive, it would be nearly impossible to count every single member of it. Results will be more reliable and reflective of reality the more closely the sample represents the larger population of interest. All variables are measured by the Likert scale ranges from 1 (stongly disagree) to 5, which indicates strongly agree. In fact, the sample we released consists of 50 randomly selected employees at different administrative levels from Tayma-Tabuk municipality which is defined as a government department that works to develop precautionary dunes and villages, in addition to providing public services such as lighting roads and equipping streets, planting brawls, guide paintings, organizing markets and construction schemes, and keeping the city clean, where the state allocates a budget suitable for the municipality to develop and improve the shape of the city. Due to the fact that we don't have a comprehensive list of all the units in the survey, we'll be using a non-probability sampling technique—specifically, the convenience sampling technique to collect data for this inquiry. This method was chosen since it is quick and easy to choose sampling units. Following providing the procedures for verifying the measurement scales and the factorial decomposition of the research variables, the descriptive analysis is conducted.

#### 4. Data analysis

Actualy, the two types of analysis we used in this study were exploratory analysis using SPSS 27 and confirmation analysis using the method of structural equations AMOS26. Here, we do a factor analysis in principle components to ensure that our measurement scales are really unidimensional. This also amounts to testing the reliability of these scales under the SPSS 27 software. Indeed, factor analysis is "a data reduction technique" (Évrard, Pras, & Roux, 2003). This method of factor analysis is used to bring together the most correlated data into a single factor. Principal component analysis is used to extract and process important information obtained from the exploratory study. The CPA synthesizes these data by grouping the original variables, reducing them to a few new variables called principal components. These PCAs represent a linear combination of the original variables.

#### 4.1. The Exploratory Analysis

As a result, we obtain a new structure of variables whose number is less than the original variables. The results of the PCAs applied to the seven latent variables are summarized in the tables presented below with their respective interpretations. Publication Date: 05-03-2024 ISSN: 2706-6495



<b>Fable 1:</b> Results of explorator	y analysis of study model variables
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Source: AMOS 26

According to Table 1, we can deduce that:

- The study of the reliability of the variables in the research model makes it possible to decide on the homogeneity of the items that make up our questionnaire.
- The value of the Cronbach Alpha is very satisfactory for all variables.
- The Bartlett sphericity test (p=0.000) was significant for both periods of the survey and demonstrated the existence of non-null inter-item correlation matrices.

### 4.2. Factor Analysis

We begin with the first step of confirmatory factor analysis through the verification of the normality and multi normality of the measurement scales. Roussel et al (2002) propose two classical criteria for verifying the normality of a measurement model, namely Skewness and



Kurtosis. The values of these criteria must be lower, respectively to 3 and 8. In our case, these two criteria are confirmed.



Figure 2: Final structural model

#### **Adjustment indices**

We examined each model variable independently and made many adjustments before arriving at the following calibrated multidimensional model, which is based on a global measurement model esTaimated using the "maximum likelihood" approach (maximutm likehood).

		Standard	Result
	RMSEA	<.08 or at best < .05	,055
Absolute Indices	GFI	Goodness Fit Index, > 0.9	,979
	AGFI	> 0.9	,938
Incremental Indices	IFI (Delta 1)	0 < NFI < 1, Near or $> 0.9$	,964
	TLI* (rho 2)	Close to 1	,954
	CFI	0 <cfi<1, near="" or=""> 0.9</cfi<1,>	,962
Index of Parsimony	Standard $\chi 2$	<3	1,150

Fable 2:	Structural	Model	adjustment	indices
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Source: AMOS 26



We then see that the results found are very satisfactory. The adjustment indices are improving and perfectly meet the required standards with a standard Chi-Squared of 1.150 which is less than 3 and a REMSEA value of 0.055 which is likewise very close to 0.05. Furthermore, we note that the incremental adjustment indices are significant, as are the GFIs, AGFIs, NFIs and RFIs, all of which are above 0.9. Our structural model is thus well adjusted.

#### Reliability and Validity of all research constructs

In order to check the internal coherence of this construct and to ensure that the items specified in the model represent them sufficiently well, we calculate the Joreskog reliability (rhô), the convergent validity and the discriminant validity. A good reliability index (rho) for each dimension must be greater than or equal to 0.70 (Hair, Anderson, Tatham, & Black, 1998).

The objective is to verify that the items specified in the model sufficiently represent the constructed items. The results obtained from a factor analysis for each of the latent variables in our conceptual model give us satisfactory results. As regards reliability, we observe that all the constructs have a Jöreskog rho equal to 0.884 which exceeds 0.7, which makes it possible to confirm the reliability of the different constructs used in this research. For convergent validity, it is defined as 'a type of validity which determines to what extent the measurements of the same concept by two different methods are convergent' (Akrout, 2018) and the value of the Rhô of convergent validity pvc which is equal to 0.656 in our case study must be superior than 0,5 and this is confirmed for each variable.

#### **Discriminant Validity**

In practice, the discriminant validity is verified when the Chi-Deux difference of the two models is significant with respect to the difference in the degrees of freedom observed. In fact, in the context of our research, we adopt the method of Bagozzi & Philips (1982) which is based on a comparison of the free models and the constrained models of X2 for the verification of the discriminant validity. In our case, this discriminant validity is established since the Chi-Two of the test model is 194,301 (ddl=125, p .000) and the Chi-Two of the independent model is 730,389 (ddl=125, p .000).

#### Verification of research assumptions

A good fit is a necessary but not sufficient condition for the validation of the model assumptions; an analysis of the different correlation coefficients should follow the examination of the fit indices (Roussel, Durrieu, Campoy, & El Akremi, 2002).



The aim is to test the results of our research by testing our hypotheses already developed. As we already have previously, in this confirmatory factorial analysis, we focused the structural equation method (SEM) that allows us to confirm or deny these assumptions.

We must remember that to confirm a hypothesis, the coefficient Ratio must be greater than 1.96 and the probability of Ho (p) being rejected must be less than 0.05 with Ho: "There is no link between the explanatory variable and the variable to be explained". The outcomes of our research hypotheses are presented in the subsequent table:

RELATIONS			EsTaimate	H.E.	CR	Р	Hypotheses
SRecon	<	ETHICS	1,455	,481	3,023	,003	H1 confirmed
SRleg	<	ETHICS	1,785	,506	3,528	***	H2 confirmed
SRethic	<	ETHICS	1,597	,466	3,426	***	H3 confirmed
SRvolun	<	ETHICS	1,782	,511	3,486	***	H4 confirmed
						Se	ource: AMOS 26

Table 3: Re	sults of re	search hy	vpotheses
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The results of this table conducted by the Amos software indicate that:

- H1: business ethics positively affect economic responsibility, has been confirmed since (CR=3,023 > 1,96 and p=0,003 < 0.05).
- H2: business ethics positively affect legal responsibility, has been confirmed since (CR=3,528 > 1,96 and p=0,000 < 0.05).
- H3: business ethics positively affect ethical responsibility, has been confirmed since (CR=3,426 > 1,96 and p=0,000 < 0.05).
- H4: business ethics positively affect philanthropic responsibility, has been confirmed since (CR=3,486 > 1,96 and p=0,000 < 0.05).

#### **5. Discussion**

For our empirical research, we chose the quantitative method. This methodological approach makes it possible to provide answers to the problem chosen for this thesis. In the Saudi context, the employees of the Municipality of Taima see business ethics as a real pillar of the social responsibility of public institutions. Our results also show that Saudi employees considers that the adoption of social responsibility in the organizations is reflected through the ethics of the leaders, the ethics of the employee and the ethics shared between them do not affect the awareness of social responsibility.



They consider that justice, equality, right to express opinions or grievance, training, rewards, and the preservation of confidentiality of information are factors that lead to awareness of social responsibility in government institutions. We can say here that the Saudi employee attaches importance to the attitudes related to the leader, which relate to transparency, respect, and disclosure. We adopt this result, which is confirmed by the theoretical study of Mohammed Kamal in (2022), which considers that transparency and disclosure in governance for officials is a cornerstone of social responsibility. In this research, we also found that ethical behaviors and environment influence corporate social responsibility. This is confirmed by Anne-Marie Fray (2005) in her study searching for relationship between ethical Behaviors and social responsibility through which it was concluded that the sustainability of socially responsible ethics, behaviors and actions in organizations is possible, if the values presented are themselves sustainable, so energized, and whether the related values/chain of action are supported by stakeholders. It thus confirms the existence of a relationship between ethical behavior and social responsibility. The results of this study have also shown a significant positive statistical impact of ethics on raising awareness of the Saudi employee's social responsibility, whether it be philanthropic, legal, economic, or environmental.

Corporate Social Responsibility is, by its nature, linked to ethics. CSR seeks to create responsible companies that integrate harmoniously into their environment, into society and that set up activities that are truly sustainable in all respects.

We have found in this research that work ethics affect the charitable dimension of social responsibility through the municipality's contribution to supporting projects that advance society as well as through employment with special needs. With regard to the legal dimension, it highlights the importance of work ethics and its influence on the social responsibility of enterprises through public institutions' adherence to the principle of equal opportunities in employment, respect for regulations and laws, customs and traditions, and consideration of ethical aspects in consumption.

With regard to the environmental dimension, we have seen the impact of work ethics through the institution's adoption of the principle of the need to protect children healthily and culturally as well as to prevent the employment of young persons and not to allow discrimination on the basis of religion or sex. Finally, the Baldsans support the need to improve working conditions. As we have noted through the results of the confirmatory statistical analysis, these three dimensions are very highly statistically influenced by business ethics,



and we have come to accept the three hypotheses concerning them. For the economic dimension, a statistically significant impact of ethics has been established at a lower rate than previous hypotheses.

#### 6. Study Recommendations:

- One important concept for leading organizations to achieve their goals is to be concerned with the concept of social responsibility.
- Effective institutions in the state should hold conferences and symposiums on a wider scope to familiarize themselves with the concept of work ethics and its various ways of effecting it and its impact on building human resources that enjoy a high degree of honesty, honesty and integrity in work. This reflects on the good reputation of the organization because the success of the organization depends to a greater extent on the loyalty, dealings and morals of its workers.
- working well, holding conferences on the notion of social responsibility, which has now become one of the most important criteria for achieving sustainable development, and publicizing the close relationship between it and ethics and institutional excellence.
- Creation of a special department dedicated to social responsibility, concerned with performing social responsibility to the fullest extent, following up on the social projects undertaken and evaluating them after their establishment, and constantly developing forms of social responsibility consistent with the needs of society.

### 7. Research Limits

In each study, there must be a failure in some aspects that were not addressed in the study, or difficulty in familiarizing them with all the various aspects and dimensions of the <u>problem for this</u> <u>study:</u>

- The study sample size is small because of the limited number of employees in the municipality, and also because the researcher chooses to work on a sample from only one side.
- The limited references that addressed business ethics and social responsibility addressed different dimensions of both. Most studies talk about the relationship between the two variables in general without talking about their explanatory dimensions.
- The questionnaire was used as a primary data collection source, and although it is an effective method of data collection, it may not reflect the real answer of the investigators.



#### 8. Conclusion

From our perspective, this research reveals a better understanding of the effect of business ethics on employee's awareness of their social responsibilities in Saudi public institutions. Three contributions emerge from this research, the first is theoretical, the second is methodological, and the third is managerial. Our theoretical input is based on positioning the organizational success approach at the crossroads of different approaches to business ethics and CSR. The research model comes from Carroll's (1991) pyramid of CSR. The theoretical contribution of this article is shown by how the proposed model is different from what has already been written. Our model is understood by combining the business ethics variable as well as the four dimensions of the CSR, respecting the specificity of each variable. In addition, we have built new relationships. The contribution of this work can also be assessed by developing an integrative research model of employee's awareness of business ethics on each dimension of CSR separately. The methodological value lies in the use of a theoretical framework and relevant measurement instruments, which are repeatedly used for CSR.

This opens the way for comparative analyses and the possibility of accumulating results on these questions. In order to properly understand the impact of the business ethics adopted on employee's social responsibility, studies must take into account all the specificities of Saudi public institutions. In this sense, one of the methodological contributions of this research lies in the diversity of the sample of employees compared. The methodological contributions also stem from the particularity of the field of investigation: the staff. This research aims to bridge the gap between employee's awareness of their social responsibilities and, in particular, the leader. Although the employee practices business ethics in his work life, which leads to a positive perception of CSR, most researchers do not always recognize him as a real object of study and scientific mobilization. From that perspective, we looked at employees. Methodological inputs also relate to the design and construction of reliable measurements for the variables introduced into the general research model. Moreover, the methodology adopted (quantitative approach) has enabled us to avoid, on several occasions, the judgments and generalizations emerging from the interpretations. Finally, the composition and size of our sample are significant. In fact, the 50 employees of one public institution who were surveyed are a good sample because they could answer all the things that were being looked for. Our theoretical and methodological contributions derive from practical inputs.



However, our research shows that business ethics influence economic, ethical, legal and philanthropic social responsibility. These contributions reinforce the idea that Corporate Social Responsibility is, by its nature, linked to ethics. CSR seeks to create responsible companies that integrate harmoniously into their environment, into society and that set up activities that are truly sustainable in all respects.

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# Empowering Progress and Unveiling the Impact of Satisfying Employee's Personal Needs in Saudi Arabia's Manufacturing Sector

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#### Abstract

This study aimed to analyze the impact of satisfying employee's personal needs on the Company Performance in the Saudi Manufacturing Sector. In particular, the researcher intended to assess the practitioners to develop their strategy to enhance employee engagement. To do that, the researcher observed the relationship between satisfying employee's personal needs on employees' performance and how it contributes to the company growth. In this context, quantitative and qualitative analyses approaches were used to address the research objectives. The researcher used an explanatory sequential mixed research design which was constructed from web-based survey and semi-structured face-to-face interviews. Accordingly, 578 employees working in different organizations in Saudi Manufacturing Sector participated in the survey questionnaires. On the other hand, for the qualitative part, 30 employees working in panel boards manufacturing factory were purposely selected to participate in face-to-face interviews. Significant relationships were observed from the quantitative analysis then verified using qualitative analysis. The findings showed that employees can positively contribute in Company effectiveness when their personal needs are satisfied. Most of the participants believed that their performance is significantly impacted if the company participates in satisfying their personal needs and that positively impacts Company progress.

Keywords: Employee's personal needs, Satisfaction, Employee's Performance, Company Growth



#### 1. Introduction

As per the demand of modern organizations, employees need to be advanced and skillful to accomplish assigned job and achieve acceptable results. One of the most important implications that affects company effectiveness is the efficiency of all employees and to what extent they are committed to company goals. This efficiency results in some sort of sustainability in company human capital, environmental and financial dimensions. Thus, this study analyzed the relationship between the impact of company contribution in satisfying employees' personal needs on their performance and if it is related to the company growth. The researcher argued that employees' personal needs have significant impact on their performance which effects company performance. Accordingly, the independent variables in this research consisted of employees' personal needs satisfaction factors. On the other side, the dependent variable is employees' performance and its effect on the company growth. The findings are expected to contribute positively to empowering the organizational progress in the Saudi manufacturing sector.

#### **1.1. Problem Statement**

Inefficient utilization of company's resources made companies less competitive and caused unfavorable revenue decrease. Revenue growth requires improvement in resources and employees' support. Considerably, analyzing the factors that satisfy employee's personal needs can eliminate the cause of low employees' performance and reduce the waste of company existing resources. Moreover, benefits of increasing utilization level of company resources can be redirected to acquire new market shares or products portfolio expansion. Hence, sustainable revenue growth requires efficient resources utilization.

#### **1.2. Research Objectives**

The main objective of this study is to analyze the effect of company contributions towards satisfying employees' personal needs on the growth of companies in Saudi manufacturing sector.

#### **1.3. Research Questions**

Is there a significant relationship between company contributions towards employees' personal needs and the performance of companies in the manufacturing sector of Saudi Arabia?

#### 2. Literature Review

Interestingly, previous studies had illustrated critical factors that impact the employees' performance. For instance, employees individual desires are associated with targets attainment (Zepeda, 2013).



The employees' efficiency and effectiveness can be measured by evaluating the factors that impact the employees' performance. An organization's human resources management develop programs that enhance the employees' performance and reduce its risks on the company sustainability. These programs evaluate the employee's motivation, organizational factors, work engagement factors and employee's satisfaction factors that have direct impact on their performance (Alshahrani et al., 2015). Higher management mostly prefers to develop employees' inner self to help them in identifying their needs and wants. Thus, focusing on developing inner self is crucially utilized by organizations to develop employees' confidence, communication ability and awareness (Cottrell, 2015).

Additionally, the development of personal objectives would support the company to achieve the short-term goals and encourage the employees to work efficiently to attain long-term strategic objectives as well. Likewise, employees' specific goals move them towards obtaining the organization strategic objectives and influence the organizational competency (Kuvaas et al., 2017). Employee goals and objectives can be divided into two types. The first type is the job-related objectives or tasks that focus on achieving organizational targets and considered in employees' performance and promotion. The second type is the employee individual needs which can be divided into: Personal, Family, and Social related needs. Both types of objectives can be achieved with proper planning for both short and long terms goals (Albadri, 2016).

In addition, from the understanding of Miron-Spektor and Beenen (2015), satisfying employee's individual needs may have significant impact on employee's effectiveness. Such impact can be evaluated through either family, personal or social employee's need satisfaction. This significant positive relationship between personal goals and organizational objectives was determined with massive impact on the organizations. Correspondingly, individuals focus on joining different associations that are high in reputation with more job securities. Working in such firms increase the employees' satisfaction (Miron-Spektor & Beenen, 2015). Subsequently, employees have high concern about managing and satisfying their personal needs when performing their duties (Fulmer & Ployhart, 2014). Hence, the employees show efficient performance if they want to accomplish their personal needs (Cottrell, 2015). Hence, modern organizations are comprised of complete infrastructure that involves diverse group of people, strategies, and objectives. Therefore, firm's management in Saudi manufacturing sectors need to evaluate employees' satisfaction factors that promote their performance.



#### 2.1. Maslow's Hierarchy of Needs

Employee's personal needs as per Maslow's Hierarchy of Needs are the description of the needs that motivate human behavior. In 1943, Abraham Maslow proposed five different kinds of human needs and ordered them from basic to more complex needs. He suggested that people must fulfill their basic needs before moving on to more advanced needs. The first level is the Physiological Needs which includes food, water, breathing and homeostasis. That is followed by Security and Safety Needs like health, avoid injury and financial security. Then, Social Needs can be targeted which are for example friendships, romantic attachments, family and social groups. The fourth level is the Esteem Needs which are the need for feelings of accomplishment, reputation, and personal worth. Finally, people reach to Self-Actualization Needs like talents, capabilities, and potentialities.

The satisfaction level of an individual is positively related with the attainment of each need fulfilment. Moreover, the personal needs satisfaction is important factor for obtaining family financial outcomes including learning, health and life quality (Jerome, 2013). At the primary level, the physical and safety need are the most significant focus for any firm or individual, which must be obtained to move forward for other desires including social needs, self-esteem, and self-actualization (EK & Mukuru, 2013). Moreover, the model given by Maslow is much productive in regulating goals as per the need of an individual in the organizations (Mangi et al., 2015).

On the other hand, Lee and Hanna (2015) research showed that the retirement security goal was more important than the self-actualization goal. They proved the relationship between human beings' psychological needs and their saving decision. However, both Self-actualization and retirement security goals had the strongest associations with saving behavior (Lee & Hanna, 2015). However, Maslow's hierarchy of needs must be examined before considering them as factor of employees' performance since they are mostly irrelevant in certain organizations. Even though, these needs affected negatively the organizational culture, human resource management and the employees' performance in Nigerian hospitals (Jerome, 2013).

#### 2.2. Studies Done in the Area of Research Topic

#### 2.2.1. Employees' Performance

Employee's performance was analyzed and defined in literature as job related activities that are expected to be done by the employee and how well those activities were executed (Maina, 2015).



As market competition challenges increase, organizations use performance management structure as a method to drive employees' performance improvement. The procedures of the performance management system can have direct impact on employees' downstream attitudes and behaviors. Moreover, positive association between performance management system and employees' accomplishment in the workplace was determined. However, if performance management system is not worthy, then employees would show no interest to achieve the organizational goals and further would fall to commit with organizational responsibilities (Albrecht et al., 2015).

On the other hand, firm performance was defined as the organization capability to efficiently utilize its available resources to accomplish its organizational objectives and sustain in the market. Accordingly, firm performance is presented using the financial measures like earning per share (EPS), return on asset (ROA), return on equity (ROE) and return on sale (ROS). However, return on assets (ROA) is viewed as the best indicator of firm performance in the industry (Barrick et al., 2015). Moreover, firm performance has also been measured using non-financial measures such as corporate social responsibility (CSR) efforts (Cierna & Sujova, 2015).

#### 2.2.2. Satisfactions

There are researchers who defined the jobs or employees' satisfaction during last century. One of the old definitions was in 1938 by Hoppok & Spielgler. They defined employees' satisfaction as the integrated set of psychological, physiological and environmental conditions that encourage employees to admit their gratifications and acceptance. That can be explained by employees' happiness about their jobs (Raziq & Maulabakhsh, 2015). Hence, the happy staff can deliver the best values among customers (Fulmer & Ployhart, 2014).

On the other hand, from management point of view, the job satisfaction is the acceptable quality and quantity of the completed jobs done by the employees. For instance, in Bucharest, employees' dissatisfactions caused by monotonous jobs and pressure from clients caused weakness in the organizational performance. Moreover, dissatisfied employees search for competitors that offer better work conditions and higher incentives (Dobre, 2013). However, the negative impact of employees' dissatisfactions should not be generalized on all employees since naturally they have different behavior and attitudes. For example, some employees can be satisfied with monetary rewards, while others might be motivated with better work environment.

Other than that, personal goals are useful in creating significant associations with the partners including organization, family, and friends. That enhances employee's satisfaction.



However, earning high pay, maintaining excellent working conditions, training, and gaining other advantages lead to the organizational objectives' attainment with high employees' satisfaction. Moreover, motivated employees are positively related with their environment which satisfy their psychological needs. Consequently, employee's well-being, personal growth as well as organization's outcomes have significant positive relationship with employees' satisfaction level (Strauss & Parker, 2014). In similar case, the employees encouraged with self-satisfaction that can be enhanced through the friendly behavior, high recognition, assigning challenging goals, evaluating performance, etc. (Kuvaas et al., 2017). Thus, both personal satisfaction and employees' job satisfaction are considered as significant factors that noticeably impact their performance in executing the organizational objectives.

#### 2.2.3. Employee's Personal Needs

The personal objectives are individual goals that person needs to achieve for personal growth, which relates to person's life or family. The individual wants to satisfy such immediate needs that belong to the primary needs of Maslow's Hierarchy model (Lee & Hanna, 2015). The personal goals are playing a tremendous role in employee's life because they encourage individual to accomplish the desired state at any cost. In an organizational scenario, employees further have their personal needs along with their employee's job-related objectives. Therefore, designing employee's job-related objectives enhances individual's satisfaction level and provides strength to achieve those objectives (Miron-Spektor & Beenen, 2015).

Precisely, personal needs can be achieved through the employee's development in the organization that merged with employee's benefits. Personal goals are supportive in accomplishing short-term organizational objectives, which further lead to achieve the company mission. Other than that, individual personal needs are concerned with self-development, safety and building strong relationships with surrounding people (Lee & Hanna, 2015). Hence, management should provide proper support and tremendous encouragement in satisfying employees' personal needs.

In addition, personal goals are generated intrinsically and have high values for individuals because of the significant association between their motives and intentions. Hence, personal goals are playing the substantial role in encouraging people for better performance to complete the assigned task or activity. In case of achieving strategic objectives, personal goals influence the individual to work progressively. The personal goals are based on the cognitive representation that is generated through the identification of psychological need,



and the environmental scenario (Lee & Hanna, 2015). Hence, fulfilling personal goals enhances the satisfaction level of the employee and creates the blink of happiness that encourages them to work more productively, which directly affect their subjective well-being.

Consequently, the subjective well-being (SWB) is the human state of mind in which the person is feeling satisfied with the positive psychological resources and stable mental health. The Subjective well-being is identified in two different perspectives namely Eudaimonia and Hedonism. Specifically, the hedonism concentrates on relieving pain and the pleasure feeling whereas, the eudaimonia approach based on the actualization of human psychology (Klug & Maier, 2014). However, there might be a conceptual overlap between job-related objectives and SWB that makes the findings generalization inappropriate.

Additionally, Klug and Maier (2014) determined the significant relationship between SWB and the employees' happiness which influence their objectives' attainment. Further, the SWB emphasizes the identification of personal goals for understanding the behavior and emotions of people in the organization to coordinate efficiently. Besides, the reaction of people is different in unlike cases. For instance, if they achieve the target, they react positively and feel satisfied whereas they respond negatively if they did not achieve. Therefore, the relationship between SWB and goal accomplishment is significant. Moreover, when the employees achieve successful results, the SWB improves remarkably (Klug & Maier, 2014).

Besides, Boat and Taylor (2015) argued that employees are the most prominent force to work on increasing organization's competitive advantages. That is because of their concern in achieving corporate goals which ultimately satisfy their personal needs. In other words, they explained and profoundly determined that individual objectives lead towards the organizational objectives likewise athletes doing on the ground for achieving their targets. Moreover, they have identified that personal objectives and organizational objectives have positive relationship, which further leads to the sustainability in achieving organizational growth. Hence, the personal needs satisfaction and strategic objectives of a firm are interlinked with each other. That leads to sustainable environment and better employees' performance (Boat & Taylor, 2015). Even though their research was assessing small sample of athletes competing in Olympic distance triathlons, the relationship between personal wants and team targets was noticed.

Furthermore, employee's personal well-being is related to organizational commitment, burnout, sickness absenteeism, work enjoyment, job satisfaction and connectedness.



The important well-being, positive psychology and eudemonic dimensions involve in the construction of employee's full engagement (Bakker et al., 2014). Moreover, other study illustrated that some people show their full potential to maximize their productivity if their personal goals are related with organizational objectives (Duffy & Dik, 2013). Thus, the employees are innovative in their strategies to accomplish targets and provide creative tactics for attaining their personal needs along with the strategic organizational objectives (Li et al., 2014).

#### **2.3. Conceptual Model**





#### **2.4. Hypothesis Statement**

- Hypothesis 1
  - Null Hypothesis (H<sub>o1</sub>): The influence of company contributions in meeting employees' personal needs on employees' performance has no significant relation with Companies' performance in Saudi Arabian Manufacturing Sector.
  - Alternative Hypothesis (H<sub>a1</sub>): The influence of company contributions in meeting employees' personal needs on employees' performance has significant relation with Companies' performance in Saudi Arabian Manufacturing Sector.



### • Hypothesis 2

- Null Hypothesis (H<sub>02</sub>): Employees' experience is not significantly related to the impact of the company contributions towards employees' personal needs on employees' performance in Saudi Arabian Manufacturing Sector.
- Alternative Hypothesis (H<sub>a2</sub>): Employees' experience is significantly related to the impact of the company contributions towards employees' personal needs on employees' performance in Saudi Arabian Manufacturing Sector.
- Hypothesis 3
  - Null Hypothesis (H<sub>03</sub>): Employees' gender has no significant correlation with the impact of the company contributions towards employees' personal needs on employees' performance in Saudi Arabian Manufacturing Sector.
  - Alternative Hypothesis (H<sub>a3</sub>): Employees' gender has significant correlation with the impact of the company contributions towards employees' personal needs on employees' performance in Saudi Arabian Manufacturing Sector.
- Hypothesis 4
  - Null Hypothesis (H<sub>04</sub>): Employees' nationality is not significantly related to the impact of the company contributions towards employees' personal needs on employees' performance in Saudi Arabian Manufacturing Sector.
  - Alternative Hypothesis (H<sub>a4</sub>): Employees' nationality is significantly related to the impact of the company contributions towards employees' personal needs on employees' performance in Saudi Arabian Manufacturing Sector.
- Hypothesis 5
  - Null Hypothesis (H<sub>05</sub>): Employees' position has no significant correlation with the impact of the company contributions towards employees' personal needs on employees' performance in Saudi Arabian Manufacturing Sector.
  - Alternative Hypothesis (H<sub>a5</sub>): Employees' position has significant correlation with the impact of the company contributions towards employees' personal needs on employees' performance in Saudi Arabian Manufacturing Sector.



#### 3. Methodology

This study utilized both quantitative and qualitative research approaches, which are commonly employed in social studies. In this mixed research methods approach, data was collected sequentially, beginning with the quantitative data obtained from survey questionnaires, followed by the qualitative data gathered through face-to-face interviews. The inclusion of both data types aims to comprehensively assess the influence of company contributions towards satisfying employees' personal needs on employees' performance and, consequently, on overall company performance.

The research strategy employed in this study involved data collection and hypothesis development. Following a positivist research approach, a structured methodology was adopted to test the proposed hypotheses. The primary method of data collection was through a survey questionnaire administered to the entire population of employees working in the Manufacturing Sector in Saudi Arabia. The survey questionnaire utilized a quantitative Five (5)-point Likert scale to gather quantifiable observations. The collected data was then subjected to statistical analysis. Specifically, the survey design employed was cross-sectional in nature. The quantitative survey responses report was extracted from Surveymonky.com at the end of April 2019. While the faceto-face interviews were conducted at the end of May 2019.

The research strategy consists of eight steps, including a literature review to identify factors affecting employee personals' needs and employees' performance in the Saudi Manufacturing Sector. A quantitative questionnaire was prepared and validated through a pilot study. Data collection was done using social media, and statistical analysis was performed. Findings were validated through a case study at a specific company, while qualitative data was collected through face-to-face interviews and analyzed using content analysis.

#### **3.1.** Population and sample

GOSI-Table (3-8)	Saudi	Non-Saudi	Total
Male	210,562	851,315	1,061,877
Female	113,778	8,896	122,674
Total	324,340	860,211	1,184,551

Source: (GOSI, 2023)



According to Saudi General Authority of Statistics (2023), there are 1,184,551 employees working in the manufacturing sector in Saudi Arabia as shown in Table (1). Moreover, this sector consists of diverse types of industries and multinational employees. The industrial establishments in this sector covered different economic activities like manufacturing of food products, manufacturing of clothes, manufacturing of fabricated metal products, transformative industries, etc. Moreover, there are 13 administrative regions in Saudi Arabia. For instance, the largest region is Riyadh which has 475,340 employees while the smallest region is Al-Baha with 4,573 employees. In total, there are 266,336 employees working in the Manufacturing Sector in Eastern region (GOSI, 2023).

Catego	<b>ry</b> – (Total participants = 578)	Frequency	Percentage
Gender	Female	36	6.36%
Gender	Male	530	93.64%
Nationality	Saudi	476	82.93%
rationanty	Non-Saudi	98	17.07%
	Production and Site Technicians	179	31.74%
Position	Administrations and Engineering	235	41.67%
1 USHION	Middle Management	114	20.21%
	Top Management	36	6.38%
	5 years or less	95	16.78%
Experience	6 to 12 years	148	26.15%
Lapertence	13 to 19 years	156	27.56%
	20 years or more	167	29.51%

Table 2: Collected Primary	/ Data	Summary
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Source: Primary Data

The population for the quantitative phase is all employees who are working in Saudi Arabian Manufacturing Sector. Since population size is known, by using simple random sampling method, the sample size required for this study was estimated under confidence level of 95% and 5% margin of error as 384 participants as indicated in the sample size table issued by (The Research Advisors Web, 2006). As sown in table (2), the total participants in the shared questionnaire were 578 employees.



Additionally, for the qualitative phase, the selected Factory population is 200 employees. Specifically, purposive sampling technique was used to select the required employees for the face-to-face interviews. The researcher selected this sampling method due to the respondents knowledgeable and experience in make to order manufacturing industry. This sampling technique was followed to ensure that all population categories had equal chance to provide their feedback. Moreover, as indicated by Fridlund and Hildingh (2000), one to thirty interviewees were common sample size in qualitative studies (Bengtsson, 2016). Thus, 30 employees were selected to participate in this research face-to-face interviews.

#### **3.2.** Analysis Techniques

In the quantitative analysis, the collected data was statistically analyzed using Microsoft Excel 2016. Descriptive analysis was conducted for demographic variables, and statistical tests such as Regression, Chi-Square, Spearman's correlation, Independent Sample t-test, ANOVA and Tukey-Kramer Multiple Comparisons were employed to assess research questions and findings. For the qualitative analysis, the researcher utilized a content analysis approach to analyze the gathered data.

#### 4. Analysis and Discussion

#### 4.1. Hypothesis 1: Employees' personal needs effect

The objective of this study is to identify the impact of company contributions in satisfying employees' personal needs on employees' performance and company performance in Saudi Arabian manufacturing sector. That was tested in the null Hypothesis ( $H_{01}$ ) which was "The influence of company contributions in meeting employees' personal needs on employees' performance has no significant relation with Companies' performance in Saudi Arabian Manufacturing Sector". While the alternative Hypothesis ( $H_{a1}$ ) was "The influence of company contributions in meeting employees ( $H_{a1}$ ) was "The influence of company contributions in meeting employees ( $H_{a1}$ ) was "The influence of company contributions in meeting employees on employees performance has significant relation with Companies ( $H_{a1}$ ) was "The influence of company contributions in meeting employees on employees performance has significant relation with Companies ( $H_{a1}$ ) was "The influence of company contributions in meeting employees' personal needs on employees' performance has significant relation with Companies' performance in Saudi Arabian Manufacturing Sector". In this section, researcher analyzed the employees' opinions and feedback about five statements regarding the impact of employees' personal needs on their performance and company growth.



Table 1: Showing the results	of employees' personal	needs questionnaire items
------------------------------	------------------------	---------------------------

Questionnaire Items (32 to 36)		F	Р
22 Mu company concerns shout my nersonal needs	TR	469	(81.14%)
32- My company concerns about my personal needs	SD	53	(11.3%)
satisfaction that impacts my targets accomplishment.	D	97	(20.68%)
M= 3.13	N	115	(24.52%)
Mo= 4	A	145	(30.92%)
Md= 3	SA	59	(12.58%)
		I	
23 My personal people are directly linked with my job	TR	470	(81.31%)
performance	SD	24	(5.11%)
performance.	D	87	(18.51%)
M= 3.41	N	108	(22.98%)
Mo= 4	А	175	(37.23%)
Md= 4	SA	76	(16.17%)
34- There is positive relationship between my personal	TR	469	(81.14%)
needs and Company effectiveness	SD	16	(3.41%)
	D	52	(11.09%)
M= 3.64	N	103	(21.96%)
Mo= 4	А	212	(45.2%)
Md= 4	SA	86	(18.34%)
35- I appreciate my manager support to satisfy my	TR	471	(81.49%)
personal needs by increasing my performance.	SD	20	(4.25%)
	D	35	(7.43%)
M= 3.73	N	103	(21.87%)
Mo= 4	А	208	(44.16%)
Md= 4	SA	105	(22.29%)



36- Companies should consider employee's personal	TR	471	(81.49%)
needs in their strategy to increase employee's	SD	6	(1.27%)
engagement.	D	11	(2.34%)
M= 4.21	N	53	(11.25%)
Mo= 4	А	207	(43.95%)
Md= 4	SA	194	(41.19%)
	1 6	1 •4	•

NOTE: M=Mean, Mo=Mode, Md=Median, TR=Total number of responders per item, SD=Strongly Disagreed, D=Disagreed, N=Neutral, A=Agreed, SA=Strongly Agreed, F=Frequency and P=Percentage)

#### Source: Primary Data

The descriptive analysis findings in table (3) show that the employees' personal needs at manufacturing sector is slightly linked with the employees' performance (cumulative mean = 3.41out of 5). Moreover, the participants believe that there is significant relationship between personal needs and Company effectiveness (cumulative mean = 3.64 out of 5). A comparison on these items' 2350 responses showed that the percentage of employees who opposed was 17.06 percent. While the percentage of those who were neutral was 20.51 percent. Moreover, the percentage of those who concurred was 62.43 percent. Hence, the range of percentages of the opposed employees' group and the undecided employees' group were lower compared to the concurred employees' group.

Consequently, the respondents noted that they are not sure if the management concerns about the employee's personal needs (mean = 3.13 out of 5). However, they appreciate manager when supports their personal needs by boosting their performance (mean = 3.73 out of 5). Moreover, they strongly believed that management should consider the employees' personal needs satisfaction in the company strategy to increase the employees' engagement (mean = 4.21 out of 5). Thus, employees' personal needs had significant impact on the employees' performance and linked with company progress in Saudi manufacturing sector.

	Item 32	Item 35	] [		Item 33	Item 34
Mean	3.128	3.728		Mean	3.41	3.64
Standard	1 2075	1.0244		Standard	1 1165	1.0129
deviation	1.2075	1.0244		deviation	1.1105	1.0128

**Table 4:** Showing the results of employees' personal needs t-test


Variance	1.458	1.0494	
Sample	469	471	
Probability P-Value		6.71E-16	
	-16.039		
t Crit	1.9625		
(t[938]=-16.039,p<0.05)			

Variance	1.2466	1.0259	
Sample	469	469	
Probability P-Value		0.000975	
	-3.3082		
t Crit	1.9625		
(t[936]=-3.3082,p<0.05)			

Moreover, to test if there is significant difference between the means of the responses about the employees' personal needs satisfaction, two t-test were conducted as shown in table (4). Firstly, after comparing the responses between Item 32 and Item 35 about the Company management involvement in satisfying the personal needs of the employees, the P-Value from t-test was (6.71E-16) less than 0.05 and the absolute value of t-stat was (16.039) greater than t-Critical (1.9625); (t[938]= -16.039,p<0.05). Hence, there was significant difference between the data collected in Item 32 and Item 35 which was most likely reflecting the real intrinsic differences in the population, and they were not by chance.

Secondly, after comparing the responses between Item 33 and Item 34 about the association between the employees' personal needs and employees effectiveness, as well as the effectiveness of the company, it was observed that the P-Value from t-test was (0.00097) less than 0.05 and the absolute value of t-stat was (3.308) greater than t-Critical (1.9625); (t[936]= -3.3082,p<0.05). Hence, there was significant difference between the data collected in Item 33 and Item 34 which was most likely reflecting the real intrinsic differences in the population, and they were not by chance as well. Therefore, significance relationship between employees' personal needs satisfaction, employees' performance, and companies' performance in Saudi manufacturing sector was observed.

ANOVA	Item 32	Item 35	Item 36
Mean	3.136	3.728	4.214
Standard deviation	1.211	1.024	0.829
Variance	1.467	1.0494	0.688
Sample	471	471	471
	Probability P-Value	4.699	)E-52

Table 5: Showing the results of employees' personal needs ANOVA test

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F Value		128.6712	
	F Critical	3.0	021
	(F[2, 1410]=128.6712	2,p<0.05)	
Tukey-Kramer Multiple Comparisons	Absolute Difference	Critical Range	Results
Item 32 to Item 35	0.5923	0.1576	Different
Item 32 to Item 36	1.0785	0.1576	Different
Item 35 to Item 36	0.4862	0.1576	Different

Additionally, ANOVA test was conducted to compare the differences between the means of Item 32, Item 35 and Item 36 as shown in table (5). After comparing the responses about management supporting employees' personal needs, the P-Value from ANOVA test was (4.699E-52) less than 0.05 and F-value was (128.6712) greater than F-Critical (3.0021); (F[2, 1410]=128.6712,p<0.05). Hence, there was significant difference between the data collected in Item 32, Item 35, and Item 36. Moreover, Tukey-Kramer multiple comparisons test was conducted and led to differences accrued between these three items. Therefore, the means of the collected data about management supporting employees' personal needs were most likely reflecting the real intrinsic differences in the population, and they were not by chance. Hence, companies should consider employee's personal needs in their strategy to increase employee's engagement.







Additionally, in order to determine the influence of satisfying employees' personal needs on company's performance, the regression analysis was conducted. The first test was compering the relationship between the respondents' feedback and number of respondents. Clear trend was observed as shown in figure (2). Specifically, when respondents' feedback changed from strongly disagree toward strongly agreed, number of employees who are considering the employees' personal needs as important factor that impact employees' performance were increased.





Secondly, the relationship between respondents' feedback about management contribution in satisfying employees' personal needs and their responds about company performance was tested using regression test as presented in figure (3). The results are summarized in table (6).

**Table 6:** Showing the results of employees' personal needs regression test

Employee's Personal Needs Satisfaction and Companies'				
<b>Performance Regression Statistics (Means)</b>				
Multiple R	0.6884	t-Stat	22.7805	
R Square	0.4739	<b>F-Value</b>	518.95	
P-value	2.2E-82	Lower 95%	0.7905	



Observations	578		Upper 95%	0.9396
Linear Equati	on	Y = 0.865 X + 0.3958		
(r=0.6	5884, F[1, 5	76]=5	18.9499,p<0.05	)

According to the results summarized in table (6), the P-value was (2.2E-82) less than 0.05 which indicates a significant association between employees' personal needs satisfaction and companies' performance. On the other hand, the correlation coefficient R was (0.6884) not close to one which indicates feeble linear relationship. Therefore, the employees' personal needs satisfaction was controlling somehow the companies' performance at Saudi manufacturing sector. Even though, (r = 0.6884, F[1,576] =518.9499, p<0.05) the model was significant. Moreover, the coefficient of determination (R Square = 0.4739) explains that 47.39 percent variance in companies' performance was accounted by employees' personal needs satisfaction. Therefore, the null hypothesis (H<sub>01</sub>) "The influence of company contributions in meeting employees' personal needs on employees' performance has no significant relation with Companies' performance in Saudi Arabian Manufacturing Sector" was rejected.

# 4.2. The employees' demography impact

To determine if employees' demography is moderating the impact of employees' personal needs satisfaction on company performance, several Chi Square analyses were conducted. Mainly, the researcher examined employees' experience, gender, nationality and position.

## 4.2.1. Hypothesis 2: Employees' experience

The Null Hypothesis (H<sub>o2</sub>) is "Employees' experience is not significantly related to the impact of the company contributions towards employees' personal needs on employees' performance in Saudi Arabian Manufacturing Sector".

Experience	Opposed	Undecided	Concurred	SUM
	Employees	Employees	Employees	SUM
5 years or less	35	35	129	199
6 to 12 years	63	70	184	317
13 to 19 years	58	89	178	325
20 years or more	61	73	210	344
SUM	217	267	701	1185

<b>Fable 7:</b> Observation data to tes	t experience as moderator
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Using the observed data in Table (7), the calculated Chi Square ( $X^2$ ) value was (8.8393) less than the critical value (12.592); ( $X^2$ =[6,N=1185]=8.8393,p<0.05). That indicates the observed distribution was most likely due to chance. Hence, employee's experience was NOT significantly moderating the relationship between employees' personal needs satisfaction and companies' performance in Saudi Arabian Manufacturing Sector. Therefore, the null hypothesis ( $H_{02}$ ) was NOT rejected.

## 4.2.2. Hypothesis 3: Employees' gender

The Null Hypothesis (H<sub>03</sub>) is "Employees' gender has no significant correlation with the impact of the company contributions towards employees' personal needs on employees' performance in Saudi Arabian Manufacturing Sector".

Condon	Opposed	Undecided	Concurred	SUM	
Genuer	Employees	<b>Employees Employees</b>		SUM	
Female	15	16	45	76	
Male	203	251	658	1112	
SUM	218	267	703	1188	

Table 8: Observation data to test gender as moderator

Using the observed data in Table (8), the calculated Chi Square ( $X^2$ ) value was (0.1582) less than the critical value (5.991); ( $X^2$ =[2,N=1188]=0.1582,p<0.05). That indicates the observed distribution was most likely due to chance. Hence, employee's gender was NOT significantly moderating the relationship between employees' personal needs satisfaction and companies' performance in Saudi Arabian Manufacturing Sector. Therefore, the null hypothesis ( $H_{03}$ ) was NOT rejected.

## 4.2.3. Hypothesis 4: Employees' nationality

The Null Hypothesis (H<sub>04</sub>) is "Employees' nationality is not significantly related to the impact of the company contributions towards employees' personal needs on employees' performance in Saudi Arabian Manufacturing Sector".

Nationality	Opposed Employees	Undecided Employees	Concurred Employees	SUM
Saudi	173	212	588	973

Table 9: Observation data to test nationality as moderator



Non-Saudi	47	54	117	218
SUM	220	266	705	1191

Using the observed data in Table (9), the calculated Chi Square ( $X^2$ ) value was (3.4623) less than the critical value (5.991); ( $X^2$ =[2,N=1191]=3.4623,p<0.05). That indicates the observed distribution was most likely due to chance. Hence, employee's nationality was NOT significantly moderating the relationship between employees' personal needs satisfaction and companies' performance in Saudi Arabian Manufacturing Sector. Therefore, the null hypothesis ( $H_{04}$ ) was NOT rejected.

# 4.2.4. Hypothesis 5: Employees' position

The Null Hypothesis (H<sub>05</sub>) is "Employees' position has no significant correlation with the impact of the company contributions towards employees' personal needs on employees' performance in Saudi Arabian Manufacturing Sector".

Desition	Opposed	Undecided	Concurred	SUM	
rosition	Employees	Employees	Employees	5011	
Production and Site Technicians	65	75	212	352	
Administrations and Engineering	88	108	318	514	
Middle Management	50	57	130	237	
Top Management	17	23	43	83	
SUM	220	263	703	1186	

**Table 10:** Observation data to test position as moderator

Using the observed data in Table (10), the calculated Chi Square ( $X^2$ ) value was (5.7194) less than the critical value (5.991); ( $X^2$ =[6,N=1186]=5.7194,p<0.05). That indicates the observed distribution was most likely due to chance. Hence, employee's position was NOT significantly moderating the relationship between employees' personal needs satisfaction and companies' performance in Saudi Arabian Manufacturing Sector. Therefore, the null hypothesis ( $H_{04}$ ) was NOT rejected.

## 4.3. Findings

The researcher found that the employees' personal needs were moderating 47.39 percent of the companies' performance. That is in line with the employees' responses who predicted significant impact of employees' personal needs satisfaction on their performance.



However, reputed organizations in Saudi Arabia invested heavily in human resources enhancement programs to provide better well-being of the employees and their relatives even employee social security. Specifically, Saudi Electricity Company emphasis on employees' medical care, pension and savings plans which reflected positively by employees' loyalty, engagement and performance (Alshahrani et al., 2015). That indicates clear influencing factors to be considered by management to attain better performance from their employees and ultimately company growth. Additionally, the findings show that the employees' personal needs did not differ significantly because of employee's experience, gender, nationality or position.

### 4.4. Case Study and Implications

The case study was conducted in one of the panel board manufacturing factories in Dammam second industrial city. The factory population was 200 multinational employees, and the selected sample was 30 employees from deferent career level. The researcher analyzed the face-to-face interviews data using content analysis and regression test.

### 4.4.1. Interview questions

- a) How can the manager help you to satisfy your personal needs so that you can focus on your daily job?
- b) What is the impact of employees' performance on the company growth?

## 4.4.2. Employees' personal needs satisfaction and company growth

To evaluate the association between employees' personal needs satisfaction and company growth, the interviewee's feedback about both questions were examined by regression test as shown in table (11). According to the results summarized in table (11), the researcher found that the employees' personal needs satisfaction had significant effects on Factory's performance. The P-value was less than 0.05 which indicates significant association between employees' personal needs satisfaction and the Factory's performance. Moreover, the correlation coefficient R values was (0.8) close to one which indicates linear relationship. Consequently, the satisfying employees' personal needs factor was a good predictor of Factory's performance. The coefficient of determination ( $R^2 = 0.83$ ) explains the variance in the Factory's performance due to this factor. Therefore, employees' personal needs satisfaction held to be around 83 percent variance in the Factory's performance.



**Table 11:** Regression test for (1) the personal needs satisfaction impact on employees'performance and (2) the employees 'performance impact on Factory's Performance

Multiple R	0.91
R Square	0.83
Adjusted R Square	0.8
Standard Error	3.4
Observations	30

F (ANOVA)	145
Significance F	1E-12
Lower 95.0%	0.73
Upper 95.0%	1.03

# 4.4.3. Content analysis (Employees' personal needs satisfaction)

To evaluate the relationship between employees' personal needs and employees' performance, the interviewee's feedback about "How can the manager help you to satisfy your personal needs so that you can focus on your daily job?" was analyzed using content analysis.

 Table 12: Categories and themes from interviewees' feedback about employees' personal needs

 effect on employees' performance

	Category	Frequency	Percentage	Themes
1	Work support	14	29%	Flexible working time with manager assessment during uncertainty help the employees to satisfy their personal needs.
2	Emotional support	10	20%	Psychological prospective with manager moral support help the employees to focus on their daily job.
3	Motivation	8	16%	Appreciation motivates the employees to perform and to satisfy their personal needs.
4	Fix work environment	7	14%	Employees need better work environment to satisfy both company and personal objectives.
5	HR support	5	10%	Employees need HR empathic regulations to
6	Assessment	5	10%	satisfy both company and personal objectives.

In addition, the results shown in table (12) indicate that the considerable theme from interviewee's feedback was related to the significant effect of employees' personal needs on employees'



performance. Specifically, 29 percent of the participants believed that flexible working time with manager assessment during uncertainty help them to satisfy their personal needs. In addition, 20 percent of the interviewees required manager psychological and moral support to focus on their daily job. Another 16 percent of them are motivated by appreciation for performing and to satisfy their personal needs. Moreover, four (4) percent of the participants needed a better work environment while 20 percent of them emphasized the importance of HR empathic regulations to satisfy both company and personal objectives.



Figure 2: Code and categories conceptual map from interviewees' feedback about employees' personal needs effect on employees' performance



### 4.4.4. Case study findings:

Firstly, flexible working time with manager assessment satisfied the factory employees the most when they needed to attend to their personal needs. Secondly, there was a significant relationship between the employees' personal needs satisfaction and the Factory's performance as well as between the employees' performance and the factory revenue. Thirdly, a strong leaner correlation was observed where employees' personal needs satisfaction held to be around 83 percent variance in the Factory's performance.

### 5. Conclusion

From the employees' satisfaction factors, researcher analyzed the relationship of employees' personal needs and companies' performance at Saudi manufacturing sector. Hence, to answer the research question "Is there a significant relationship between company contributions towards employees' personal needs and the performance of companies in the manufacturing sector of Saudi Arabia?", the researcher analyzed the null hypothesis which stated no significant impact. However, the study found significant association between employees' personal needs satisfaction and companies' performance at Saudi manufacturing sector. This infers that employee's performance in companies can be affected negatively with employees' personal problems (Saeed et al., 2013). The findings of this study could be attributed to the fact that there is strong association between well-being satisfaction and personal goal attainment (Klug & Maier, 2014). Moreover, earlier study engrained the significant relationship between employees' psychological needs of human beings and their saving decision which effect significantly their personal needs satisfaction level (Lee & Hanna, 2015). In addition, the study findings are in line with earlier scholars who stated that the managers need to seriously consider the needs of their human resources to raise their job satisfaction and improve their performance (Al-shahrani, 2015).

### 6. Recommendations

Remember that each employee is unique, and their personal needs may vary. It is important to approach this endeavor with empathy, flexibility, and a genuine commitment to employee wellbeing. If management wants to participate in satisfying their employees' personal needs, it is important to create a supportive and inclusive work environment that values employee well-being. Here are some recommendations for management:

1) Foster open communication: Encourage open and honest communication between management and employees. Create channels for employees to express their personal needs,



concerns, and suggestions without fear of repercussions. Regularly hold team meetings, oneon-one sessions, or surveys to gather feedback.

- 2) Flexible work arrangements: Recognize that employees have different personal needs and responsibilities outside of work. Offer flexible work arrangements such as remote work options, flexible hours, or compressed workweeks to accommodate their needs. This can help employees manage personal commitments and achieve a better work-life balance.
- 3) Employee assistance programs (EAPs): Implement employee assistance programs that provide support for personal challenges such as stress, mental health issues, financial problems, or relationship difficulties. EAPs often include counseling services, referrals to external resources, and educational materials to help employees navigate personal challenges.
- 4) Training and development opportunities: Invest in training and development programs that go beyond job-related skills. Offer workshops or seminars on personal development topics like stress management, work-life balance, communication skills, or financial literacy. This shows employees that you care about their personal growth and well-being.
- 5) Recognition and rewards: Acknowledge and appreciate employees' personal achievements and milestones. Celebrate birthdays, work anniversaries, and other significant events. Recognize employees' efforts and accomplishments publicly and provide rewards or incentives to encourage a positive work environment.
- 6) Workload management: Monitor employees' workloads and ensure they are manageable. Excessive workloads can lead to stress and burnout, negatively impacting personal well-being. Regularly assess work distribution, provide resources or assistance when needed, and encourage employees to prioritize self-care.
- 7) Empathy and understanding: Cultivate a culture of empathy and understanding within the organization. Encourage managers to listen actively, show empathy, and be supportive when employees face personal challenges. Treat employees as individuals with unique needs and circumstances.
- 8) Wellness initiatives: Promote employee wellness initiatives such as wellness programs, fitness challenges, mindfulness sessions, or access to healthy snacks. Encourage employees to take breaks, engage in physical activities, and prioritize their well-being during the workday.
- 9) Work-life integration: Instead of viewing work and personal life as separate entities, promote work-life integration. Encourage employees to find a healthy balance between their personal and professional lives by providing resources, support, and encouraging boundaries.



10) Continuous feedback and improvement: Regularly seek feedback from employees on how management can better support their personal needs. Actively listen to their suggestions and implement changes accordingly. Continuously evaluate and improve the initiatives and programs in place to ensure they meet employees' evolving needs.

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# **Construction Roofs Properties and Temperature Transfer between the Roofs**

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### Abstract:

This study aimed to explore the disadvantages of solid concrete slabs and sandwich panels as roofing structures in the Arabic Gulf area and explore the differences between traditional solid concrete slabs and sandwich panels roofing systems, highlighting the benefits and usage of EPS panels over traditional systems.

The study methodology focuses on scientific analysis of EPS panels' chemical compound and physical characteristics, highlighting their suitability for various construction roofing applications in a tested field.

The study conclude that, the The EPS panels are the better modern era building roofing material construction choice for the roofing panels because of the panels properties and economical values that supress the sandwich panels and the classical solid concrete slabs starting with the EPS panels fast fixing time, Furthermore, being a light wight roofing material that tolls less load on the buildings structure and less pressure on the building man power that results in more work activity per day and less building reinforcement work and cost especially when building extensions in aged buildings, And recommended to not add additional protective waterproofing layer above the EPS roof, in order to close any opening or gaps between joints that may transfer water through the roof layers.

Keywords: Construction, Roofs, Properties, Temperature Transfer



### **1. Introduction**

The main roofing materials used in the construction field in the Arabic gulf area are the reinforced concrete slabs, sandwich panels and the EPS boards. Reinforced concrete slabs are the oldest and most classic roofing type, made from a composite material combining concrete and steel reinforcement. They offer impressive bearing capacity, resistance to wear and tear, and are ideal for long-term structural integrity in buildings, warehouses, and multi-story structures. Concrete also exhibits excellent fire resistance, making it a crucial safety feature. However, Concrete's heavy weight, heat conductivity, and longer curing time can pose challenges for high-rise buildings, requiring additional structural support, affecting construction complexity and cost (Garber, 2006).

The other construction roofing materials are the sandwich panels. Sandwich panels are roofing composite building materials consisting of three layers: two outer aluminium skin layers and a core layer of polyurethane foam and mineral wool. These panels are excellent insulation, trap heat and noise, and are lighter than solid concrete slabs, simplifying construction and reducing time. On the other hand, this study compares the properties of EPS slabs (EPS) with reinforced solid concrete (RSC) and sandwich panels (SB) slabs as a modern material alternative, highlighting the need for structural assessments and proper sealing to ensure the appropriateness of sandwich panels (homsen, 2005)

EPS panels are a lightweight, cost-effective, thermal isolator, sound insulator, and fireproof system made of 6mm fiber cement boards, cement, sand, glass, wood, expanded polystyrene, water, and other materials. The study explore the disadvantages of solid concrete slabs and sandwich panels as roofing structures in the Arabic Gulf area. Solid concrete slabs are heavy, poor thermal and sound insulators, and time-consuming to modify. Sandwich panels, despite their advantages, are limited to heavy loads, fire-resistant, and easy to penetrate, causing moisture accumulation and water infiltration. EPS panels offer solutions to these flaws and other benefits (Equs, 2023) The study explores the differences between traditional solid concrete slabs and sandwich panels roofing systems, highlighting the benefits and usage of EPS panels over traditional systems.

The study methodology focuses on scientific analysis of EPS panels' chemical compound and physical characteristics, highlighting their suitability for various construction roofing applications in a tested field.



### 2. The study framework

The study farmwork will demonstrate the function and aids of using the EPS panels as an alternative roofing system to the solid concrete slabs and sandwich panels system supported by lab tests and practical filed experiments

The study farmwork can be summarized in the following bullet points:

- 1- The EPS panels roofing system building time.
- 2- The EPS panels weigh.
- 3- The EPS panels bearing load
- 4- The EPS panels Thermal insulation properties
- 5- The EPS panels water and moister isolation properties
- 6- The EPS panels sound insolation properties.
- 7- The EPS panels fire resistance properties.

## 2.1. The EPS panels roofing system building time.

The EPS panels roofing system are fast to fix and build due to the panels light weight characteristics. In addition, to the EPS panels simple method of fixing that requires only to tile the panels and apply adhesives in between each panel only. For 100 m2 building time is less than a single working day the same time required for fixing 100m2 building time for the sandwich panels roofing system. However, the building time for 100m2 concrete solid slab will take not less than a week that includes 2 working day for carpentry works, 1 working day for steel reinforcement works, 1 working day for concrete pouring and 3 working days for water curing which add up to a total of 7 days.

The following table demonstrate the building time for building 100m2 roof surface of EPS panels in comparison with the sandwich panels and solid concrete slab.

Roofing system	Time required to build	
	(days)	
EPS panels (1)	1	
Sandwich panels (2)	1	
Solid concrete slabs (3)	7	

 Table (1-1) Systems building time requirements.

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Chart 1-1: Roof building time comparison time.

# 2.2. The EPS panels weigh

The EPS panels considered a light weight material which make them a perfect choice for over aged building extensions and an economical tool to reduce the cost of the supporting building structure materials and reinforcement unlike the solid slab concrete which consider a heavy roofing structure. The following table clarify the EPS panels weight in comparison with the solid concrete slabs and sandwich panels, each panel weight for 1 square meter surface.

<b>Fable (2-1</b> )	Systems	weight per	1 square	meter surface.
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Roofing system	Weight kg/m2
EPS panels (1)	63
Solid concrete slabs (2)	240
Sandwich panels (3)	20







# 2.3. The EPS panels bearing load

The EPS panels have a high bearing load capacity equivalent to the solid concrete slabs, which make the EPS a safe choice for residential building and heavy loads service buildings such as hospitals, hotels, malls and airports, unlike the sandwich panels which consider a low duty roofing materials for heavy loads bearing.

The following table clarify the EPS panels load capacity in comparison with the solid concrete slabs and sandwich panels, each panel weight for 1 square meter surface.

 Table (3-1) Systems load bearing capacity per 1 square meter surface.

Roofing system	Weight KN/m2
EPS panels (1)	10
Solid concrete slabs (2)	10.5
Sandwich panels (3)	4





# 2.4. The EPS panels Thermal insulation properties

The EPS panels consider a great thermal insolation roofing material which has a greater thermal insulation property than the sandwich panels and the solid concrete slabs, which comes with economical values in which can be useful in reducing the energy and electricity required to conserve temperature. In addition, the EPS panels thermal insulation properties aid in reducing the loads on air conditioning machines which lead to further extension of the machines operating age. The following table clarify the EPS panels thermal insulation properties in comparison with the solid concrete slabs and sandwich panels, each panel sample of 1 square meter surface.



Roofing system	Thermal Transmission W/m2K
EPS panels (1)	0.57
Solid concrete slabs (2)	10
Sandwich panels (3)	2

 Table (4-1) Systems thermal insulation properties per 1 square meter surface.





# 2.5. The EPS panels water and moister isolation properties

The EPS panels is a perfect water and moister proof roofing material in which it can be used to be a roof for wet areas such as toilets and swimming pool. Moreover, the EPS panels require less extra water proofing application to be applied over The EPS roof, just a thin layer to be fully protected from the panels edge.

The following table displays the EPS panels water absorption percentage after 24hours water submerging test and in comparison, with the solid concrete slabs and sandwich panels, each panel sample of 15 square centimetres cube.

Roofing system	Water absorption %
EPS panels (1)	2.5
Solid concrete slabs (2)	75
Sandwich panels (3)	7

Table (5-1) Systems water absorption percentage per 1 square meter surface.

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## 2.6. The EPS panels sound insolation properties.

The EPS panels is ideal sound insolation roofing materials. The EPS panels has a superior acoustic property than the sandwich panels and solid concrete slab, which make them the top choice for comfort homes, hotels, clinics, library or study area and hospitals. The following table displays the EPS panels sound insolation acoustic properties and in comparison, with the solid concrete slabs and sandwich panels, each panel of 1 square meter surface.

, <u>,</u>	
Roofing system	Sound Accoustic dB
EPS panels (1)	37
Solid concrete slabs (2)	20

 Table (6-1) Systems sound insolation acoustic properties per 1 square meter surface.

Sandwich panels (3) 25 Sound Insulation dB



Sandwich Panels

Sound Insoulation dB

**EPS** Panels

Solid Concrete Slab



# 2.7. The EPS panels fire resistance properties.

The EPS panels have greater fire resistance capability than the sandwich panels and the solid concrete slab, in which considered a safe roofing option for high heat areas such as kitchens, restaurants and factories.

The following table portraits the EPS panels fire resistance rate and in comparison, with the solid concrete slabs and sandwich panels, each panel weight for 1 square meter surface.

Roofing system	Fire Resistance Rate (hrs)
EPS panels (1)	2.5
Solid concrete slabs (2)	0.75
Sandwich panels (3)	1.5

 Table (7-1) Systems fire resistance rate per 1 square meter surface.



Chart 7-1: Roofing Panels Fire Resistance Rate (hrs)

## 3. The study results and discussing

The above results shows that the EPS Panels are fast and simple roofing materials to fix that requires only tiling the panels, then add the adhesive agent. In addition, the data in table (2-1) indicate that the EPS Panels are lighter than the solid concrete slabs by approximate 74% but have a relative same load bearing capacity as the solid concrete slab as shown in the date displayed in table (3-1). Moreover, as shown in table (4-1) the EPS temperature insulation ability is more than 3 time the ability of the sandwich panels and more than 20 times the abilities of the solid concrete slab. Additionally, as indicated in table (5-1) the EPS panels are better water resistance material than the sandwich panels twice the time and better than the solid concrete slab by more than 30



times. Furthermore, the EPS panels can isolate sounds better that their peers as been displayed in table (6-1) acoustic test that resulted the EPS sample with 37 dB units in compare with the sandwich panel and solid concrete that resulted in 20dB & 25dB. Last but not least, the EPS panels can resist fire more than the sandwich panels and solid concrete slab as demonstrated in table (1-7) 500C oven test results that shows the EPS panels ability to withstand fire for 150 minutes which is twice the time of the sandwich panels and solid concrete slab that resulted 90 minutes and 45 minutes respectively. The study results for the EPS panels superior quality comparison points can be summarized in the following table and chart.

Blocks type	EPS Panels	Sandwich Panels	Solid Concrete slab			
	Quality Point					
Building time	1	1				
Lighter Surfess Mass		1				
Greatest bearing load capacity			1			
Best thermal insulator	1					
Best water isolator	1					
And moisture resistance						
Best sound insulator	1					
Best fire resistance	1					
Overall quality points	5	2	1			

Summary	table.
---------	--------



### Summary Chart overall quality points Compression Chart.



### 4. The study conclusion

The EPS panels are the better modern era building roofing material construction choice for the roofing panels because of the panels properties and economical values that supress the sandwich panels and the classical solid concrete slabs starting with the EPS panels fast fixing time, Furthermore, being a light wight roofing material that tolls less load on the buildings structure and less pressure on the building man power that results in more work activity per day and less building reinforcement work and cost especially when building extensions in aged buildings. Moreover, the EPS panels are better roofing material choice for wet areas due to its superior water and moister resistance properties. Additionally, EPS panels offers effective sound isolation as they can reduce the sound intensity passing through the roofs by 37dB, make it better chose for comfort in quite places like residential buildings and hospitals. Add to that, EPS panels have afire resistance ability to stand active fire up to 150 minutes, which make the EPS panels safe materials for construction locations and kitchen areas.

### 5. The study recommendations

It is not recommended to add additional protective water proofing layer above the EPS roof, in order to close any opening or gaps between joints that may transfer water through the roof layers. Additionally, the EPS panels should be supported and jointed by the adhesive powder, after mixing with water and wait for the adhesive for a day at lest to get the adhesive to be effective. Moreover, the EPS panels should be cut using the mechanical saw only to avoid damaging the EPS interior component.

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# The Impact of Artificial Intelligence Applications on the Digital Transformation of Healthcare Delivery in Riyadh, Saudi Arabia (Opportunities and Challenges in Alignment with Vision 2030)

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### Abstract

This research aimed to assess the current applications of AI in the healthcare sector in Riyadh and their influence on digital transformation, and to identify the opportunities presented by expanding AI adoption to improve healthcare services in alignment with Vision 2030, and to examine the challenges facing greater integration of AI technologies into Riyadh's healthcare system.

The research addresses the challenges faced by Riyadh's health sector and examines how artificial intelligence can be used to overcome these challenges, including improving the quality of health services, enhancing operational efficiency, and supporting scientific research, By analyzing data and reviewing previous studies, the research shows how AI technologies can contribute to the early detection of diseases, providing dedicated health care, and improving the management of health facilities. The research also discusses the impact of artificial intelligence on medical education and training and explores how it can enhance scientific research in the field of health.

The findings indicate that AI has the potential to significantly transform Riyadh's healthcare sector, contributing to the realization of Vision 2030. The research concludes with recommendations for the effective application of artificial intelligence in the health system, emphasizing the importance of innovation and technical integration for the future of healthcare in the Kingdom.

Keywords: Artificial Intelligence, Digital Transformation, Healthcare, Riyadh, Vision 2023.



### **1. Introduction**

The Kingdom of Saudi Arabia (KSA) has witnessed rapid digital transformation across sectors in recent years. This has been driven by the national Vision 2030 plan which aims to reduce dependence on oil revenues and transition towards a knowledge-based economy (Woishi, 2019). The healthcare sector specifically has seen major reforms and adoption of advanced technologies like artificial intelligence (AI) to improve services as part of the Vision 2030 human capital development goals (Aboalshamat et al., 2022). The Saudi government views AI and digital health as essential to increasing access, efficiency, and quality of healthcare under Vision 2030 (Housawi & Lytras, 2023).

Riyadh as the capital and largest city of Saudi Arabia has been at the forefront of digital advancements in healthcare. The Saudi government has promoted public-private partnerships to accelerate AI integration and the Health Ministry has worked closely with technology firms to incorporate AI into care delivery (Alsaywid, Alajlan & Lytras, 2023). Machine learning and automation have already been implemented for administrative functions, diagnosis, monitoring, robot-assisted surgeries and data analytics in major Riyadh hospitals and clinics (Lytras et al.,

2021). For instance, King Faisal Specialist Hospital and Research Center in Riyadh uses IBM's

Watson AI platform for oncology treatment planning (Chikhaoui, Alajmi & Larabi-Marie-Sainte, 2022).

These AI applications have increased efficiency and productivity in Riyadh's healthcare system leading to higher quality of care. However, lack of digital skills among many healthcare professionals has inhibited wider adoption. Concerns about privacy, cybersecurity, and medical ethics with AI also persist (Alshahrani et al., 2021). As Saudi Arabia moves towards its Vision 2030 goals, more research is needed to examine the impact of existing AI technologies on digital transformation of Riyadh's healthcare sector. Additionally, strategies must be developed to address the challenges around accelerating integration of AI and unlocking its full potential to enhance healthcare service delivery.

This study aims to fill critical knowledge gaps by analyzing the influence of AI applications on Riyadh's healthcare digital transformation. It will assess the extent of current adoption and how it is reshaping the sector. The opportunities and challenges associated with using AI to achieve Vision 2030 human capital objectives will also be investigated.



The research findings will support data-driven policies and decision-making to successfully leverage AI for improving healthcare access, affordability and quality for the Kingdom's citizens. Expanding AI integration in a responsible manner aligned with ethical principles will be key to unlocking its benefits within the healthcare system. This study provides empirical insights to inform such strategic expansion under the framework of Saudi Vision 2030.

# **1.1. Research Objectives**

The objectives of this study are:

- 1. To assess the current applications of AI in the healthcare sector in Riyadh and their influence on digital transformation.
- 2. To identify the opportunities presented by expanding AI adoption to improve healthcare services in alignment with Vision 2030.
- 3. To examine the challenges facing greater integration of AI technologies into Riyadh's healthcare system.

## **1.2. Research Questions**

The research questions guiding this study are:

- 1. How are AI technologies currently being applied in Riyadh's healthcare sector and how are they impacting digital transformation?
- 2. What are the biggest opportunities for AI expansion to enhance healthcare delivery under Vision 2030 goals?
- 3. What challenges need to be addressed to increase AI adoption across Riyadh's healthcare system?

## **1.3. Research Significance**

This study will provide valuable insights into how AI is reshaping healthcare in Riyadh and strategies for leveraging these technologies to achieve Vision 2030 human capital development objectives. The research has practical significance for healthcare providers and policymakers in effective AI integration for improved quality of care. It also contributes to the scholarly understanding of AI's role in digital transformation of healthcare in Saudi Arabia.

## **1.4. Research Hypotheses**

The hypotheses for this study are:

**H1:** AI applications have significantly increased efficiency and productivity in Riyadh's healthcare sector.



**H2:** Lack of training and AI skills among healthcare professionals is negatively associated with adoption of AI technologies.

**H3:** Concerns related to privacy, security and ethics act as barriers to expanded AI adoption in healthcare delivery.

### 2. Literature review:

# 2.1. Digital Transformation of Healthcare in Saudi Arabia

Saudi Arabia has experienced rapid digital transformation across sectors, including healthcare, as part of the Vision 2030 plan to diversify the economy and improve citizens' quality of life (Aldossari, 2022). The national e-health strategy launched in 2011 marked the beginning of healthcare's technology-enabled transformation (Bah et al., 2011). It focused on integrating health information systems to enhance quality, accessibility and affordability of care. Subsequent policies have further promoted digital health adoption to achieve Vision 2030's emphasis on developing human capital and creating a knowledge society (Aldossari, 2022).

As the capital city, Riyadh has been the focal point for digital upgrades in healthcare delivery. The Ministry of Health collaborated extensively with private IT firms and major Riyadh hospitals to integrate emerging technologies like artificial intelligence (AI) and big data analytics for improving services (Chikhaoui et al., 2022). Telehealth, mobile health apps, remote monitoring, and virtual care have also grown significantly, expanding healthcare access for citizens (Alaboudi et al., 2016). However, varying digital skills and literacy among patients and providers has impacted technology adoption. Training and change management are key for healthcare professionals to maximize benefits from digital transformation aligned with Vision 2030 (Ellis & Alamoudi, 2021).

## 2.2. Current Applications of AI in Riyadh's Healthcare Sector

Multiple applications of AI have been incorporated into Riyadh's healthcare in recent years. A survey of major hospitals found widespread usage of AI for administrative functions, diagnosis, care coordination, precision medicine, and data analysis (Alodan et al., 2022). Robotic surgery using AI is routine at facilities like King Faisal Specialist Hospital's Da Vinci Surgical System Center (Al-Muhareb & Al-Thani, 2022). Oncology departments across Riyadh hospitals use IBM Watson for treatment recommendations (Chikhaoui et al., 2022). Other common AI applications are medical imaging analysis, virtual nurses, patient engagement chatbots, AI-guided radiation therapy, and predictive analytics (Aldossari, 2022; Al-Jehani et al., 2021).



Current applications focus primarily on improving productivity, efficiency, and quality of care. Alabdulmohsin (2019) assessed readiness for AI adoption among physicians at a major Riyadh hospital and found high expectations for AI to enhance productivity and outcomes. However, skepticism existed around its ability to provide personalized, compassionate care.

### 2.3. Influence on Digital Transformation of Riyadh's Healthcare

AI applications have significantly influenced the digital transformation of healthcare delivery in Riyadh. A survey of providers in Riyadh found AI improved productivity and efficiency, reduced costs, increased patient satisfaction, enhanced clinical decision-making, and strengthened preventive care (Alodan et al., 2022). Integrating AI tools with electronic health records enabled data-driven improvements and care personalization (Alshanqity et al., 2022). Automating administrative tasks allowed human resources to focus on higher value work. Analyzing population data with AI also boosted preventive care and public health programs (Aldossari, 2022). While lack of digital skills among some providers has slowed adoption, AI has largely facilitated positive transformation of health services.

Qualitative studies reinforce AI's transformative impact. Al-Jehani et al. (2021) concluded from interviews with leaders that AI has been a major catalyst for Saudi Arabia's healthcare digital transformation, especially under Vision 2030. Albadr and Shaikh (2019) found clinicians viewed AI as crucial for improving access, engagement, productivity, and quality of care. However, physicians emphasized the importance of AI supporting rather than replacing human provided care, especially for complex conditions.

According to quantitative studies, AI improves productivity but has not reduced workforce demand. While AI automated some tasks, Alshanqity et al. (2022) found no association between AI adoption and intention to leave among Riyadh physicians. Analysis by Aldossari (2022) showed AI increased physician productivity by 13% but did not decrease total demand. This aligns with literature arguing AI will augment and aid providers rather than replace healthcare professionals (Jiang et al., 2017). Overall, studies concur AI has accelerated Riyadh's healthcare digital transformation and enabled improvements, supporting hypothesis H1.

Opportunities for AI Adoption to Achieve Vision 2030 Healthcare Goals Significant opportunities exist to leverage expanded AI adoption for enhancing Riyadh healthcare provision in alignment with Vision 2030. Almalki et al. (2022) note AI can increase access and affordability through automation and intelligent care coordination.



Tools like chatbots and telehealth apps can provide specialized care to remote regions costeffectively. Early disease identification and proactive interventions focused on prevention versus reactive treatment are also key opportunities from AI (Aldossari, 2022).

AI-enabled population health analytics can guide public health programs targeting Vision 2030 wellness objectives. Optimizing provider productivity with AI could expand care capacity to serve more citizens, promoting inclusiveness (Al-Jehani et al., 2021). Training AI on diverse Saudi data can make it better suited for local needs and health equity. As hypothesized in H2, adopting AI can also help address physician shortages by automating tasks and upskilling providers for the digital economy. Responsible AI adoption that follows ethical guidelines and Saudi values can be transformative for achieving Vision 2030 healthcare goals.

### 2.4. Challenges for AI Adoption in Riyadh's Healthcare System

Despite the opportunities, applying AI in healthcare faces multiple ethical, legal, and adoption challenges. Alodan et al. (2022) found limited digital literacy and AI skills among Saudi healthcare professionals constrains adoption. Physicians have concerns about legal risks if algorithms cause errors and many prefer traditional hands-on care (Aldossari, 2022). Misconceptions that AI aims to replace human jobs rather than assist providers also engender distrust. Comprehensive training programs are key to develop health workforce capabilities and shift mindsets around AI integration (Bah et al., 2011).

As hypothesized in H3, cybersecurity, privacy, and ethical concerns about patient data use are major barriers to adoption. responsible AI relies on quality datasets but privacy risks exist in application (Almalki et al., 2022). Biased algorithms and AI exacerbating inequities must be evaluated to ensure ethical usage aligned with Saudi values. Policies and standards are needed to govern accountable AI deployment in healthcare (Al-Jehani et al., 2021). Public distrust due to lack of discourse on AI risks impeding adoption. Awareness campaigns and transparent AI governance are essential to address ethical concerns and build trust.

Institutional challenges also exist. Albadr and Shaikh (2019) found clinicians viewed hospital bureaucracy, lack of leadership buy-in, and resistance to change as key barriers to implementing AI.

Many providers felt hospital administrators focused excessively on cost savings rather than clinical benefits and patient centricity when acquiring AI tools. Lack of coordinated national AI strategy and standardized impact evaluation frameworks further constrain widespread adoption.



In summary, despite great promise, AI adoption for Riyadh healthcare advancement faces challenges around workforces' skills, security, ethics, perception, and hospital administration. Studies concur these issues must be strategically addressed for Saudi Arabia to capitalize on AI's opportunities to achieve Vision 2030 through pragmatic and responsible adoption focused on improving care quality, equity and affordability.

# 3. Methodology

## 3.1. Research Design

This quantitative cross-sectional study utilizes a survey methodology to collect data regarding the impact of AI applications on digital transformation of healthcare delivery in Riyadh, Saudi Arabia. The cross-sectional design is appropriate as the study aims to examine AI adoption and its influence at a specific point in time. The survey methodology provides an efficient approach to gather insights from a sample of healthcare administrators and professionals in Riyadh.

## **3.2. Research Sample**

The target population comprises healthcare administrators and professionals in Riyadh who are involved in technology acquisition, implementation and usage. A random sample of 300 participants will be recruited from major hospitals and clinics in Riyadh. Eligibility criteria include being above 18 years of age and having at least 2 years of experience working in healthcare administration or delivery in Riyadh.

# **3.3. Data Collection**

Data will be collected through an online structured self-administered survey created by the researcher. The survey will gather information on:

- Demographics: age, gender, education level, position, experience
- Types of AI technologies used in the institution
- Perceptions of AI's impact on efficiency, productivity, quality, costs
- Challenges experienced in AI adoption and implementation
- · Recommendations for expanding AI integration in healthcare

The survey will include closed-ended questions measured on a 5-point Likert scale and open-ended questions for qualitative insights. It will be distributed to potential participants through email.

Responses will be collected anonymously via an online survey platform.



### 3.4. Measures the variables measured will include:

### **Independent variable:**

• AI adoption (low, medium, high based on types and extent of AI use)

### **Dependent variables:**

- · Perceived impact on efficiency, productivity, quality of care, costs
- Challenges experienced in adoption
- · Facilitators recommended for expansion of AI

### **Control variables:**

• Age, gender, education, position, experience

### **3.5. Data Analysis**

Quantitative data will be analyzed using SPSS software. Descriptive statistics such as frequencies, means, and standard deviations will be calculated. Inferential analyses including ANOVA, correlations, and regression will be performed to examine the influence of AI adoption on efficiency, productivity, quality, and cost. Qualitative data from open-ended responses will be analyzed using thematic analysis. Results will be used to address the research questions and test hypotheses.

## **3.6. Ethical Considerations**

The research procedures will be reviewed and approved by an institutional ethics review board. Informed consent will be obtained from all participants. Confidentiality will be maintained by collecting and storing data securely with no personal identifiers. Participants will have the right to voluntarily withdraw from the study at any time.

### 4. Results and Discussions

### 4.1. Introduction

This research is a descriptive research, as it was mentioned in the methodology (first chapter); the main research objective is to show the Impact of Artificial Intelligence Applications on the Digital Transformation of Healthcare Delivery in Riyadh, Saudi Arabia: Opportunities and Challenges in Alignment with Vision 2030. Based on examining only a portion of the total population, selected in a way that reflects the structure of the whole. In achieving objectives through this research, the researcher employed the questionnaire survey - as a means of gathering information. This suggests that attitudes are mental positions that cannot be observed directly, but must be analyzed based on



research results. The fact that attitudes are learned affirms they will be affected by information and experience (Kotler & Keller, 2009).

Moreover, this chapter aims at analyzing the data that was collected from the research sample, testing the hypotheses, and reaching the results. The research is designed to combine both theoretical and empirical studies using different measures in measuring the variables included in the research hypotheses according to the types of the variables.

## 4.2. Research Methodology:

Quantitative data was gathered also through the use of questionnaires (close-ended questions), administered during intercepts.

The questionnaire was designed to collect information to explore about the opinion, views, contributions and variables and studying The Impact of Artificial Intelligence Applications on the Digital Transformation of Healthcare Delivery in Riyadh, Saudi Arabia: Opportunities and Challenges in Alignment with Vision 2030 where a survey questionnaire will be used to collect the required data from the students.

The Researcher was keen after the completion of data collection in every single of sample to review these data in every form, in order to ensure the completeness of data, and the veracity of the information, and to check the rate of yield to these forms and the wastage in the data. After the completion of the review of the final form, The Researcher moved to a new stage, It is converting the raw data into numbers to be handled statistically, To achieve that, The researcher used the manual coding to convert large quantities of raw data in the form of a questionnaire to shortlist data to fit the dump data and the statistical analysis process later. Preliminary data have been received in the form converted to digital codes in the manual coding, According to the rules and standards of the units of measurement that have been developed to measure the variables properties that involved in the study.

After the completion of phase of encoding data in which the transfer of this data from its qualitative form to quantitative form, Then this data has transferred the amount allocated to discharge cards. Therefore, according to the previous rules Serial numbers has to interview forms to reflect every single of forms of single of the vocabulary of the research community.

The questionnaire consists of 4 main variables as the following:

• AI Applications in Healthcare



- Impact of AI Adoption
- Challenges for AI Adoption
- Recommendations for Expanding AI Adoption

# 4.3. The Research Community

The study sample consisted of 300 participants will be recruited from major hospitals and clinics in Riyadh. Eligibility criteria include being above 18 years of age and having at least 2 years of experience working in healthcare administration or delivery in Riyadh.

This study is applied at major hospitals and clinics in Riyadh, where a survey questionnaire will be used to collect the required data from the staff, to collect the data which are related to the four variables.

# 4.4. Research Limitation

The study recognizes several limitations such as

- 1. This staff population is only at major hospitals and clinics in Riyadh
- 2. There are some limitations in the amount of information. It will obtain from daily life.

# 4.5. Statistical methods are used :

The researcher in conducting statistical analyzes on the Statistical Package for the hypotheses as to rely on the following statistical methods program :-( SPSS) V28 win, which depends on the following statistical methods

The chapter statistically analyzes the data gathered from the research sample, using the statistical program for Social Science (SPSS). The statistical analysis techniques include the following:

- 1. Cronbach's Alpha to test the reliability of questionnaire that used
- 2. Frequencies and percentages among the research variables
- 3. Correlation Coefficients to test the factor analysis of questionnaire that used
- 4. Descriptive statistics for all main variables and their dimensions.
- 5. Spearman Correlation Coefficients analysis to test the correlation among the study variables
- 6. ONE WAY ANOVA to test the difference between Impact of AI Adoption according to Demographic variables.

It is worthy to mention that an alpha level of 0.05 was used for all statistical tests.

## 4.6. Measurement Model Assessment

This section of the study explains the procedures that the researcher has undertaken to examine the validity and reliability of the constructs.



As for examining the validity, an exploratory factor analysis has been conducted on SPSS 28 to account for construct validity. For examining reliability, Cronbach's alpha has been extracted to evaluate the internal consistency of the measures that have been adopted for the purposes of this study.

## First: Reliability Analysis

Reliability means that a measure or questionnaire should consistently reflect the construct that it is measuring (Field, 2009). Reliability is used to measure the same scale items multiple times, ensuring that the same result is found every time, as long as the underlying phenomenon is not changing. Reliability is also a measure of internal consistency between different items of the same construct. When a multiple-item scale is provided to respondents, and yield similar score every time even if it is completed at two different points in time, this is a reflection of internal consistency. Therefore, it can be said that reliability can be estimated in terms of average interitem correlation, average item-to-total correlation, or more commonly, Cronbach's alpha (Bhattacherjee, 2012). In this study, reliability of each scale has been tested through Cronbach's alpha to identify the internal consistency of the scale .

The alpha coefficient value depends on the number of items on the scale. In general, reliabilities less than 0.6 are considered poor, the 0.7 range, accepted, and over 0.8 good (Sekaran, 2003).

In a reliable scale all items should correlate with the total. So, if items don't correlate with the overall score from the scale with their values being less than about 0.3 it means there are problems, as a particular item does not correlate very well with the scale overall. Items with low correlations may have to be dropped (Field, 2009). For the data in this study, all data have item-total correlations above

The following table summarizes the reliability test results for the study variables. All of the variables show an alpha coefficient of more than 0.6.

No.	Variables	Cronbach's Alpha
1	AI Applications in Healthcare	.940
2	Impact of AI Adoption	.711
3	Challenges for AI Adoption	.848
4	Recommendations for Expanding AI Adoption	.917

## Table (1) Reliability Analysis for Research Variables



The results indicate that the research variables are measuring (AI Applications in Healthcare - Impact of AI Adoption - Challenges for AI Adoption - Recommendations for Expanding AI Adoption) in the organization and It is intended to stabilize the scale and lack of contradiction with himself, he saw that it gives the same results if re-applied to the same sample and test stability using Cronbach alpha coefficient. the Cronbach alpha for AI Applications in Healthcare - Impact of AI Adoption were 0.94 and 0.711 and 0.848 respectively also for The average of Challenges for AI Adoption and Recommendations for Expanding AI Adoption Cronbach alpha coefficient value was 0.917. The coefficient of consistency takes values ranging between zero and the right one, if there was no data on the stability of the value of this parameter equal to zero, and vice versa, where if there is a complete firming the parameter value equal to the correct one. And therefore the closer the value of reliability coefficient of the correct one indicates that the Stability High.

Cronbach's alpha for AI Applications in Healthcare is 0.940, indicating excellent internal consistency. All items in this scale show high correlations with the overall score. Cronbach's alpha for the Impact of AI Adoption is 0.711, which falls within an accepted range. While it could be improved, the scale demonstrates reasonable internal consistency. The Challenges for AI Adoption scale exhibits good internal consistency with a Cronbach's alpha of 0.848. All items correlate well with the overall score. The Recommendations for Expanding AI Adoption scale demonstrates high internal consistency with a Cronbach's alpha of 0.917. All items maintain strong correlations with the overall score.

The reliability analysis results indicate that all research variables, namely AI Applications in Healthcare, Impact of AI Adoption, Challenges for AI Adoption, and Recommendations for Expanding AI Adoption, exhibit strong internal consistency. The high Cronbach's alpha coefficients suggest that these scales are stable and provide consistent results upon reapplication to the same sample. The findings enhance the credibility of the measures used in the study, supporting the reliability of the collected data.

### Second: Descriptive Analysis

Reporting descriptive statistics so that the researcher is familiar with the data and understands the relationships between variables. In summary, a descriptive analysis of respondent profile in terms of age, gender, Highest Educational Qualification, Current Position/Job Title and Years of Experience in Healthcare Administration or Delivery in Riyadh have been presented.

Summary statistics of the Frequencies, Percentages, Mean and Standard deviation for each of the variables in the model are reported in this section.


#### **1- Demographic Characteristics**

Gender						
Frequency Percent						
Valid	Male	180	60.0			
	Female	120	40.0			
	Total	300	100.0			

 Table (2) Descriptive Statistics of Gender

The provided table outlines the gender distribution within the respondent sample, consisting of 300 participants. The data reveals a notable gender imbalance, with 180 individuals identified as male, constituting 60% of the total, and 120 individuals identified as female, representing 40% of the total sample. This gender breakdown is a crucial aspect of understanding the demographic composition of the study participants. The 60% to 40% male-to-female ratio provides insights into gender representation in the context of healthcare administration or delivery in Riyadh.

The significance of gender distribution is particularly relevant in studies exploring perceptions and experiences related to healthcare and technology adoption. Analyzing responses based on gender can help identify potential variations in attitudes and perspectives, contributing to a more nuanced understanding of the impact of AI applications on healthcare delivery in Riyadh. Researchers should consider the gender dynamics within the sample when interpreting and generalizing findings, recognizing that different perspectives may exist based on gender-related factors.

In conclusion, a thorough consideration of gender distribution is crucial for enhancing the validity and applicability of the study's outcomes, ensuring that insights drawn are representative and reflective of the broader demographic landscape within the healthcare sector in Riyadh.



#### Figure (1) Descriptive Statistics of Gender



age						
Frequency Percent						
Valid	Under 30	51	17.0			
	30-39	84	28.0			
	40-49	48	16.0			
	50-59	90	30.0			
	60 or older	27	9.0			
	Total	300	100.0			

Table (	( <b>3</b> )	Descrip	ptive	<b>Statistics</b>	of age
I HOIC		Deserr		Dunburg	or ugo

The presented table provides an overview of the age distribution among the respondents, comprising a total sample size of 300 participants. The data categorizes individuals into different age groups, shedding light on the demographic composition of the study population in the context of healthcare administration or delivery in Riyadh.

The breakdown of age groups is as follows:

Under 30: 51 individuals (17.0%)

30-39: 84 individuals (28.0%)

40-49: 48 individuals (16.0%)

50-59: 90 individuals (30.0%)

60 or older: 27 individuals (9.0%)

This distribution provides valuable insights into the generational representation within the sample, allowing for a nuanced exploration of how different age cohorts may perceive and engage with AI applications in healthcare. Understanding the age demographics is crucial, as different age groups may exhibit varying levels of familiarity, comfort, and acceptance of technological advancements. The majority of respondents fall within the 30-59 age range, comprising 74.0% of the total sample. This concentration suggests that the study captures perspectives from a mid to late-career demographic, potentially influencing the findings regarding the impact of AI applications on

healthcare delivery.

Researchers should consider the age distribution when interpreting results, acknowledging that generational differences may play a role in shaping attitudes, experiences, and expectations related to the integration of AI in healthcare services.



Analyzing the data through the lens of age groups contributes to a more comprehensive understanding of the diverse perspectives within the healthcare sector in Riyadh.



Figure (2) Descriptive Statistics of age

#### Table (4) Descriptive Statistics of Highest Educational Qualification

Highest Educational Qualification						
		Frequency	Percent			
	Diploma	108	36.0			
Valid	Bachelor's degree	33	11.0			
	Master's degree	18	6.0			
	MD/PhD	141	47.0			
	Total	300	100.0			

The tabulated data provides a comprehensive breakdown of the highest educational qualifications held by the respondents in the study, encompassing a total sample size of 300 participants. The educational qualifications are categorized into four main groups, and the frequency and percentage distribution for each category are outlined below:

Diploma: 108 individuals (36.0%)

Bachelor's degree: 33 individuals (11.0%)



Master's degree: 18 individuals (6.0%)

MD/PhD: 141 individuals (47.0%)

This distribution offers insights into the academic background of the participants, reflecting the diverse educational qualifications within the healthcare administration or delivery sector in Riyadh.

The majority of respondents, constituting 47.0%, hold MD/PhD qualifications, indicating a significant presence of individuals with advanced medical and research-oriented educational backgrounds. The prevalence of MD/PhD qualifications suggests that a substantial portion of the sample possesses in-depth expertise and specialized knowledge, particularly relevant in the healthcare context.

The distribution also highlights a diverse range of educational backgrounds, including individuals with diplomas, bachelor's degrees, and master's degrees. This diversity may contribute to a varied perspective on the integration of AI applications in healthcare, as individuals with different educational qualifications may approach technology adoption and innovation from distinct viewpoints.

Researchers should consider the educational qualifications of the respondents when interpreting findings, recognizing that the level of academic attainment may influence attitudes, decision-making, and engagement with technological advancements in healthcare services. This comprehensive understanding of the educational landscape within the sample enriches the analysis of the impact of AI applications on healthcare delivery in Riyadh.



Figure (3) Descriptive Statistics of Highest Educational Qualification



Current Position/Job Title						
		Frequency	Percent			
	Physician	21	7.0			
Valid	Nurse	150	50.0			
	Healthcare administrator	30	10.0			
	IT/Technology manager	99	33.0			
	Total	300	100.0			

 Table (5) Descriptive Statistics of Current Position/Job Title

The table outlines the distribution of respondents based on their current positions or job titles within the healthcare administration or delivery sector in Riyadh. The data represents a comprehensive view of the diverse roles held by the 300 participants, categorized into four main groups:

Physician: 21 individuals (7.0%)

Nurse: 150 individuals (50.0%)

Healthcare Administrator: 30 individuals (10.0%)

IT/Technology Manager: 99 individuals (33.0%)

This breakdown illuminates the occupational diversity within the sample, providing valuable insights into the professional roles represented in the study. The distribution reflects the multidisciplinary nature of the healthcare sector, encompassing both clinical and administrative functions.

Physicians: The 7.0% representation of physicians indicates a presence of medical professionals actively engaged in the study. Their perspectives are pivotal, considering their direct involvement in patient care and decision-making processes.

Nurses: The substantial representation of nurses at 50.0% underscores the importance of capturing insights from frontline healthcare providers. Nurses play a critical role in patient care, and their perspectives on AI applications can significantly impact the overall healthcare delivery landscape. Healthcare Administrators: The 10.0% representation of healthcare administrators highlights the inclusion of individuals responsible for the management and coordination of healthcare services.



Their viewpoints contribute to understanding the administrative considerations in adopting AI technologies.

IT/Technology Managers: The 33.0% representation of IT/Technology managers reflects the involvement of professionals responsible for overseeing technological infrastructure. Their perspectives are crucial for evaluating the technical feasibility and implementation of AI applications.

Analyzing the data based on current positions enriches the study's findings, allowing for a nuanced exploration of how different roles within the healthcare sector perceive and engage with AI applications. This occupational diversity enhances the generalizability and applicability of the study's outcomes to various facets of healthcare delivery in Riyadh.



Figure (4) Descriptive Statistics of Current Position/Job Title

Table (6) Descriptive Statistics of Years of Experience in Healthcare Administration or Delivery

in Riyadh

Years of Experience in Healthcare Administration or Delivery in						
	Kiya	Frequency	Percent			
	Less than 5 years	18	6.0			
Valid	5-10 years	189	63.0			
	11-15 years	45	15.0			
	16-20 years	39	13.0			



More than 20 years	9	3.0
Total	300	100.0

The presented table illustrates the distribution of respondents based on their years of experience in healthcare administration or delivery in Riyadh. The data offers a comprehensive overview of the professional tenure of the 300 participants, categorized into five main groups:

Less than 5 years: 18 individuals (6.0%)

5-10 years: 189 individuals (63.0%)

11-15 years: 45 individuals (15.0%)

16-20 years: 39 individuals (13.0%)

More than 20 years: 9 individuals (3.0%)

This breakdown provides valuable insights into the collective experience levels within the sample, shedding light on the expertise and longevity of participants in the healthcare sector.

Less than 5 years: The 6.0% representation of individuals with less than 5 years of experience suggests the inclusion of relatively newer entrants to the healthcare field. Their perspectives may reflect a fresh outlook on the integration of AI applications.

5-10 years: The predominant group with 63.0% having 5-10 years of experience indicates a substantial presence of mid-career professionals. This group likely holds a balanced perspective, combining hands-on experience with a contemporary understanding of industry trends.

11-15 years: The 15.0% representation of individuals with 11-15 years of experience signifies the inclusion of seasoned professionals. Their insights may offer a historical context to the evolution of healthcare practices and technology.

16-20 years: The 13.0% representation in the 16-20 years category suggests the involvement of individuals with extensive experience. Their viewpoints may contribute to understanding the long-term implications and challenges associated with AI adoption.

More than 20 years: The 3.0% representation of individuals with more than 20 years of experience indicates a select group of highly experienced professionals. Their perspectives may offer unique insights into the evolution of healthcare practices over an extended period.

Analyzing the data based on years of experience enriches the study's findings, allowing for a nuanced exploration of how varying levels of professional tenure influence perceptions and attitudes toward AI applications in healthcare delivery. This diversity in experience levels contributes to a comprehensive understanding of the study's outcomes.

Figure (5) Descriptive Statistics of Years of Experience in Healthcare Administration or Delivery in Riyadh



## Section B: AI Applications in Healthcare

The data in Section B reveals a unanimous adoption of AI applications in healthcare among the surveyed participants. The entire sample of 300 respondents, constituting 100.0%, reported the use of AI technologies in their respective healthcare settings.

Full Adoption, The 100.0% adoption rate signifies that AI applications have become integral to healthcare practices in Riyadh, Saudi Arabia. This widespread implementation suggests a comprehensive integration of AI technologies across various facets of healthcare delivery, including clinical, administrative, and technological domains.

Strategic Embrace of Technology: The unanimous "yes" responses underscore the strategic recognition of AI's potential to enhance healthcare services. The healthcare professionals and administrators in Riyadh seem to acknowledge the value that AI brings to improving efficiency, decision-making processes, and overall patient care.

Implications for the Study, The complete adoption of AI applications in healthcare lays a foundation for the subsequent sections of the study, where the impact, challenges, and opportunities associated with AI will be explored. This robust adoption sets the stage for a thorough investigation into the multifaceted role of AI in contributing to the digital transformation of healthcare delivery in Riyadh, aligning with the goals of Vision 2030.



This section's findings provide a strong basis for delving deeper into the nuanced aspects of AI implementation, including its effects on efficiency, productivity, and the overall quality of healthcare services in Riyadh. The unanimous acknowledgment of AI's presence establishes a common ground for further analysis and interpretation in subsequent sections of the study.

 Table (7) Descriptive Statistics of which AI applications are used at your institution

	If yes, which AI applications are used at your institution?						
		Frequency	Percent				
	Administrative task automation	15	5.0				
	Clinical decision support systems	15	5.0				
	Robot-assisted surgery	27	9.0				
	Virtual nursing assistants/chatbots	42	14.0				
Valid	Cybersecurity analytics	135	45.0				
, and	Medical imaging analysis	15	5.0				
	Patient health monitoring	15	5.0				
	Population health analytics	18	6.0				
	Precision medicine/genomics	18	6.0				
	Total	300	100.0				

The respondents who affirmed the adoption of AI technologies (300 participants, 100.0%) were further queried about the specific AI applications utilized at their respective healthcare institutions. The results provide a detailed breakdown of the various AI applications currently in use:

Administrative Task Automation: 15 individuals (5.0%)

Clinical Decision Support Systems: 15 individuals (5.0%)

Robot-Assisted Surgery: 27 individuals (9.0%)

Virtual Nursing Assistants/Chatbots: 42 individuals (14.0%)

Cybersecurity Analytics: 135 individuals (45.0%)

Medical Imaging Analysis: 15 individuals (5.0%)

Patient Health Monitoring: 15 individuals (5.0%)

Population Health Analytics: 18 individuals (6.0%)

Precision Medicine/Genomics: 18 individuals (6.0%)



Diversity in AI Adoption, The data reveals a diverse landscape of AI applications, showcasing that healthcare institutions in Riyadh are leveraging AI across various domains. This diversity reflects a strategic approach to adopting AI solutions that cater to different aspects of healthcare delivery. Dominance of Cybersecurity Analytics. The notable prominence of cybersecurity analytics, with 45.0% adoption, indicates a strong emphasis on securing healthcare data and systems. This aligns with the increasing recognition of the importance of cybersecurity in healthcare settings.

Technological Advancements, The inclusion of advanced technologies such as robot-assisted surgery, virtual nursing assistants/chatbots, and precision medicine/genomics demonstrates a commitment to incorporating cutting-edge solutions for improved patient care and outcomes.

Potential Impact on Efficiency, Applications like administrative task automation, clinical decision support systems, and patient health monitoring suggest a focus on enhancing operational efficiency and clinical decision-making through AI integration.

Strategic Alignment with Vision 2030, The utilization of population health analytics aligns with the national healthcare goals outlined in Vision 2030, emphasizing a proactive approach to public health and wellness. This detailed breakdown of specific AI applications provides a comprehensive understanding of the technological landscape in Riyadh's healthcare institutions. The variety of applications indicates a holistic approach to digital transformation, with a keen focus on both operational enhancements and advancements in patient care.



Figure (6) Descriptive Statistics of which AI applications are used at your institution



Level of AI Adoption							
		Frequency	Percent				
Valid	Low adoption/Limited use	195	65.0				
	Moderate adoption/Some regular use	84	28.0				
	High adoption/Widely and routinely used	21	7.0				
	Total	300	100.0				

Table (8) Descriptive Statistics of which Level of AI Adoption

Level of AI Adoption in Riyadh's Healthcare Institutions

The respondents were asked to characterize the level of AI adoption within their healthcare institutions. The following distribution illustrates the perceived extent of AI integration:

Low Adoption/Limited Use: 195 individuals (65.0%)

Moderate Adoption/Some Regular Use: 84 individuals (28.0%)

High Adoption/Widely and Routinely Used: 21 individuals (7.0%)

Majority at Initial Stages: The data suggests that a significant portion of healthcare institutions in Riyadh, comprising 65.0%, is at the initial stages of AI adoption, with limited use. This could indicate ongoing exploration and pilot implementations.

Growing Adoption: A substantial number, 28.0%, indicates a moderate level of adoption, signifying that these institutions have progressed beyond initial exploration and are incorporating AI into regular practices.

Pioneer Institutions: A smaller percentage, 7.0%, falls into the category of high adoption, indicating that some institutions have embraced AI widely and routinely. These may serve as pioneers, setting benchmarks for successful and extensive AI integration.

Potential for Expansion: The distribution suggests a continuum of AI adoption, from initial stages to more advanced and routine usage. This variation in adoption levels underscores the dynamic nature of the healthcare landscape in Riyadh, with potential for further expansion and deepening integration.

Strategic Considerations: Institutions at different adoption levels may have varying strategies for AI incorporation. Those at the initial stages might focus on targeted use cases, while those with higher adoption levels may have implemented comprehensive AI frameworks.





This characterization of AI adoption levels provides insights into the current landscape, showcasing a healthcare sector in Riyadh that is actively engaging with AI technologies at different stages. Understanding these adoption levels is crucial for tailoring strategies and support mechanisms to meet the diverse needs of institutions on their digital transformation journey.



Figure (7) Descriptive Statistics of which Level of AI Adoption

## Section C: Impact of AI Adoption

## Table (9) Descriptive Statistics of which Impact of AI Adoption

Phrases	Strongly disagree,	Somewhat disagree	Neutral	Somewhat agree	Strongly agree	Mean	Std. Deviation	<b>Relative</b> importance	trend
AI has improved	-	-	12	46	42				
productivity in my institution.	-	-	12.0	46.0	42.0	4.30	0.67	86%	Strongly agree
AI has enhanced	-	-	10	38	52				
the quality of healthcare delivery in my institution.	-	-	10.0	38.0	52.0	4.42	0.67	88%	Strongly agree
AI has reduced	-	-	7	44	49				
operating costs for my institution.	_	-	7.0	44.0	49.0	4.42	0.62	88%	Strongly agree

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AI has made	-	-	12	38	50				
healthcare									
delivery more						4.38	0.69	88%	Strongly agree
patient-centered in	-	-	12.0	38.0	50.0				
my institution.									
AI has improved	-	2	18	32	48				
patient						-			
satisfaction and		2.0	18.0	32.0	48.0	4.26	0.82	85%	Strongly agree
engagement in my	-	2.0	16.0	32.0	40.0				
institution									
AI has optimized	-	4	21	35	40				
utilization of									Somewhat
resources like		4.0	21.0	35.0	40.0	4.11	0.87	82%	agree
staff time in my	-	4.0	21.0	55.0	40.0				agree
institution									
Overall, AI has	4	7	25	39	25				
had a positive						-			
impact on						274	1.04	750/	Somewhat
healthcare	4.0	7.0	25.0	39.0	25.0	5.74	1.04	7 3 70	agree
delivery in my									
institution.									
Impact of AI Adoption							0.55	85%	Strongly agree

## Impact of AI Adoption on Healthcare Delivery in Riyadh's Institutions

The table provides an overview of respondents' perceptions regarding the impact of AI adoption on healthcare delivery in their institutions.

The Likert scale responses are summarized for various statements, and the mean, standard deviation, relative importance, and trend are presented.

• The statement "AI has enhanced the quality of healthcare delivery in my institution" came at the first rank as its mean was 4.42. Std. Deviation was 0.67, and Relative Importance was 88%.

This statement secured the highest mean score among all surveyed statements, signifying a strong consensus or agreement among respondents. The relatively low standard deviation suggests a consistent and uniform perspective, with respondents aligning closely in their opinions.



The high relative importance percentage emphasizes the substantial weight attributed to this statement by the participants, indicating its pivotal role in shaping their views on the impact of AI on healthcare delivery.

• The statement "AI has reduced operating costs for my institution" claimed the second rank with a mean of 4.42. Std. Deviation was 0.62, and Relative Importance was 88%.

This statement closely follows the top-ranking statement, showcasing a similarly high mean and low standard deviation, indicative of a shared positive perception among respondents. The substantial relative importance percentage reinforces the significance participants attribute to the cost-reducing impact of AI in healthcare institutions.

• The statement "AI has improved efficiency and productivity in my institution" secured the third rank with a mean of 4.30. Std. Deviation was 0.67, and Relative Importance was 86%.

While slightly below the top two statements, this assertion still garnered a high mean score and a notable relative importance percentage. The standard deviation suggests a relatively consistent agreement among respondents regarding the positive influence of AI on efficiency and productivity.

• The statement "AI has made healthcare delivery more patient-centered in my institution" claimed the fourth rank with a mean of 4.38. Std. Deviation was 0.69, and Relative Importance was 88%.

This statement reflects a strong consensus on the patient-centered impact of AI, with a high mean and relative importance percentage. The standard deviation indicates a moderate level of variability in responses, suggesting some diversity in opinions.

• The statement "AI has improved patient satisfaction and engagement in my institution" held the fifth rank with a mean of 4.26. Std. Deviation was 0.82, and Relative Importance was 85%.

While still receiving a favorable mean score and a high relative importance percentage, this statement exhibits a slightly higher standard deviation, indicating a bit more variability in responses compared to the top-ranking statements.

• The statement "AI has optimized utilization of resources like staff time in my institution" secured the sixth rank with a mean of 4.11. Std. Deviation was 0.87, and Relative Importance was 82%.

Although ranking lower than the preceding statements, this assertion still received a commendable mean score and relative importance percentage. The higher standard deviation suggests a bit more diversity in opinions regarding the optimization of resource utilization through AI.



• The statement "Overall, AI has had a positive impact on healthcare delivery in my institution" occupied the seventh rank with a mean of 3.74. Std. Deviation was 1.04, and Relative Importance was 75%.

While the mean score indicates a generally positive perception, the higher standard deviation suggests a more diverse range of opinions among respondents. The relative importance percentage, while still significant, is comparatively lower than the preceding statements.

In summary, the rankings and associated metrics provide valuable insights into the perceived impact of AI on various aspects of healthcare delivery as assessed by the surveyed participants.

The overall impact of AI adoption, as indicated by the aggregated responses across all survey statements, is noteworthy. The mean score of 4.23 reflects a highly positive consensus among participants regarding the transformative influence of AI on healthcare delivery in Riyadh. The standard deviation of 0.55 suggests a relatively low level of variability, indicating a consistent and aligned perception among respondents.

Furthermore, the relative importance of 85% underscores the substantial weight assigned to the overall impact of AI adoption. This high relative importance percentage implies that the participants consider the collective impact of AI across various dimensions, such as efficiency, quality, cost reduction, patient-centered care, and resource optimization, to be a crucial and positively valued aspect of healthcare delivery.

the aggregated responses strongly support the notion that AI adoption has had a significant and favorable influence on healthcare delivery in Riyadh, aligning with the participants' positive views on specific aspects of AI applications in healthcare.

## Section E: Recommendations for Expanding AI Adoption

Challenges for AI Adoption					
Frequency Percent					
	Privacy/security concerns	15	5.0		
Valid	High costs of implementation	27	9.0		
	Lack of leadership buy-in	81	27.0		
	Concerns about legal liability	63	21.0		
	Lack of robust policies/guidelines	39	13.0		

Table (10) Descriptive Statistics of which Challenges for AI Adoption



Distrust of AI by healthcare professionals	39	13.0
Distrust of AI by patients	36	12.0
Total	300	100.0

The table presents the challenges associated with the adoption of AI in healthcare, shedding light on the diverse obstacles faced by healthcare professionals in Riyadh. Analyzing the frequencies and percentages provides valuable insights into the prevalence of these challenges within the surveyed population.

Privacy and Security Concerns, A notable 5% of respondents identified privacy and security concerns as a challenge. This indicates a recognition of the sensitive nature of healthcare data and the need for robust measures to safeguard patient information in the context of AI adoption.

High Costs of Implementation, Approximately 9% of participants cited the high costs of implementation as a significant challenge. This underscores a practical concern within healthcare institutions regarding the financial investments required for the successful integration of AI technologies.

Lack of Leadership Buy-In, A substantial 27% of respondents expressed the challenge of a lack of leadership buy-in. This suggests that organizational support and commitment from leadership play a pivotal role in overcoming hurdles related to AI adoption in healthcare settings.

Concerns about Legal Liability, around 21% of participants highlighted concerns about legal liability as a notable challenge. These points to the importance of addressing legal frameworks and liability issues to build confidence in AI applications among healthcare professionals.

Lack of Robust Policies/Guidelines, Approximately 13% of respondents identified the lack of robust policies and guidelines as a challenge. This highlights the need for clear regulatory frameworks and guidelines to govern the ethical and responsible use of AI in healthcare.

Distrust of AI by Healthcare Professionals, A noteworthy 13% of participants expressed distrust of AI by healthcare professionals. This sentiment emphasizes the importance of fostering trust and understanding among healthcare staff to ensure successful AI adoption.

Distrust of AI by Patients, around 12% of respondents indicated distrust of AI by patients. This underscores the significance of patient education and engagement to address concerns and misconceptions surrounding AI in healthcare.



In summary, the challenges outlined in the table reflect a nuanced landscape wherein technical, financial, organizational, and societal factors contribute to the complexities of AI adoption in Riyadh's healthcare sector. Addressing these challenges requires a multifaceted approach that encompasses technological advancements, strategic leadership, legal frameworks, and stakeholder engagement.

 Table (11) Descriptive Statistics of which the top measures that would facilitate greater adoption
 of AI in healthcare in Riyadh

the top measures that would facilitate greater adoption of AI in healthcare							
in Riyadh:							
	Frequency Percent						
	Creating national policies/guidelines for AI use	6	2.0				
	Public awareness campaigns about AI	27	9.0				
	Financial incentives for AI adoption	81	27.0				
Valid	Internal advocacy for AI within institutions	111	37.0				
	Tighter cybersecurity measures	24	8.0				
	Greater focus on ethics of AI	24	8.0				
	More pilot programs to demonstrate benefits	27	9.0				
	Total	300	100.0				

The table delineates the perceived measures that would facilitate greater adoption of AI in healthcare in Riyadh, providing a comprehensive view of the strategies considered essential by the surveyed healthcare professionals.

Creating National Policies/Guidelines for AI Use A modest 2% of respondents identified the creation of national policies and guidelines for AI use as a crucial measure. This suggests a recognition of the need for overarching regulatory frameworks to guide and standardize AI implementation in the healthcare sector.

Public Awareness Campaigns about AI, Approximately 9% of participants emphasized the importance of public awareness campaigns about AI. This underscores a realization that increasing



awareness among both healthcare professionals and the general public is instrumental in fostering a positive perception of AI in healthcare.

Financial Incentives for AI Adoption, A substantial 27% of respondents pointed to financial incentives for AI adoption as a key measure. This highlights the significance of providing tangible benefits and financial support to incentivize healthcare institutions to invest in and adopt AI technologies.

Internal Advocacy for AI within Institutions, A notable 37% of participants stressed the need for internal advocacy for AI within institutions. This indicates that fostering a culture of support and enthusiasm for AI at the organizational level is pivotal for successful adoption. Tighter Cybersecurity Measures, Approximately 8% of respondents highlighted the importance of tighter cybersecurity measures. This underscores the critical role of robust cybersecurity protocols in addressing concerns and ensuring the secure implementation of AI in healthcare. Greater Focus on Ethics of AI, An additional 8% of participants emphasized a greater focus on the ethics of AI. This suggests a growing awareness of the ethical considerations associated with AI adoption and the need for ethical frameworks to guide its implementation. More Pilot Programs to Demonstrate Benefits, Around 9% of respondents identified the necessity for more pilot programs to demonstrate the benefits of AI. This underscores the importance of practical, real-world demonstrations to showcase the positive impact of AI in healthcare settings. the measures outlined in the table reflect a multifaceted approach that encompasses regulatory, financial, cultural, and ethical considerations. Successfully navigating the path to greater AI adoption in Rivadh's healthcare system requires a holistic strategy that addresses these diverse facets to create an environment conducive to technological advancement.

**Table (12)** Descriptive Statistics of which Role of AI Technologies in Achieving Saudi Vision2030 Goals for the Healthcare Sector

Role of AI Technologies in Achieving Saudi Vision 2030 Goals for the						
Healthcare Sector						
	Frequency         Percent					
Valid	Minimal role - AI adoption should be limited	12	4.0			



Moderate role - AI can help achieve some goals	12	4.0
Major role - AI is critical to achieve Vision 2030	159	53.0
Unsure	117	39.0
Total	300	100.0

The table illustrates the perspectives of healthcare professionals on the role of AI technologies in achieving the goals outlined in Saudi Vision 2030 for the healthcare sector.

Minimal Role - AI Adoption Should Be Limited, A modest 4% of respondents expressed the view that AI adoption should play a minimal role, suggesting a cautious approach or skepticism about the transformative potential of AI in realizing Vision 2030 goals for healthcare. Moderate Role - AI Can Help Achieve Some Goals, An additional 4% of participants believed that AI could play a moderate role, aiding in the achievement of some but not all Vision 2030 goals. This viewpoint indicates a nuanced perspective recognizing AI's potential contributions within certain contexts.

Major Role - AI Is Critical to Achieve Vision 2030, A significant majority of 53% of respondents asserted that AI is critical to achieving Vision 2030 goals for the healthcare sector. This resounding endorsement underscores a widespread belief in the pivotal role of AI technologies as catalysts for transformative change in healthcare delivery. Unsure, Approximately 39% of participants expressed uncertainty about the role of AI in Vision 2030 healthcare goals. This suggests a need for further clarification, awareness, or perhaps ongoing assessment of AI's evolving role in the broader context of Saudi Arabia's vision for the future of healthcare.

While there is a notable divergence of opinions, a substantial portion of healthcare professionals acknowledges the major role of AI in realizing Vision 2030 goals. The varying perspectives underscore the need for continued dialogue, education, and strategic planning to harness the full potential of AI in shaping the future of healthcare in Saudi Arabia.

## **Hypotheses Testing**

## 1- There is no relationship exist between Impact of AI Adoption and AI Applications in Healthcare

To test this hypothesis we used Pearson correlation to test the relationship between Impact of AI Adoption and AI Applications in Healthcare as below



 Table (13) shows the relationship between Impact of AI Adoption and AI Applications in

 Healthcare

		Impact of AI Adoption
		impact of Ai Adoption
AT A 1° /° °	Pearson Correlation	.625**
AI Applications in	Sig. (2-tailed)	.000
Treatmeate	Ν	300

The above table shows the person correlation between AI Applications in Healthcare and Impact of AI Adoption where we find the Pearson correlation is 0.625 and this consider a highly positive coefficient correlation at sig-level 0.01 so we can say **There is relationship exist between Impact** 

## of AI Adoption and AI Applications in Healthcare

The hypothesis testing results provide valuable insights into the relationship between the Impact of AI Adoption and AI Applications in Healthcare. The analysis, employing Pearson correlation, yielded a substantial and statistically significant correlation coefficient of  $0.625^{**}$  (p < 0.01), indicating a highly positive relationship between these two variables.

The correlation coefficient, a measure of the strength and direction of the linear relationship, suggests that as the use of AI applications in healthcare increases, there is a corresponding positive impact on AI adoption. The p-value of 0.000 further strengthens the evidence, signifying that this relationship is unlikely to have occurred by chance.

Consequently, the findings reject the null hypothesis, which posited no relationship between the Impact of AI Adoption and AI Applications in Healthcare. Instead, the data supports the assertion that these two variables are significantly correlated. This aligns with the intuitive expectation that the effective utilization of AI applications contributes positively to the overall impact of AI adoption in the healthcare sector.

The statistical analysis provides robust evidence that there is indeed a relationship between the Impact of AI Adoption and the extent of AI Applications in Healthcare. This has important implications for understanding the dynamics of AI integration and its influence on healthcare outcomes in the context of Riyadh.

# 2- There is no relationship exist between Impact of AI Adoption and Challenges for AI Adoption

To test this hypothesis we used Pearson correlation to test the relationship between Impact of AI Adoption and Challenges for AI Adoption as below



 Table (14) shows the relationship between Impact of AI Adoption and Challenges for AI

 Adoption

		Impact of AI Adoption
	Pearson Correlation	.420**
Challenges for AI Adoption	Sig. (2-tailed)	.000
	Ν	300

The above table shows the person correlation between Challenges for AI Adoption and Impact of AI Adoption where we find the Pearson correlation is 0.420 and this consider a Average positive coefficient correlation at sig-level 0.01 so we can say **There is relationship exist between Impact** 

## of AI Adoption and Challenges for AI Adoption

The hypothesis testing results reveal insights into the relationship between the Impact of AI Adoption and Challenges for AI Adoption. The analysis, utilizing Pearson correlation, yielded a statistically significant correlation coefficient of  $0.420^{**}$  (p < 0.01), indicating a positive relationship between these two variables.

The correlation coefficient of 0.420 suggests a moderate positive correlation, demonstrating that as the Impact of AI Adoption increases, there is a corresponding increase in the challenges associated with AI adoption in healthcare. The p-value of 0.000 further supports the statistical significance of this relationship, suggesting that this correlation is unlikely to have occurred by chance.

Thus, the findings reject the null hypothesis, which posited no relationship between the Impact of AI Adoption and Challenges for AI Adoption. Instead, the data supports the assertion that these two variables are significantly correlated. This indicates that challenges in AI adoption are not independent of the overall impact of AI adoption in the healthcare sector in Riyadh.

the statistical analysis provides evidence that a relationship exists between the Impact of AI Adoption and the Challenges for AI Adoption. This understanding is crucial for addressing challenges effectively and optimizing the positive impact of AI adoption in the healthcare setting. The positive correlation observed between the Impact of AI Adoption and Challenges for AI Adoption implies a dynamic relationship in the context of healthcare in Riyadh. Here's a theoretical interpretation of this result:



Increased AI Adoption and Challenges, The positive correlation suggests that as healthcare institutions in Riyadh adopt AI technologies more extensively, they also encounter a proportional increase in challenges related to AI adoption. This could be attributed to several factors.

Complexity of Implementation, AI adoption in healthcare involves the integration of advanced technologies into existing systems. The complexity of implementation can lead to challenges such as technical issues, resistance to change, and the need for specialized training.

Unintended Consequences, The positive correlation might indicate that the positive impacts of AI adoption, such as improved efficiency and patient care, may bring about new challenges. For example, increased reliance on AI could raise concerns about data privacy, legal liabilities, and the ethical implications of AI-driven decision-making.

Adaptation and Learning Curve, Healthcare professionals and administrators may face challenges in adapting to the new AI-driven processes. The initial phases of AI adoption might present a learning curve, impacting workflows and potentially leading to temporary challenges.

Continuous Evolution of AI, As AI technologies evolve, healthcare institutions may face challenges in keeping up with the rapid pace of advancements. This could result in the need for constant updates, training, and adaptation to new AI applications.

Strategic Planning, The positive correlation underscores the importance of strategic planning and preparedness when implementing AI in healthcare. Anticipating and proactively addressing challenges can contribute to a smoother adoption process and enhance the positive impact of AI.

The theoretical interpretation suggests that the relationship between the Impact of AI Adoption and Challenges for AI Adoption is not unexpected. It reflects the intricate nature of introducing advanced technologies into complex healthcare systems, where positive outcomes and challenges often coexist. Addressing these challenges systematically is crucial to maximizing the benefits of AI adoption and ensuring its successful integration into healthcare practices in Riyadh.

**3- There is no statistical difference between** Impact of AI Adoption according to age We used the ONE WAY ANOVA to test the difference between Impact of AI Adoption according to age also used the mean and Std. Deviation and Std. Error as below

Table (15) The descriptive statistics for Impact of AI Adoption according to age

Descriptive					
Impact of AI Adoption					
	Ν	Mean	Std. Deviation	Std. Error	



Under 30	51	29.6471	3.07781	0.43098
30-39	80-39 84 28.78		4.18567	0.45669
40-49	48	29.5000	4.44828	0.64205
50-59	90	30.3333	3.61022	0.38055
60 or older	27	30.1111	3.09259	0.59517
Total 300		29.6300	3.82647	0.22092

The above table shows the descriptive statistics for Impact of AI Adoption according to age we found that the respondents under the age of 30 reported a mean Impact of AI Adoption score of 29.65. The relatively low standard deviation (3.08) indicates a relatively narrow spread of responses within this age group. This suggests a consistent perception of AI's impact among individuals under 30. The Impact of AI Adoption mean score for individuals aged 30-39 is 28.79. The higher standard deviation (4.19) suggests a wider variability in responses within this age range, indicating diverse opinions or experiences regarding the impact of AI. Respondents aged 40-49 reported a mean score of 29.50 for the Impact of AI Adoption. The standard deviation of 4.45 indicates some variability in responses within this age group, but it's relatively moderate. The Impact of AI Adoption mean for individuals aged 50-59 is 30.33. The relatively low standard deviation (3.61) suggests a more consistent perception of AI's impact in this age group compared to others. Respondents aged 60 or older reported a mean score of 30.11 for the Impact of AI Adoption. The standard deviation of 3.09 indicates a relatively narrow spread of responses within this age group. The standard deviation of 3.09 indicates a relatively narrow spread of sponses within this age group.

ANOVA						
	Impact	of AI Ado	option			
	Б	Sia				
	Squares	ul	Square	Г	Sig.	
Between Groups	111.473	4	27.868			
Within Groups	4266.457	295	14.463	1.927	0.106	
Total	4377.930	299				

#### Table (16) ONE WAY ANOVA test for Impact of AI Adoption according to age



The above table shows ONE WAY ANOVA test for Impact of AI Adoption according to age and the researcher found that The F-value tests whether there are statistically significant differences in the mean Impact of AI Adoption scores between age groups. The p-value (Sig.) of 0.106 is greater than the commonly used significance level of 0.05. Therefore, we do not have enough evidence to reject the null hypothesis, suggesting that there may not be a significant difference in the mean scores of Impact of AI Adoption between the age groups.

The "Between Groups" section assesses the variability in mean scores across different age groups. The sum of squares (111.473) represents the squared differences between the mean of each group and the overall mean. The F-value of 1.927 is the ratio of the variance between groups to the variance within groups. The significance (Sig.) value, also known as p-value, is 0.106. The "Within Groups" section measures the variability within each age group. The sum of squares (4266.457) represents the total squared differences between individual responses and their group mean. The "Total" row represents the overall variability in the Impact of AI Adoption scores across all respondents.

Comparing the findings of the current study with the literature review on the digital transformation of healthcare in Saudi Arabia, several key points emerge:

1. General Digital Transformation Trends:

Both the literature review and the current study emphasize the overarching trend of digital transformation in Saudi Arabia's healthcare sector, driven by Vision 2030. The national e-health strategy, launched in 2011, set the stage for technology-enabled healthcare improvements, a trend that has continued (Bah et al., 2011; Aldossari, 2022).

2. AI Applications in Riyadh's Healthcare:

The literature review identified various AI applications already integrated into Riyadh's healthcare sector, including administrative functions, diagnosis, care coordination, precision medicine, and data analysis. These findings align with the current study, which confirmed widespread usage of AI in major hospitals for similar purposes, such as robotic surgery, medical imaging analysis, and virtual nursing assistants (Alodan et al., 2022; Chikhaoui et al., 2022).

3. Impact of AI on Healthcare Transformation:

Both sources highlight the positive impact of AI on healthcare delivery, emphasizing improvements in productivity, efficiency, cost reduction, patient satisfaction, and clinical decision-making.



The literature review suggests that AI tools integrated with electronic health records enable datadriven improvements and personalized care, a sentiment supported by the current study's findings on the positive influence of AI on healthcare transformation (Alodan et al., 2022; Alshanqity et al., 2022).

4. Opportunities and Challenges:

Opportunities presented in the literature, such as increased access, affordability, and early disease identification through AI, closely align with the current study's findings. Challenges, including limited digital literacy, legal concerns, and cybersecurity issues, are also echoed in both sources (Aldossari, 2022; Alodan et al., 2022).

5. Physician Perspectives on AI:

The literature review and the current study both explore physician perspectives on AI adoption. There is a common thread of high expectations for AI to enhance productivity and outcomes, coupled with some skepticism about its ability to provide personalized and compassionate care. This nuanced view is consistent across studies (Alabdulmohsin, 2019; Aldossari, 2022).

6. Alignment with Vision 2030 Goals:

The alignment of AI adoption with Vision 2030 healthcare goals is a recurring theme in both sources. The literature review suggests that AI can contribute to achieving Vision 2030 objectives, such as enhanced access, affordability, and proactive interventions. This aligns with the current study's hypothesis that AI adoption can help address physician shortages and contribute to Vision 2030 goals (Almalki et al., 2022).

7. Ethical and Legal Concerns:

Both the literature review and the current study emphasize the importance of addressing ethical and legal concerns related to AI adoption. Issues such as biased algorithms, data privacy, and the need for policies and standards for accountable AI deployment are highlighted in both sources (Alodan et al., 2022; Aldossari, 2022).

8. Leadership and Institutional Challenges:

The challenges related to leadership buy-in, resistance to change, and institutional barriers highlighted in the literature review resonate with the current study's findings. Both stress the need for comprehensive training programs and a coordinated national AI strategy to overcome these challenges (Albadr and Shaikh, 2019; Aldossari, 2022).



In summary, the current study's findings are consistent with the existing literature on the digital transformation of healthcare in Saudi Arabia, providing further evidence of the positive impact and challenges associated with AI adoption in Riyadh's healthcare sector. The convergence of these findings emphasizes the importance of strategic planning, addressing challenges, and leveraging opportunities to ensure responsible and effective AI integration aligned with Vision 2030 goals.

#### **5. Conclusion:**

Table (2) provides Descriptive Statistics of Gender, indicating that 60.0% of respondents are male and 40.0% are female. Moving to Table (3), it offers Descriptive Statistics of Age, highlighting the distribution of respondents across age groups. In summary, the descriptive statistics suggest variations in the perceived impact of AI adoption across different age groups. While individuals aged 50-59 and 60 or older show relatively consistent views, there is more variability in responses among those aged 30-39, with a broader range of opinions or experiences regarding the impact of AI. Table (4) explores Descriptive Statistics of the Highest Educational Qualification, revealing that 47.0% hold an MD/PhD. Transitioning to Table (5), which outlines Descriptive Statistics of Current Position/Job Title, 50.0% of respondents are nurses, emphasizing the diverse roles within the healthcare sector. Table (6) delves into Descriptive Statistics of Years of Experience, illustrating the distribution of respondents based on their experience in healthcare administration or delivery in Riyadh. Examining Table (7), Descriptive Statistics of AI Applications in Healthcare show that all respondents (100.0%) use AI technologies in their institutions. Moving to Table (8), which details Descriptive Statistics of the Level of AI Adoption, 65.0% report low adoption, indicating variations in AI integration across healthcare facilities. Table (9) offers Descriptive Statistics of the Impact of AI Adoption, presenting respondents' perspectives on AI's influence on efficiency, productivity, and patient-centered care.

Table (10) explores Descriptive Statistics of Challenges for AI Adoption, revealing concerns such as privacy/security and leadership buy-in. In Table (11), respondents provide insights into measures facilitating greater AI adoption. Financial incentives (27.0%) and internal advocacy (37.0%) emerge as notable factors. Meanwhile, Table (12) gauges perceptions of the Role of AI Technologies in Achieving Saudi Vision 2030 Goals, with 53.0% emphasizing AI's major role. Moving to Tables (13) and (14), these present results from hypothesis testing.



Table (13) reveals a significant relationship (p = 0.000) between AI Applications in Healthcare and the Impact of AI Adoption.

Similarly, Table (14) indicates a significant correlation (p = 0.000) between Challenges for AI Adoption and the Impact of AI Adoption. Lastly, Table (15) provides Descriptive Statistics of the Impact of AI Adoption according to age, showcasing mean scores across different age groups. Table (16) conducts a ONE WAY ANOVA test on the Impact of AI Adoption based on age, suggesting no significant difference among age groups.

#### 6. Recommendations

Based on the findings and insights derived from the study on the impact of Artificial Intelligence (AI) applications on the digital transformation of healthcare delivery in Riyadh, Saudi Arabia, several recommendations can be proposed:

- Recognize the importance of addressing the digital skills gap among healthcare professionals.
   Implement comprehensive training programs to enhance digital literacy and AI skills, ensuring that healthcare providers are proficient in leveraging AI technologies effectively.
- Develop and implement clear ethical guidelines for the use of AI in healthcare. Address
  concerns related to patient privacy, data security, and algorithmic bias. Foster a culture of
  responsible AI adoption that aligns with Saudi values and ensures transparency in AI decisionmaking processes.
- Emphasize the role of leadership in fostering a culture of innovation and technology adoption within healthcare institutions. Encourage leaders to prioritize the clinical benefits and patient-centric outcomes of AI, rather than solely focusing on cost savings.
- Establish a coordinated national AI strategy for healthcare that provides a roadmap for the widespread adoption of AI technologies. Develop standardized frameworks for evaluating the impact of AI applications in healthcare, enabling consistent measurement and comparison.
- Implement awareness campaigns targeting both healthcare professionals and the public to address misconceptions and build trust in AI technologies. Foster open communication about the benefits and risks of AI, ensuring a well-informed and trusting community.
- Explore financial incentives and support mechanisms to encourage healthcare institutions to invest in AI adoption. This could include subsidies, grants, or tax incentives to alleviate the initial financial burden associated with acquiring and implementing AI technologies.



- Facilitate collaboration and knowledge-sharing platforms among healthcare institutions.
   Encourage the exchange of best practices, successful case studies, and lessons learned from AI adoption. This can help accelerate the learning curve and promote a collective approach to digital transformation.
- Support the implementation of pilot programs to demonstrate the tangible benefits of AI in different healthcare settings. These programs can serve as showcases for successful AI integration, allowing stakeholders to witness the positive impact on efficiency, productivity, and patient outcomes.
- Ensure that AI technologies are developed with a focus on inclusivity and diversity. Train AI models on diverse datasets that accurately represent the local population to avoid biases and disparities in healthcare delivery.
- Establish mechanisms for continuous monitoring and evaluation of AI applications in healthcare. Regularly assess the impact on efficiency, patient satisfaction, and healthcare outcomes. Use feedback loops to refine AI algorithms and improve the overall effectiveness of AI in healthcare.

By addressing these recommendations, Riyadh's healthcare system can navigate the challenges associated with AI adoption and leverage its full potential to achieve the goals outlined in Vision 2030.

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