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Understanding the General Overview of Conflict Transformation and its Dynamics in the Savannah Region of Ghana

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Abstract

From creation, conflict has since lived with mankind in all facets of life. Conflict lives with man, his environment, groups or associations. In families or marriages, conflict is deeply experienced either in the form of simple or chronic. At the workplace or the institutional level, conflict plays a key role in work operations among or between employees and employers or core management. Conflict in itself comes with positive and negative development to society. In the sovereign country like Ghana, majority of the population hold the perception or proposition that the five regions of the North are deeply rooted into conflict engagements. This perception is done to some geo-conflict occurrences in the Northern part of Ghana. The question is - what really is the term conflict? Many have divergent conceptualized views, opinions or perceptions about conflict in society. Some find answers by saying it erupts when there is argument between two or more people, when there are interests to satisfy, misunderstanding, cheating, injustice among others. Even identical twins do have conflicts. Examples of conflicts include the Kusasi – Mamprusi conflict of Bawku, Konkomba – Dagomba conflict, the Abudu – Andani Dagbon Chieftaincy conflict all of Northern Ghana and the Eritrean – Ethiopia Civil War, Rwandan Genocide, Somali Civil War, Nigerian Civil War as well as the Russia – Ukraine War.

Keywords: *Conflict, Development, Innovations and Best practices, Mechanisms, Transformation.*

Introduction

Conflict across the world borders on the diversified understanding perspectives of individuals and groups who by nature conduct research or inquiries to understand conflict and to prescribe remedial solutions to forestall the social and cultural caprices contributed by conflict to society.

The genesis and dynamic nature of conflict with varied understanding makes it complex and therefore associate it to the spaghetti bowl theory. The conflict phenomenon transcends across the globe; within families, ethnic groups, associations, communities, individuals, countries etc. thereby making the study of conflict extremely complex. Many defined conflict to mean, any argument within an individual or between two or more people in society. In the animal Kingdom, conflict is still an experience anchored on the principle of the survival of the fitters of an ecology. Many postulate that conflict erupts when matters surmount to argument between two or more people, when there is an interest in consideration, cheating, injustice among others. Conflict is a universal phenomenon with positive and negative impacts. Thus, conflict creates environmental insecurity, thwart social relations and is a key factor of poverty in society. Conflict in general affects the vulnerable like women and children, creates

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organizational or institutional deficiency and food security issues. Early researchers such as Karl Marx and Max Weber, among others, are protagonists in the discipline, and their works helped to create a body of knowledge known as conflict theory [1]. The conflict perspective has its roots in Karl Marx's classic works, which argued that industrialization creates two classes of people: the "haves" (bourgeoisie) and the "have-nots" (proletariat). Marx concluded that the proletariats, who can only earn subsistence wages, estrangement, and the need for an ideological change as prerequisite conditions for the occurrence of conflicts [2].

Research Hypothesis

1. Leaders who apply conflict transformation mechanisms enjoy no peace in Northern Ghana (Ho).
2. Leaders who apply conflict transformation mechanisms enjoy peace in Northern Ghana (Hi).

Research Objectives

1. To understand the general perspectives of conflicts in Northern Ghana.
2. To examine the general interests that causes conflict in Northern Ghana.
3. To investigate the impact and challenges involved in conflict eruption in Northern Ghana.
4. To outline the best mitigation practices of conflict transformation in Northern Ghana
5. To identify sustainable innovations for conflict transformation in Northern

Problem Statement

Conflicts in many forms have been discussed extensively and scholarly in different perspectives in society. The unnecessary interruption by stakeholders creates conflict all the time in northern Ghana.

Many of the times, conflict mirror into destruction of scarce resources, property of state, property of private individuals, loss of lives, displacement of human beings (the vulnerable women and children), retardation of education, it also put to questioning human health, environmental unsustainability and destruction of societal peace. It therefore appears to seem clear that the bad caprices of conflict in society outweigh the good aspects of conflict in society. Conflict in its perpetual convocation of misunderstanding between more than one person and the degree of interest involved in a particular cause of action derail the reasoning ability of man to take unequivocal decisions and actions in other to satisfy the pursuing interest either privately or collectively. The mastery design of pursue interest result into struggles, community pressure, ethnic segregations, disunity and general societal acrimonies thereby creating an unconducive environment for development and peacebuilding in society.

It is therefore against this background that this study is carried out to provide the appropriate transformable mechanisms, innovations and the best human practices to fix or narrow the protracted lingering gap between conflict and peace in society. In the end, the research seeks to provide a congenial inhabitable environment for the growth of human relationship building for peace in the World. The study objectively aims to change the narrative by providing the appropriate transformable mechanisms to bring to zero or reduce conflict existence and happenings in human society and promote the growth of peacebuilding and effective human relationship to provide environmental and institutional development.

Methodology

Methodology is the systematic, theoretical analysis of the methods applied to a field of study. It comprises the theoretical analysis of the body of methods and principles associated with a branch of knowledge. Typically, it encompasses concepts such as paradigm, theoretical model, phases and quantitative or qualitative technique. A methodology does not set out to provide solutions–it is, therefore, not

same as a method. For example, in the organisational development consulting process, the steps include entry, contracting, data collection and analysis, feedback, implementation of intervention, evaluation and exit. Thus, a systematic process.

In other words, methodology carries philosophical postulations about how an investigative process should continue, proposing ways of thinking that assist to shape the evaluation of research objectives, questions, and design [3].

Research methodology in this sense are the procedures, principles, techniques, tools, and processes used in the identification and resolution of a social problem [4].

Qualitative and Quantitative technics of data collection were employed in gathering data on the topic under study. Both secondary and primary data collection remain relevant in data gathering. Structured and unstructured questionnaires equally remain essential to information gathering for the purpose of this study.

Data Collection

Data collection or analysis is the process of gathering and measuring information on variables of interest, in an established systematic fashion that enables one to answer stated research questions, test hypotheses, and evaluate outcomes. All facets of the data collection process were carefully reviewed in order to ensure reliable and valid data (U.S. Department of Health & Human Services).

Below are some data collection tools.

1. **Interviews:** It is a medium of communication or conversation where questions are asked to elicit information. Usually, interviews take the form of face to face, group, focus group etc. Interviews are either structured (close ended), semi structured or unstructured (open ended) Interviews provide in-depth information pertaining to participants' experiences and viewpoints of a particular topic [5].
2. **Spider-Web Instrument (SWI):** was used as a tool for community groups, teams or retreatants to appreciate team building and get everybody involved in a transformation agenda [6]. It is a tool for data collection. Using this tool, participants' names, their likes (cherished values) and dislikes, and competencies are clearly stated. Observation, lessons learned, and the impressions of the participants were documented.
3. **Questionnaire:** A questionnaire is a research tool featuring series of questions used to collect useful information from respondents. These instruments include either written or oral questions. Questionnaires may be qualitative or quantitative and can be conducted online, by phone, on paper or face-to-face, and questions don't necessarily have to be administered with a researcher present. Questionnaires are either opened or closed questions and sometimes, a mixture of both is used.
4. **Observation**: is used in the social sciences as a method for collecting data about people, processes, and cultures. Observation, particularly participant observation, has been the hallmark of much of the research conducted in anthropological and sociological studies and is a typical methodological approach of ethnography. It is also a tool used regularly to collect data by researchers. In the case of this survey, observation was highly used.

Study Area

The Savannah region is located in the north of the country Ghana. Its capital is Damongo. The region has a land size of 35,862 square kilometers with a total population of 581,368 people. The region has seven (7) districts which include Bole, West Gonja Municipal, Central Gonja, North Gonja, Sawla-Tuna-Kalba, Northeast Gonja and East Gonja Municipal. It is the largest region in terms of land size in

Ghana. The survey was conducted in the seven (7) districts of the Savannah Region of Ghana.

Fig.1 is a map showing the districts in the Savannah Region of Ghana. In the Savannah region, the central Gonja district is the largest district while the smallest district is the east Gonja district.

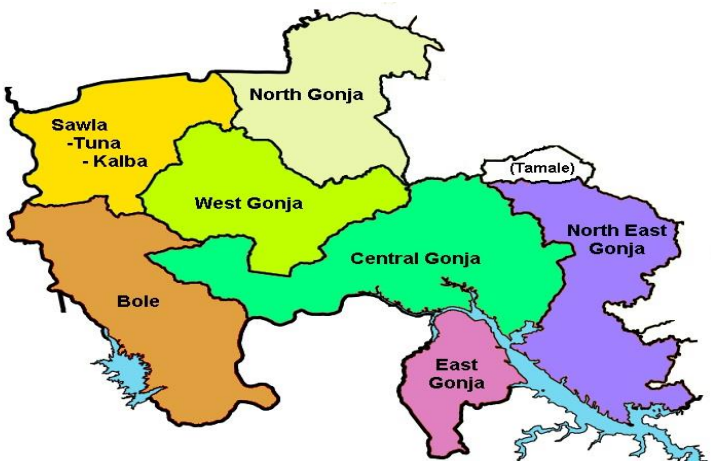

Figure 1. A Map Showing the Districts of the Savannah Region of Ghana

Sample Size and Sampling Technique

Sample size is the measure of the number of individual samples or observations used in a statistical setting. It can also be called sample statistics. Sample size is a critical determination for a project, as it affects the accuracy and reliability of the results of the research. In short, the sample size is the number of people to be surveyed.

Using sample size calculator in determining the sample size with a population of 70 people, at confidence level of 95% with a margin of error of 5% with population proportion of 50%. The sample size (n) therefore is 60 people.

Sampling Technique

Online survey or Google form survey and stratified sampling techniques were used to gather data from respondents in conducting the survey.

The sampling technique is the method employed while choosing a sample from a population. For example, you could select every 3rd person, everyone in a particular age group, and so on. The study was carefully considered and put into perspective before choosing the appropriate sampling technique. The sampling technique has a significant effect on the results. For example, some sampling techniques might be intentionally biased. So, selecting a suitable sampling technique is essential to draw accurate conclusions from the data.

Definition of Conflict

According to [7], Societies are defined by inequality that produces conflict, rather than order and consensus. This conflict based on inequality can only be overcome through a fundamental transformation of the existing relations in society and is productive of new social relations.

According to [8] some of these "rights" and "entitlements" in Ghana include wages and salaries, electoral laws and procedures, taxes, health and education policies, chieftaincy, the need for involvement, etc. Denying these "rights" or "entitlements" is equivalent to denying citizenship and inviting war.

[9] listed several conditions that must be met for conflict to arise, including opposing interests, thoughts, perceptions, and feelings; recognition of the existence of the opposing points of view by those involved; an ongoing rather than one-time disagreement; and attempts by those holding opposing viewpoints to thwart the objectives of the other party.

I therefore view conflict as a clash of values and interests, in the mist of imbalance power of social injustice within the confines of limited resources in human society.

Causes of Conflict

The causes of conflict are numerous and uncountable that faces society day in day out. It is perhaps so because of the unpredictability nature of mankind.

Bates asserts that institutions are a way of overcoming social welfare conundrums brought on by individual conduct and that they aid in maximizing collective welfare [10].

The risk of conflict escalating, and its intensity is influenced by various political forms of governments [11]. As a first observation, history demonstrates that democratic societies with distinct legal roles are less prone to experience negative, harmful conflicts because they have open legal and political institutions that enable conflicts to be managed.

[12] for example, explains how society might be drawn into a fight when it is not in everyone's best interests to engage. The ease with which institutions operate may also be determined by hierarchy. In communities where inequality and injustice are seen as normal and an integral element of society (such as the caste system), disputes over the distribution or access to scarce resources are less likely to turn violent since they are seen as just a component of the system. Disagreement may not lead to physical altercations if the parties feel that doing so would be a waste of time and energy.

According to [13] ethnic conflict is a sign of a fragile state, or a state mired in ancient allegiances. In this case, states act biased in favor of one ethnic group or region over another, which exacerbates ethnic tensions through actions like preferential treatment. As a result, in difficult or critical political circumstances, the capacity of the government to address social problems and basic human needs is essential.

[14] Because it extends beyond ideas that attribute African conflicts to a prehistoric past, this theory is important for managing ethnic conflict in Africa. Instead, it highlights institutions that are dysfunctional and unable to provide the fundamental demands of their constituents. Conflict is unavoidable when such non-negotiable needs are not addressed. Other ideas.

Levels of Conflict

Interpersonal Conflict

This conflict is between individuals, often due to differences in values, beliefs or personalities. It occurs when a couple's needs, objectives, or communication style are at odds. At the same time, humans have very real distinctive behaviours that cannot be overcome by any amount of increased communication. Strong disagreements in values, approaches, or motivations while dealing with others are referred to as “personality conflicts.”

Intergroup Conflict

This occurs between people, such as racial or ethnic groups, between departments or levels of decision-making within organizations, and between management and labor. Intergroup conflict is typically generated by competition for limited resources, and societies have developed several regulatory measures to deal with intergroup conflict in less disruptive ways, such as collective bargaining and mediation. Members of one group frequently construct prejudices against the opposite group, use them as a convenient target to cover up their issues and discriminate against them. These basic indications of intergroup conflict can be found in the workplace just as frequently as racial problems in public locations.

Multi-Party Conflict

This type of conflict occurs in a society or community when various interest groups and

organizations place different priorities on the management of resources and the creation of policies. These complex conflicts frequently combine sources of power, value, and the economy. Traditional authoritative or adversarial processes frequently fall short of dealing with this complexity, hence more cooperative methods of achieving consensus are needed [15].

Western-Centered Conflict Management Mechanisms

Western-centered systems for managing conflicts are formal processes that are supported by concerns about human rights, the rule of law, and retributive justice [9]. These broadly encompass diplomatic and economic tools, including ceasefire orders, peacekeeping operations, bilateral and multinational agreements, and enforcement tools like trade embargos [16]. The official judicial system and tribunals, mediation efforts, and peace education initiatives are some of these instruments on the inside [16]

Institutions/Mechanisms Responsible for Conflict Resolution in Ghana

The Formal Court System

Adjudication is currently the primary means of conflict management permitted by law in Ghana [17]. It is well known that efforts to preserve some African traditions were only made inadvertently and even then, under very restrictive guidelines. The western legal system placed a lot of stress on the courts to make sure that the law plays its part in managing conflict. Courts are viewed as the arbiters of conflicts between citizens or between citizens and the state. Courts have the authority to use socially sanctioned force to carry out officially recognized conflict management and resolution.

The two divisions of the judiciary are the Superior Courts, such as the Supreme Court, the Court of Appeals, the High Court, and Regional Tribunals, and the Lower Courts, which consist of Circuit Courts, District Courts, and Juvenile Courts [18]. The legal system Ghana acquired from the British does not, perhaps more importantly, sufficiently and accurately represent Ghana's socio-political structure, societal values, and demographic trends. Due to these circumstances, the burden of legal issues in the rising traditional conflicts is becoming more and more severe [19].

To address the underlying causes of violence, prevent its recurrence, and foster community healing and reconciliation, formal justice mechanisms have proven to be unsuccessful [20]. As a result, communities have grown to distrust these structures, which has led to a rejection of their use and increased instability in conflict situations [17].

Commission of Inquiry (CI)

One of the many organizations at the government's disposal to look into different matters is CI. CI presents its findings, offers guidance, and suggestions to the government about an issue. It offers a distinctive avenue for interested parties to directly take part in the decision-making process.

According to [21] these committees/commissions are post-dated in the sense that they are established to conduct a post-mortem after the conflict has occurred and the harm has been done. Several committees and commissions were established in the Dagbon Chieftaincy struggle, with the Wuaku commission being the most notable.

[22] notes that conflict management mechanisms that are primarily based on the Western agenda of "liberal peace" do not always offer the best solutions to conflict and sustaining peacebuilding. Due to this, the majority of conflict management specialists now recommend using indigenous processes that are primarily based on the cultural values of the populace.

Alternative Dispute Resolution (ADR) Act 798 of 2010

It is an Act of law passed by parliament of Ghana and assented to by the President of the Republic of Ghana purposely to provide for the settlement of disputes by arbitration, mediation and customary arbitration to settle matters of conflict in society. The Act made provision for the establishment of ADR centers to provide such important services. The Act further mandates the Ministry of Justice and Attorney General to establish National ADR centers to regulate the practice of ADR in Ghana. The ADR mechanisms include arbitration, land disputes, mediation, negotiation and settlement conferences.

Conflict Transformation

Conflict transformation is a process that goes beyond resolving disputes by addressing underlying issues and transforming relationships. It focuses on changing the structures and dynamics of a conflict to promote understanding and collaboration rather than simply reaching a compromise or resolution.

Scholars such as [23] & [24], helped popularize the conflict transformation school (CTS).

CTS most likely arose in response to the constraints of the resolving conflicts school (RCS). When [16] observed that "the majority of conflict theory considers the issues, players, and interests as given and makes efforts to find a solution to minimize or remove tensions between them," they recommended a transformative approach as opposed to settlement. Nonetheless, the social, economic, and political processes of society cause subjects, actors, and interests to change over time. Although conflict transformation is not succinctly described by [16], he does question the effectiveness of the RCS. His understanding that conflict is dynamic and significantly more extensive in scope is a crucial contribution since it expands the framework in which we see and handle conflict. Following this, [16] identified four entrance stages that are necessary while attempting to resolve a disagreement. These are as follows: i. Actor transformation ii. Issue transformation iii. Rule transformation and iv. Structural transformation

According to [23] conflict transformation is defined as imagining and responding to the ebb and flow of social conflict as life-giving possibilities for generating fruitful transformation processes that lessen violence, increase justice in interpersonal relationships and social structures, and address practical issues in interpersonal interactions. The conflict transformation approach focuses on relationship building, and Lederach emphasizes that a transformational approach recognizes conflict as a normal and constant dynamic within human interactions.

Conflict transformation mechanisms (CTM) strategies and approaches include:

Communication and Dialogue

Communication and dialogue are crucial tools in conflict transformation as they foster understanding, build trust, and provide a platform for finding mutually acceptable solutions. Effective communication assists in addressing underlying issues, reducing tensions and promoting sustainable resolution among parties. Communication will aid all affected parties to share their worries and concerns to the third party which will inform the third party of the best strategies to use in the transforming process for sustainable peace. Effective feedback enhances trust and confidence building in affected parties.

Mediation

Mediation involves a neutral third party to facilitate discussions, guide negotiations, and assist in finding mutually acceptable solutions. Mediation facilitates conflict transformation by providing a structured process for parties to communicate, understand each other’s

perspectives and interests, and collaboratively find solutions. It encourages active listening, empathy, and promotes a focus on common interests rather than entrenched positions.

Building Social Cohesion

Social cohesion plays a crucial role in conflict transformation by fostering a sense of unity and shared identity among diverse groups. When people feel connected and understand each other, it can reduce tensions and contribute to resolving conflicts. Building trust through open communication and shared experiences promotes cooperation and helps address underlying issues that may contribute conflict. In addition, social cohesion provides a foundation for inclusive decision-making, leading to sustainable transformable solutions that consider the needs and perspectives of all parties.

Table 1 explains the various conflict prevention tools usually used in conflict resolution. These include negotiation, mediation, problem solving (win-win) and reconciliation. Table1 numerates the advantages and disadvantages associated with each of the conflict prevention tools.

Table 1. Modern Conflict Prevention Tools

S/N	Conflict prevention tools	Advantages	Disadvantages	Remarks
1	Negotiation	1.It allows parties to reach mutually beneficial agreements 2.It promotes a sense of ownership to the final agreement.	1.Power Imbalance occur in some cases between the parties. 2.Time-consuming in the negotiation process	General tool for conflict resolution
2	Mediation	1.The process is informal, flexible. 2. Confidentiality principle is guaranteed	1. Unwillingness of one or both parties may set 2. Time and efforts may be in vain	Peace prevails
3	Problem solving (Win-Win)	1. It fosters positive emotions for improve well-being. 2.It increase satisfaction, valued, and respected	1. Parties may find it difficult to forgive 2. Rigid positions and biases may occur	Creates joy and happiness among parties
4	Reconciliation	1.It prevents the use of the past as a seed to renew conflict	1.Time consuming and raise of sentiments	Effective tool for conflict resolution

		2. Reconciliation consolidate peace and cycle of violence break	2. It is also expensive to handling	

Source: field survey, 2024

Data Analysis and Results

Data Analysis

Data analysis is the process of applying statistical practices to organize, represent, describe, evaluate, and interpret data. In the statistical application, data analysis can be divided into descriptive statistics such as averages or median may be generated to help to understand the data. In the case of this data, excel was used to analyse and interpret the data.

Results Interpretation

Interacting with respondents, many perceptions about conflict and its understanding took diverse dimensions. Some respondents viewed conflict as a perceived incompatibility between two or more parties. These incompatibilities could include power, beliefs systems, social values, inequitable resource sharing and derogatory cultural remarks.

Also, some viewed conflict as an expressed struggle between two or more individuals and groups, over an interest and needs. Others hold the view that conflict is a natural phenomenon and a disagreement over an issue or idea. According to respondents, conflict is not bad. However, how it is managed is a challenge to society. Here, objective (1) which centered on understanding conflict was addressed considering the many definitions and explanations provided.

Table 2 gives information on the causes of conflict in the Savannah Region of Ghana. The variable that easily causes conflict in the Savannah Region observing from the table is unfair distribution of power representing 21%. Religion or worship has little tendency of causing conflict in the Savannah region representing 9%.

Table 2. Causes of Conflict in Savannah Region of Ghana

S/N	**Variables**	**Numbers**	**Percentages (%}**
1	Values & Beliefs	30	15
2	Scarce Resources	34	17
3	Unfair Distribution of Power	42	21
4	Religion & Worship	17	9
5	Chieftaincy Succession	37	19
6	Land Ownership	38	19
Totals		**198**	**100**

Source: field survey, 2024

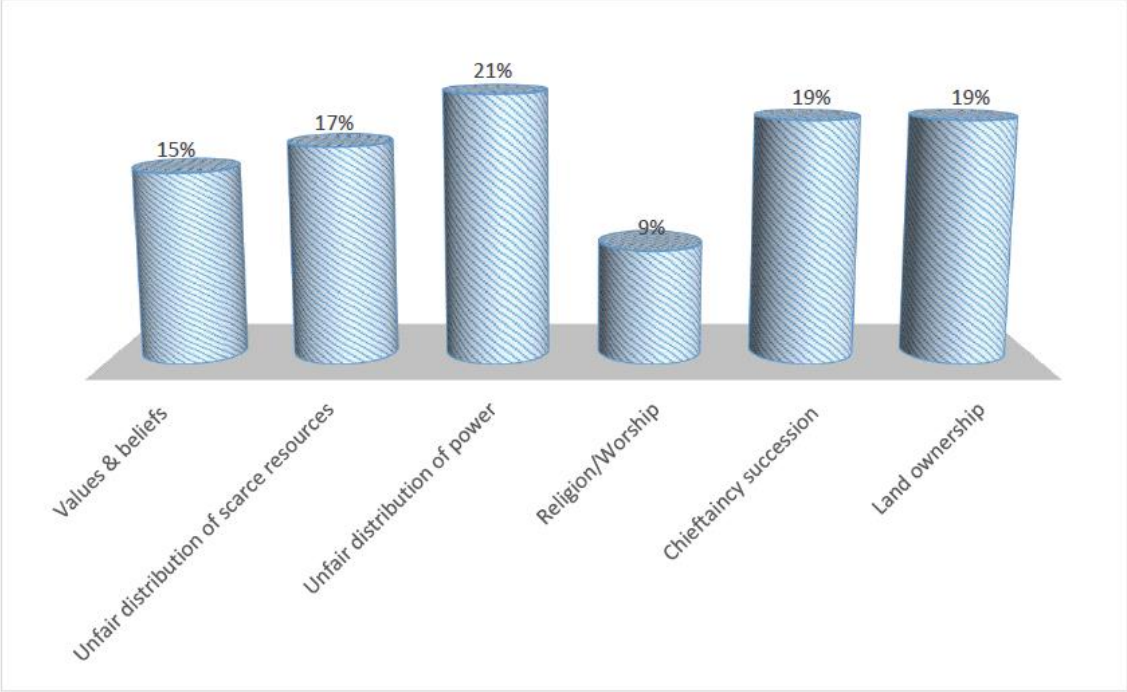

Figure 2. Bar Graph Showing Causes of Conflict in the Savannah Region

Figure 2 shares information on the causes of conflict in the Savannah Region. It is observed that unfair distribution of power is the most pressing area when it comes to causes of conflict in the region.

From the bar graph, the major cause of conflict in the Savannah region is unfair distribution of power representing 21%. This, however, is not limited to poverty, greed, injustice, superiority complex, stereotyping, land ownership, prejudice, ineffective chieftaincy succession and resource management structural regimes etc. Objective (2) of the research seeks to answer causes of conflict.

In resolving conflict with the indigenous mechanisms that longed-lived with the local system predates modern mechanisms in preventing and reducing conflict in society. Engaging with respondents brought to the limelight many indigenous mechanisms and these include but not limited to.

1. **Blood burial**: with this approach, the mediator brings an animal before the parties. The animal is slaughtered, and spiritual recantations and traditional oaths are recited to invoke the gods or the deities the parties' belief and have faith in. the animal (sheep) is then slaughtered. In the case of the Kusasi – Mamprusi conflict in Bawku, each side refuses to perform the blood burial to avert the conflict. This is similar to Okro stick burial approach.
2. **Playmate concept**: many of the tribes and according to custom and tradition are playmates to each other. For example, the Dagabas and the Frafra, the Gonjas and Kasen, the Gonjas and the Mos, the Gonjas and the Bimoba, Chokosi, as well as the Dagomba and the Mosi, the Mamprusi and Kamara and many other tribes makes it difficult for such tribes to engage in conflict or any disagreement. These families or tribes are by birth playmates and closets friends which is deep rooted according to custom and tradition. This concept makes it flexible to live well with each other without prejudice in society.

Respondents recommended the following modern tools in resolving conflict.

3. **Negotiation:** It is a discussion between two or more disputants who try to work out a solution to their problem. This is a common tool people use to deal with

problems/conflict, it works better when the parties involved are ready to talk to each other and to find a solution to the problem. It is the process where interested parties resolve disputes, agree upon cause of action, bargain for individual collective advantage and design outcomes to serve their mutual interests. What is spectacular about negotiation is that the parties acknowledge that there is some conflict of interest between them and think they can use some form of influence to get a better deal.

4. **Mediation:** It is a confidential conference, where all the participants have agreed to attend and cooperate in good faith to resolve the dispute between parties. The presence of an impartial third party helps two or more parties discuss a dispute and work toward a solution that is acceptable to all parties and participation is normally voluntary. The mediator does not decide the outcome of the dispute. Mediated agreements tend to succeed because they result from a process that allows arties to create their own solutions. People prefer mediation because it is friendlier, informal, and if successful, provides a cheaper and quicker means of settling disputes.

A blend of the indigenous and modern mechanisms answer's objective 4 of the research.

Table 3. Innovations for Conflict Transformation in the Savannah Region of Ghana

S/N	Variables	Number	Percentages (%)
1	Inter-Marriage relationships	30	15
2	Intercultural tribal games	34	17
3	Collective decision making	31	16
4	Business development	30	15
5	Conflict transformation committees	40	20
6	Relationship Sustenance	33	17
Total		**198**	**100**

Source: Field survey, 2024

Table 3 provides information on the innovation areas to improve upon conflict related issues in the region. These include inter-marriage relationships, intercultural tribal games, collective decision making, business development, conflict transformation committees and relationship sustenance. When these areas are enhanced, conflict and its related activities will reduce to the bearer's level.

According to respondents and clearly from table 2, the best innovation to embark on is the establishment of conflict transformation committees representing 20% across the Savannah region to bring peace to society. Obviously, objective 5 has been addressed since the innovation areas have been identified.

Table 4. Challenges of Conflict in the Savannah Region of Ghana

S/N	Variables	Number	Percentage (%)
1	Endanger lives	46	21
2	Drastic drain of resources	45	21
3	Social Incoherence	39	18
4	Ineffective education	42	20
5	Change tradition & culture	24	11
6	Destruction of social structure	20	9
Total		**216**	**100**

Source: field survey, 2024

Table 4 concerns itself on the challenges of conflict in the Savannah region of Ghana. Some of the challenges include life endangerment, drastic drain of community resources, social incoherence, ineffective education, change of tradition and culture and destruction of social structure.

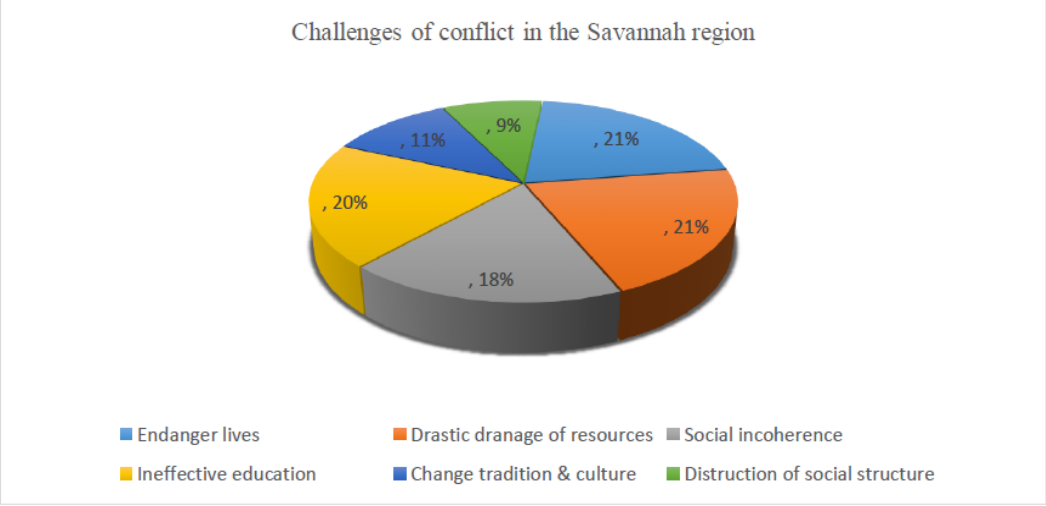

Figure 3. Pie Chart Showing Challenges of Conflict in the Savannah Region of Ghana

Figure 3 provides information on the challenges of conflict in the Savannah Region. The data clearly indicates that endangerment of life representing 21% is the key challenge in the Savannah Region.

After conflict and its related issues in the Savannah region, and per the view of respondents, ineffective education representing 20% is a major challenge to the leadership and folks of the region. Respondents further

revealed that conflict exerts on society a series of negative impacts such as cultural and traditional structural change, social incoherence, loss of lives and property among others as indicated in the pie chart above. Objective 3 equally is satisfied with the responses of respondents.

Discussion

A forum was organised for results presentation to the leadership and key stakeholders in the region for discussion and the best mechanisms to employ in overcoming conflict in the region. Equitable power sharing and clear role definition, equitable sharing of community resources, and relationship building, chieftaincy succession issues were discussed and to work on them for sustainable conflict transformation and peacebuilding. The stakeholders for the session included traditional authority, the security, opinion leaders, assemblymen and women, politicians, the youth groups among others. Participants for the session were enthused for bringing to the fore a mirage of issues to discuss to enhance conflict transformation in the region. The outcome of the discussion was to establish effective collaboration with all the structures in society.

Conflict Concept Diagram

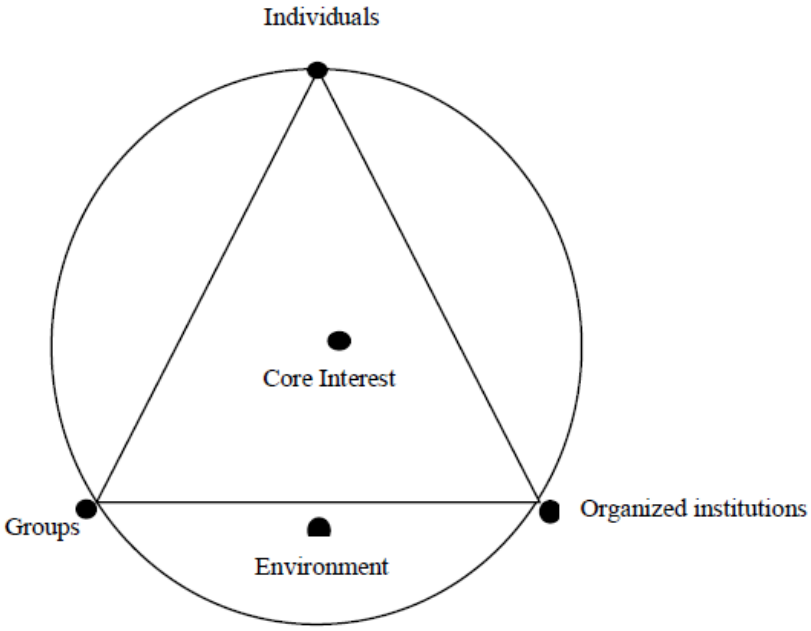

Figure.4. Conflict Concept Diagram

Figure 4 is a conceptual view of conflict in society and how the environment relates with conflict.

In every environment, there are people (individuals), groups and organised institutions. Every individual in a particular point in time and location has an interest. Likewise, groups or organised institutions (Formal organization). Each of these three key thematic areas has an interest and their interest may conflict. That is why leadership and conflict transformation facilitator or practitioner must ensure everybody is involved in the decision-making process [25].

Conclusion

The research used the best techniques and methods in gathering data for quality results. The validity of the work was enhanced as a result of proof reading of work. The commitment of respondents to the research work was encouraging and stakeholders in providing the needed information was apt and timely to aid the work. It was observed that matters of sustainable relationship building and understanding of roles were key factors to achieve a transformed society and peacebuilding. The region will develop and

expand if more sensitization work is carried out on effective social cohesion principles, good leadership and strong relationship building are considered as key focused areas.

Conflict of Interest

Conducting the research, the research has no conflict of interest in the course of the study about any occurrences. Professionally, there is not any conflict of interest during the study.

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Determination of Relationship Between the Application of ICT and Decision-Making Federal Universities of Northern Nigeria

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Abstract

This study examines how Federal Universities of Northern Nigeria use ICT to make decisions. Technology in data storage, analytics, and decision support systems has transformed decision-making, according to the introduction. We examine how ICT improves decision-making through data gathering, analysis, and communication. The hypothesis is that ICT use does not affect decision-making in these universities. The correlational study included 2,114 workers from all Northern Nigerian Federal Universities. The sample procedure selected states from each geopolitical zone and seven federal institutions from each state. Data was collected using a questionnaire on ICT in Effective Planning (QAICTEP). The null hypothesis was tested using Pearson's Product Moment Correlation coefficient (PPMCC). The respondents' age, experience, and qualifications were diverse. Male respondents outnumbered female respondents 75% to 25%. The null hypothesis was rejected since the PPMCC analysis showed a positive correlation (r = 0.609) between ICT application and decision-making. The conclusion shows that ICT use improves decision-making. ICT infrastructure investments, training, enhanced Decision Support System integration, and strong data governance regulations are recommended. at conclusion, this study sheds light on strategic ICT integration and decision-making at Federal Universities in Northern Nigeria, emphasising the need to improve decision-making quality and efficiency.

Keywords*: Application of ICT, Decision Making, Information and Communication Technology, Northern Nigeria, University.*

Introduction

Information and communications technology (ICT) has transformed decision-making across private and public sector organizations over the past few decades. As Jim and Chen note, advancements in data storage, analytical capabilities, and decision support systems have enabled more evidence-based and data-driven decision making. ICT encompasses technologies like databases, analytics, modeling, dashboards and intelligent systems that empower more informed and strategic choices [10].

At the core, ICT enhances decision making by enabling the collection, analysis and communication of more comprehensive data [15]. Databases allow massive amounts of structured information to be stored, accessed and analyzed [16]. Analytics and modeling techniques help decision makers identify patterns, test scenarios and predict outcomes using that data [9]. Visualizations like dashboards then communicate model outputs and analytical insights in intuitive formats to guide determinations [12].

These capabilities support various decision-making mechanisms. Descriptive analytics using reports, queries and drilling down on databases helps understand what has happened and diagnose issues [10]. Predictive analytics forecasts what could happen in the future, while

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prescriptive analytics suggests optimal decisions or actions [15]. Some systems automate certain decision workflows through programmed algorithms and rules [16].

By leveraging these techniques, ICT facilitates more rigorous analysis of alternatives, trade-offs and risks integral to organizational decisions [13]. Quantitative data and analytical models offset cognitive biases, emotions or gut feelings that can skew human judgments [9]. The enhanced evidentiary base and transparency from ICT also foster greater confidence in and consistency of decisions [12]. Thereby supporting improved institutional strategy, policy and operations.

Hypothesis

Ho_1: There is no significant relationship between the application of ICT and decision making in Federal Universities of Northern Nigeria.

Methodology

The researcher used a correlational research design for this investigation [20]. A non-experimental research method known as correlational analysis measures two variables decision making and evaluates the statistical relationship (also known as the correlation) between them with little to no effort to control unrelated variables. [20], a correlation test uses statistics to identify whether there is a propensity for two (or more) variables or two sets of data to change in a predictable way.

All Federal Universities in Northern Nigeria make up the population for this study. The population is ten thousand five hundred and seventy-seven (10,577) staff. The rule of thumb for estimating sample size from a particular population were used to extract twenty percent (20%) from the whole population for this study, which includes selected employees from Federal Universities in Northern Nigeria. And the sample size is two thousand one hundred and fourteen (2,114) staff.

The technique for sampling the study's sampled states will be chosen using the Dip-Hand sampling method of [21], and respondents will be chosen from each department in the selected states using the proportionate sampling method. The following method was employed:

North Central (6 states), Northeast (6 states), and Northwest (7 states) are the three geopolitical zones that make up Northern Nigeria's 19 states. There will be three students assigned to different sampled states. Each student represented a different zone, and the names of each state were written on pieces of paper and placed in a container for the zone-representing student to choose from.

Students from the Northwest chose three times, while those from the North Central and Northeast each chose twice. Due to the additional variances in one state, three states from the Northwest region, two from the Northeast region, and two from the North Central region will be chosen. Seven federal institutions from each of the chosen states will serve as a representative sample of those states.

The seven federal institutions in each state will be sampled using a proportional sampling method, and respondents were chosen from the four colleges and departments.

The departments and faculties that will be used for the study will be chosen using a Dip-Hand sampling approach. A process known as accidental sampling will be utilized to distribute or allocate copies of the questionnaire to responders.

The questionnaire on application of ICT in Decision Making (QAICTDM) created by the researcher, will be the instrument utilized for the study. The instrument was divided into three parts. The instrument's initial section asks for background information on the respondent status. ICT applications will be covered in the instrument's second section, and management practices and ICT will be covered in its third component. Section C of the instrument will be

divided into seven sections titled effective planning using ICT.

A four-point Likert Rating Scale with the options strongly agree, agree, disagree, and strongly disagree was used to structure the surveys. These will each receive a 4, 3, 2, 1 grade. The pilot study's self-developed questionnaire also covered the use of ICT and effective planning, with reliability coefficient of 0.81. Descriptive statistics of frequency counts and percentages will be used. At a significance level of 0.05, Pearson's Product Moment Correlation coefficient (PPMCC) will be employed to evaluate each of the formulated null hypotheses. Using SPSS version 29, a statistical tool for social science.

Results

Table 1. Demographic Characteristics of the Respondents

AGE		**Frequency**	**Percent**
Valid	20-30	496	23.6
	31-40	350	16.6
	41-50	379	18.0
	51-60	527	25.0
	61 above	352	16.7
YEARS OF EXPERIENCE			
Valid	1-10	525	25.0
	11-20	371	17.6
	21-30	505	24.0
	31 above	703	33.4
QUALIFICATION			
Valid	BSC/BED/BA	175	8.3
	MSc/MA	700	33.3
	PhD	1229	58.4
SEX			
Valid	**Male**	**1578**	**75.0**
	Female	526	25.0

Table 1 indicates the demographic characteristics presented in the age distribution shows a wide range, from young adults in their 20s to older adults over 60 years old. The most frequently observed age group was 51-60 years (25%). About a quarter were also relatively young, aged 20-30 years (23.6%). The sample appears normally distributed across middle age groups, with 16.6% aged 31-40, 18% aged 41-50, and 16.7% aged 61 and above. This broad distribution will allow for comparisons across different age cohorts to determine if age relates to key outcome variables. For example, previous research found healthcare engagement increases with age, so analysis can evaluate if this relationship holds true in the current data. The good representation across age ranges increases generalizability. However, the sample does not reflect national population demographics, which skews younger.

The sample is skewed towards more experienced respondents, with 33.4% having 31+ years of experience. Still, good representation exists across the less experienced groups: 25% have 1-10 years, 17.6% have 11-20 years, and 24% have 21-30 years of experience. The higher proportion of veteran respondents is logical if sampling targeted subject experts. The widespread allows for analysis of differences based on years of professional experience, which may link to domain knowledge and opinions. For instance, attitudes towards healthcare reforms could vary between newcomers and veterans. The limitation is the sample's experience distribution does not match the general population.

The respondents are highly educated overall, with 58.4% holding doctorate degrees and 33.3% having master's qualifications. Only 8.3% have bachelor's degrees and no other categories are represented. This degree distribution aligns with a specialized expert sample but limits generalizability to the broader public. However, the education levels enable examining views by degree type. For example, previous studies found higher education is associated with more progressive attitudes. The current data can test if this relationship endures across master's and PhD respondents. Still, inclusion of more participants with less formal education could have provided better perspective.

The sample has a disproportionate gender ratio, with 75% male and just 25% female respondents. This 3:1 imbalance could result from sampling methods or reflect male dominance in certain professions or positions surveyed. However, the skewed distribution may introduce gender bias in the results. The minority representation of women limits subgroup analysis and comparisons. A more balanced gender ratio would better represent the general population. Additional steps to include more women respondents could have enhanced the integrity and generalizability of the findings.

Table 1. Pearson Product Moment Coefficient of Relationship between Application of ICT and Decision-Making Federal Universities of Northern Nigeria

Variables	**Mean**	**Std. Dev**	**N**	**Df**	**R**	**Prob**	**Decision**
Application of ICT	3.25326	0.54623	2104	2102	0.609*	0.0001	Rejected
Decision making	3.01512	0.701851	2104				

df=2102, r=0.609, Prob=0.0001

Table 2 showed that there is no significant relationship between the application of Information and Communication Technology (ICT) and decision making in Federal Universities of Northern Nigeria. To test this hypothesis, a Pearson Product Moment

Coefficient of correlation was calculated using the same data set as before. The results presented shows that there is a significant positive correlation (r = 0.609*) between the application of ICT and decision making in Federal Universities of Northern Nigeria. This means that as the level of ICT application increases, the level of decision making also increases. The positive r value indicates that higher use of ICT is associated with improved decision-making abilities. The very low p-value (p=0.0001) means this correlation is highly statistically significant and unlikely due to chance. Therefore, we would reject the null hypothesis Ho2, as there is a significant positive relationship between ICT application and decision making.

Discussions

There is significant relationship between the application of ICT and decision making in Federal Universities of Northern Nigeria. Information and communication technology (ICT) adoption in higher education institutions globally has transformed decision-making processes. There is a significant relationship between ICT application and decision-making in federal universities in Northern Nigeria. Learning management systems for e-learning [3]. Library management systems for automating library functions [8]. Student records management information systems [7]. Financial management information systems for accounting, payroll etc. [5]. Websites for information dissemination and service delivery [19]. Despite challenges, ICT application has increased steadily over the years in these institutions [6]. Academic planning and curriculum design [14]. Recruitment, promotion and discipline of staff [7]. Infrastructure development and resource allocation [2]. Budgeting and financial control [5]. Policy formulation on admission, fees, etc. [14]. Student welfare and administration [3]. Relationship between ICT Application and Decision Making. ICT provides accurate and timely data for informed decision-making [6]. ICT enables proper collation, analysis and modeling of data [5]. ICT facilitates forecasting, projections and scenario planning [2]. ICT allows benchmarking with other institutions for realistic goal-setting [8]. ICT enhances stakeholder participation in the decision process through information access [7]. ICT promotes transparency, accountability and data-driven decision culture [19]. ICT aids in monitoring and evaluation of decision outcomes [3].

Federal Universities in Northern Nigeria have made notable strides in integrating ICT into their operations. ICT applications encompass a wide array of functions, including student management systems, research data analysis, digital libraries, e-learning platforms, and administrative systems [1]. This technological infusion has streamlined administrative processes, empowered data analysis capabilities, and facilitated decision-making at multiple levels within the institutions. A critical facet of ICT's contribution to decision-making is the enhanced accessibility and analysis of data. ICT tools provide universities with the ability to efficiently collect, store, and analyze vast amounts of data. This data can range from student performance metrics to financial and resource allocation data [18]. The availability of data analytics tools and reporting systems empowers university decision-makers with the information necessary to make data-driven, informed choices.

ICT has played a crucial role in streamlining administrative processes within Federal Universities of Northern Nigeria. Tasks such as admission and registration, staff management, and resource allocation have seen substantial improvements through ICT applications [4]. These streamlined processes translate into more efficient decision-making as administrators have more time and resources to focus on strategic planning. Effective decision-making often hinges on transparent and efficient

communication among various university departments and stakeholders. ICT tools, such as email, video conferencing, and collaborative software, have significantly improved communication and collaboration capabilities [11]. This fosters a better exchange of ideas and information among decision-makers, which ultimately aids in more informed and timely decisions. Many Federal Universities in Northern Nigeria have implemented Decision Support Systems (DSS) that leverage ICT to provide real-time information and analytics to decision-makers. DSS enables administrators to access critical data and information on-demand, facilitating quicker, well-informed decisions [17].

Conclusion

Based on the results and analysis presented in this study, the following conclusions can be drawn there is a significant positive relationship between the application of ICT and decision-making effectiveness in Federal Universities of Northern Nigeria. The Pearson correlation analysis showed a moderately strong positive correlation ($r = 0.609$, $p < 0.05$) between ICT application and decision-making ratings. This indicates that greater use and integration of ICT facilitates improved decision-making capacity.

Recommendations

Implementation of these recommendations can contribute to the optimization of ICT in decision-making processes within Federal Universities of Northern Nigeria, ultimately enhancing efficiency, transparency, and the overall quality of decisions made by university authorities.

1. Invest in upgrading and expanding ICT infrastructure within Federal Universities. Ensure reliable and high-speed internet connectivity, modern computer systems, and software applications that support various aspects of decision-making processes.
2. Implement regular training programs for university staff and decision-makers to enhance their ICT skills. This includes training on using decision support systems, data analytics tools, and other ICT resources relevant to effective decision-making.
3. Integrate advanced Decision Support Systems (DSS) that leverage data analytics, artificial intelligence, and machine learning. These systems can provide real-time insights, forecasting, and scenario analysis to support informed decision-making.
4. Establish robust data governance policies and practices to ensure the quality, security, and accessibility of data. Efficient data management is critical for accurate and timely decision-making.

Conflict of Interest

There were no conflicts of interest in this work.

Acknowledgment

I would like to express my heartfelt appreciation to all the persons and institutions who have made valuable contributions to the successful completion of this research study on the correlation between the use of Information and Communication Technology (ICT) and efficient planning in Federal Universities in Northern Nigeria. We would like to extend our profound gratitude to the administrators, academic members, and staff of the Federal Universities of Northern Nigeria for their generous contribution of time and valuable insights to this project. This research would have been impossible without their collaboration and invaluable contributions.

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Unveiling the Potential of Open Strategy: An Exposé of Strategic Planning in the South African Mining Sector

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Abstract

The South African mining industry, despite being the world's fifth-largest mineral reserve, is facing various challenges that prevent it from contributing to the economy to its fullest potential. These challenges include inflationary pressure, extreme nationalism, political instability, civil unrest, poor infrastructure, and inefficient regulatory practices, which have discouraged foreign investments. Although the government has developed legal frameworks to address uncertain circumstances, the lack of follow-up and transparency are key drawbacks contributing to the persistence of these issues. The aim of this study was to investigate the potential of open strategy as a strategic management method in the South African mining industry can foster innovation and growth while showcasing how open strategy can benefit both established and emerging mining entities. The study highlights the importance of adopting a mutually beneficial approach, which can unlock the full potential of the mining industry and lead to more innovative and competitive business strategies. The study used a mixed methodology, which means both quantitative and qualitative data were collected. The research included interviews with 20 highly knowledgeable participants and a survey that received 205 responses. To identify the right individuals to participate in the research, the snowball research technique was used. It helped in creating a relevant chain sampling and selecting individuals based on their knowledge, relationships, and expertise regarding the research subject. According to the study's results, there is a favorable attitude toward open strategy, which is reinforced by the growing demand for inclusive communication as an effective means of engaging stakeholders. The results also revealed that the South African mining sector lacks formalized strategies and employee engagement methods. The research determined the value of the current strategic processes in South Africa's mining sector and generated an approach to how open strategy can be a successful process for mining companies.

Keywords: *Open Strategy, South Africa Mining Industry, Strategic Approaches.*

Introduction

Mining Industry in South Africa is referred to as the world's fifth-largest mineral endowment [6]. South Africa swiftly transformed from an agricultural to industrial domain in the late 19th century, and since then mining industry has been the nucleus of economic development considering its status as one of the resource-laden countries in the world [1]. It has also played an active role in attracting foreign investments and founding top-notch global enterprises. However, the dynamics shifted in the 1970s, when the mining industry suffered greatly because of political destabilization and civil unrest. The economy of South Africa later was adversely affected by the Global Financial Crisis in 2008 which led to a recession in GDP growth by -2% in 2009. Persistent trade deficits, higher household

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debts, financial, and residential bubbles pushed the mining industry into the crisis as it relied on global economic growth to plump up the prices and demands for steady development during uncertain times. The period from 2008-2011 paved the way for the emergence of issues such as labour disputes, underachieving assets, nationalization, lack of trust between stakeholders, and deplorable policy approaches toward the mining industry. Statistics from January 2013 revealed that the lack of compensation after the Marikana tragedy [13] caused a precipitous abatement in physical production volumes. It also caused intensive labour unrest and strike action leading to a significant fall in production from March 13 and onwards [2].

Researchers and analysts have highlighted high inflation and unstable political structure as the reasons for the decline in the mining sector. From the top ten world business menaces, mining was categorized into resource nationalism and inflationary pressure on prices [5].

The mining sector is lagging far behind in global competition for funding and skilled workforce. Foreign investment in new mining projects is restricted whereas the marginal deposits are stuck midway due to consequences associated with political and socio-economic uncertainties. These may include inconsistent regulations, concerns threatening resource nationalism, unsatisfactory performance of state-managed infrastructure, and strained relations with stakeholders and the community.

The absence of efficacy, sustenance, and stability is the cause of hindered long-term investment. The political leadership's setback in restricting the conversion of internal political disputes into wide-scale civil unrest has created an environment of distrust amongst global investors. This concern has been deeply amplified and enrooted by far-reaching media coverage spotlighting ransacks, malicious damages, and incompetency to regulate law and order [7]. The apparent lack of suitable regulatory structure, police, and security forces accompanied by delayed responses from the government and extreme dependence on community-based sentinels are the reasons that account for the unpreparedness of institutes to strikes that often convert into civil unrest [11]. Channelling community support is a persisting challenge in areas where large operations are around clusters of various communities, it is owing to the inability of the government to identify stakeholders and simultaneously develop strategies incorporating them [3].

The only way to bring stabilization and prosperity to the mining industry at both national and international levels requires for establishment of programs integrating key stakeholders, including state ministries, local government, conventional leaders, civil society organizations, workforce, and community representatives.

The government of South Africa has implemented diverse strategies [4] oriented to address the challenges within the mining industry. Mining charters [9] were devised to focus on areas including employment opportunities, equity, titles, procurement, and community expansion. The target of this charter was to alleviate the inequities and foster inclusiveness. It also developed the Mineral Petroleum Resources Development Act (MPRDA) [10] to promote sustainable socio-economic development by following environmental standards, management, and mineral rights [8]. Government, at national level also introduced Mining and Petroleum Resources Royalty Act which emphasizes on income taxes and royalties to capture windfall benefits. A beneficiation strategy [14] was also undertaken to add value to the mineral resources before export. The primary objective of this strategy was to spur economic growth, create employment opportunities, and promote the economy by attracting foreign investments in related industries including manufacturing and processing units.

However, despite the practice of these strategies, the South African mining industry still stands amid challenges varying from uncertainty, lower investments, policy discrepancy, inefficient and lacking infrastructure, and workforce hindrances to declining ore grades [3]. Subsequently, there is a dire need for the development of a strategic approach that involves active collaboration between all the key stakeholders, including government, mining companies, labour unions, communities, and external stakeholders.

Research orients to entail a detailed insight into the hurdles and opportunities open strategy holds for the mining sector in South Africa as mentioned in Figure 1. The study will be supplementary information for policymakers and government concerning the requirements and considerations set forth by the internal stakeholders including civil authority and the workforce. The research will guide on the benefits of an open strategy for the mining industry in terms of economic development, environment regulation, management, and attracting foreign investments.

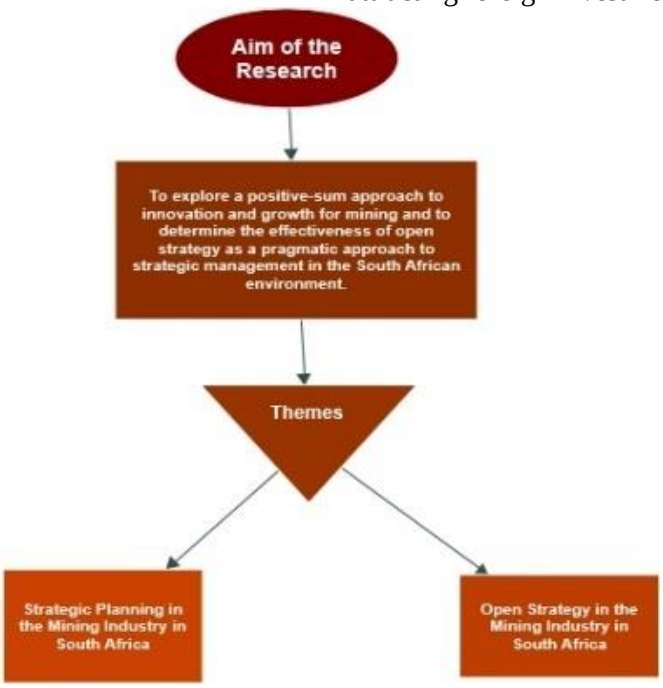

Figure 1. Aim of the Research

Limitations of this Study

1. Strategic planning is affected by the unpredictable nature of industry-related challenges, for instance, supply chain disruption, communication hurdles, environmental regulations, and a necessity for periodic policy reviews and adjustments [1].
2. Various challenges are also highlighted as the orientation of leadership, understanding the concept of individual roles in achieving strategic objectives, and balancing idealist strategies [22] with operational needs.
3. External changes including legal guidelines and regulatory framework, market transitions, political stability, and environmental standards contribute to tiers of complexity [9].

Materials and Methods

The research adopted a mixed-method analysis [4] approach to investigate the subject. Both qualitative and quantitative analyses were performed for the validity of research outcomes. Detailed literature review as the qualitative segment setting baseline framework for designing and orchestrating quantitative analysis. The survey integrated a series of

questions that focused on the identification of knowledge saturation, trends, and roadblocks in the adoption of open strategy for the South African mining industry. The research included interviews with 20 highly knowledgeable participants and a focus group (n=205) was designed elusively consisting of people who work, once worked, were associated, or are associated with the mining industry of South Africa. Various parameters were collected alongside age and the position held by the responders. The quantitative outcomes of the research are measured using SPSS statistical techniques [15]. To validate the research objective Pearson Correlations was performed to check significant relationships among variables.

Results

The objective of extensive data research is to identify trends and connections in open strategy [16] procedures in the mining sector. The knowledge of their effects on stakeholder openness, organizational effectiveness, job generation, and employee participation is the main goal.

This report offers detailed insights into the consequences and difficulties of adopting an Open Strategy in the mining industry by closely examining survey results and investigating the connections between many variables.

Demographic Characteristics

Frequencies Analysis

Table 1. Years of Experience in the Mining Industry or Related Industry

	Frequency	**Percent**	**Valid Percent**
Supervisor	56	26.9	27.5
Middle	95	45.7	46.6
Senior	52	25	25.5
All	1	0.5	0.5
Total	**205**	**100**	

The responders have varying degrees of expertise in relevant professions or the mining business. Table 2 indicates that 28.3% have 5–10 years, 46.8% have 10–20 years, and 22.0% have 20 years or more of experience. Roughly 2.9% have 0–5 years of experience. With 1.4% of the data missing, the overall percentage is 98.6%.

Table 2. Positions in the Mining Industry

	Frequency	Percent	Valid Percent
0-5 years	6	2.9	2.9
5-10 years	58	27.9	28.3
10-20 years	96	46.2	46.8

20 years and more	45	21.6	22.0
Total	**205**	**100.0**	

Among the 205 respondents, this distribution offers a variety of viewpoints on the subject as shown in above given Table 1. The responders have worked in the mining sector in a variety of roles. 46.6% of the distribution are middle-level employees, followed by supervisors (27.5%) and senior employees (25.5%). A negligible portion (0.5%) is designated as 'All.'

Validity of the Questionnaire

Pilot Testing

To measure the reliability of the research questionnaire pilot testing was performed on initial 20 research participants. The validated and reliability was tested through performing statistical testing in SPSS. The Cronbach alpha test was applied for pilot testing purpose. The below table indicates the results.

Table 3. Reliability Statistics

Cronbach's Alpha	**N of Items**
.956	24

Table 3 indicates the results of pilot testing, and the Cronbach alpha value is 0.956. The value showed that participants fully understand the questions. Further the questionnaire has excellent internal consistency indicating it is fit for research data collection and analysis.

Scale Testing

Table 4. Reliability Statistics

Cronbach's Alpha	**N of Items**
.933	24

There were 205 valid examples included in the reliability analysis in above given Table 4, which evaluates the consistency of responses across several questions. Due to listwise deletion, three examples were eliminated; they were probably the result of certain variables having incomplete data.

There was a high value of .933 for Cronbach's Alpha [17], a measure of internal consistency. The results of the analysis show that the 24 survey questions analysed had a high degree of reliability, indicating that the survey items were consistently assessing the intended constructs or dimensions. The acquired value of .933 shows the strong reliability of the survey instrument because a Cronbach's Alpha value over 0.7 is often regarded as appropriate for research purposes.

Correlations

H0: Open strategy cannot have a positive influence on organizations.

H1: Open strategy can have a positive influence on organizations.

Table 5. Correlations for Hypothesis 1

	Open Strategy processes can lead to greater employee involvement in the mining industry	Positive changes in employee involvement with the implementation of an Open Strategy process
Open Strategy processes can lead to greater employee involvement in the mining industry		.636**
Positive changes in employee involvement with the implementation of an Open Strategy process	.636**	

The correlation analysis intended to investigate the connection between employee participation in the mining sector and the perceived benefits of open strategy procedures.

The degree of agreement with the claim that "Open Strategy processes can lead to greater employee involvement" and the reported improvements in employee involvement as a result of implementing an open strategy process showed a statistically significant positive correlation ($r = 0.636$, $p < 0.01$), according to the results mentioned in Table 5.

The alternative hypothesis (H1) that open strategy may positively impact businesses, particularly in terms of increasing employee participation in the mining sector, is supported by this considerable correlation. A rather significant positive correlation between the variables is shown by the computed correlation coefficient of 0.636.

H0: Staff must not be involved in strategy to understand it and have a genuine ownership to execute it effectively.

H2: Staff must be involved in strategy to understand it and have a genuine ownership to execute it effectively**.**

Table 6. Correlations for Hypothesis 2

	Open Strategy creates an openness amongst staff and the stakeholders	Open Strategy ultimately drive success and avoids failure
Open Strategy creates an openness amongst staff and the stakeholders		.750**
Open Strategy ultimately drive success and avoid failure	.750**	

The purpose of the correlation analysis was to investigate the link between stakeholders' and employees' views of open strategy and how it may foster transparency among them as well as how it can lead to success and prevent failure.

The findings given in Table 6 show a statistically significant positive correlation ($r = 0.750$, $p < 0.01$) between the confidence that an "open strategy would ultimately drive success and avoid failure" and the idea that "open strategy would create an openness among staff and stakeholders."

The alternative hypothesis (H2) that staff engagement in strategy, as suggested by open strategy procedures, is connected with enhanced openness, and leads to organizational performance while minimizing failure risks, is supported by this substantial positive correlation. A strong positive correlation between the variables is shown by the computed correlation coefficient of 0.750.

H0: There is no relation between open strategy and growth.

H3***:*** There is a relation between open strategy and growth.

Table 7. Correlations for Hypothesis 3

	Open Strategy contributes to economic growth and job creation in the mining industry	Open Strategy relevance for building organizational continuity
Open Strategy contributes to economic growth and job creation in the mining industry		.720**
Open Strategy relevance for building organizational continuity	.720**	

The correlation analysis serves the purpose of exploring the relationship of open strategy with mining industry's capacity for fostering organizational community, creating job opportunities, and potential for economic growth. The responses for "Open strategy contribute to economic development and creates employment opportunities in mining industries" and "Open Strategy is relevant for building organizational continuity" displayed a positive correlation ($r = 0.720$, $p < 0.01$).

The hypothesis (H3) is supported by the substantially positive relation observed between variables i.e. the open strategy and employment opportunities coupled with the economic progress of the mining industry mentioned in Table 7.

H0: The absence of clients, investors, suppliers, and partners in the strategic approach cannot produce incorrect assumptions.

H4: The absence of clients, investors, suppliers, and partners in the strategic approach can produce incorrect assumptions.

Table 8. Correlations for hypothesis 4

	Strategic planning importance for the success of mining companies	Strategic planning is effectively integrated into the day-to-day operations of your organization
Strategic planning importance for the success of mining companies		.833**
Strategic planning effectively integrated into the day-to-day operations of your organization	.833**	

The correlation analysis weighed the opinions concerning the significance of integrating strategic planning into mining businesses' performance and how well it is integrated into day-to-day operations. The findings of Table 8 show a highly significant positive correlation ($r = 0.833$, $p < 0.01$) between the perception that "Strategic planning is effectively integrated into the day-to-day operations of your organization" and the belief that "Strategic planning is important for the success of mining companies."

The null hypothesis (H0), which states that false assumptions do not arise when clients, partners, or suppliers are not participating in the strategy process, is supported by this significant positive connection. A strong positive correlation between the variables is shown by the computed correlation coefficient of 0.833, suggesting that people who value strategic planning are more likely to view its successful integration into day-to-day operations.

Correlations

H0 There is not much relevance and scope for the application of open strategy in mining.

H5: There is much-needed relevance and scope for the application of open strategy in mining.

Table 9. Correlations for hypothesis 5

	Full involvement in the strategic planning process of your company	Full implementation of strategic planning in your organization
Full involvement in the strategic planning process of your company		.687**
Full implementation of strategic planning in your organization	.687**	

The purpose of the correlation analysis was to investigate the link between worker perceptions of the organization's complete strategic planning execution and their desire to participate completely in the process. The findings show a strong positive correlation (r =

0.687, $p < 0.01$) between the perception that "Strategic planning is fully implemented in your organization" and the preparedness to actively engage in the process as mentioned in Table 9. The alternative hypothesis (H5), according to which there is much-needed relevance and scope for the adoption of open strategy in mining, is supported by this strong positive correlation.

The correlation value of 0.687 that was found suggests a significant positive link, indicating that people who are willing to fully participate in strategic planning are more likely to believe that their business has fully implemented it.

Discussion

Absence of Committed Strategies

The mining industry is facing challenges when it comes to adopting committed written strategies. The exploration of this issue has revealed that many respondents rely on programs like the "Mining Works Programme" [18] without utilizing them for regular performance monitoring. Additionally, the frequency of strategy reviews ranges from regular biennial reviews to more dynamic approaches without any specific timeframe as mentioned in Figure 2.

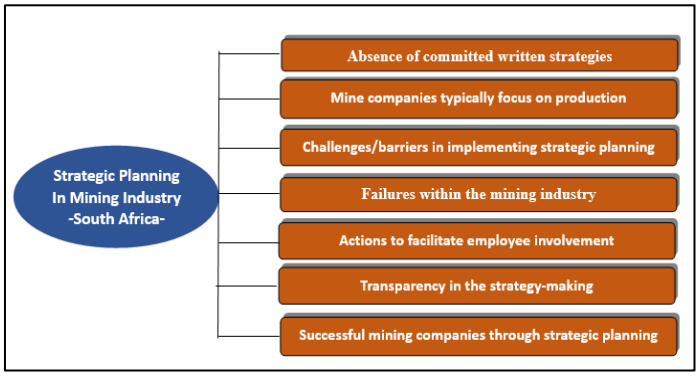

Figure 2: Strategic Planning in the South African Mining Industry

Integration of employees has been identified as the point of disagreement, while some favoured the dynamic incorporative strategies, others emphasized the challenges emerging from a pronounced focus on production. The concept of open strategy [16] is characterized by flexibility and resilience, which amongst respondents served as a better alternative to rigid plans. Lack of committed strategies, ineffective implementation, and discrepant priorities are major challenges subduing strategic planning [20]. The survey responses have shown mixed sentiments on the frequency of strategic plan reviews, stakeholder involvement, and the perceived importance of strategic planning for economic growth and job creation in the mining sector. This diversity underscores the complex landscape of strategic planning in mining, revealing a spectrum of approaches and perspectives within the industry.

Companies Typically Focus on Production

The diversity of responses from industry professionals implied a strategic approach [19] as a complex and multifaceted process. The central theme of strategic planning focuses on production; however, it further extends to the operational, financial, and regulatory dimensions. Operational strategy [21] incorporates competent practices observed from daily to long-term horizons in multinational corporations. Financial concerns [23] involve fiscal regulations and sustainable development. In addition, skill development and succession planning including employee training programs, environmental standard compliance, and health and safety are also vital

components of strategic planning. Development, in the present era particularly emphasizes on consolidation of corporate social responsibility [24] and ESG (Environmental, Social, and Governance) reporting. The strategic planning [22] thus provides a delicate equilibrium between meeting the production goals and circumnavigating the intricate network of financial, operational, socio/political, and ethical considerations in the mining industry.

Barriers Implementing Strategic Planning

A wide range of interconnected issues reported by industry professionals pose critical challenges [25] for the implementation of Strategic Planning in mining industries [26]. Exaggerated optimistic predictions coupled with conventional cost-effective expectancies to attract foreign investors is one of the key recurring hurdles. It leads to intensification of operational pressures by accentuating production to overcome the loss when faced with breakdowns or wasted time. Several other challenges include the absence of strategic approaches as a prerequisite during decision-making [27], and reliance on spreadsheet-centered information. The development of effective, communicating strategic plans for operational challenges [22] emerges as a crucial interference for the successful implementation of policies.

Regulatory barriers, civil-employee relations, everchanging legal frameworks, and market volatility are supplementary obstacles. The erratic industrial challenges including supply chain interruptions impact strategic planning same as the effect of poor communication, and environmental issues. Leadership configuration [28], individual's distinct roles in achieving strategic objectives, and the steadiness between ideal strategies and operational requirements are cited as barriers to effective practice of strategy. Successful strategic planning in the dynamic landscape of the mining industry depends on factors like effective communication, adaptive leadership, and addressing external influences.

Failures in the Mining Industry

Professionals trace faulty strategic planning [29] in the mining industry as the cause of failures posing shared challenges concerning commodities and companies. Exigency is frequently highlighted to overshadow the considerations that lead organizations to fall from one crisis to another. There is a dire need for the development of an open strategy [16], including a multi-perspective solution as a remedy to this widespread symptom. Some examples of failures include cashflow challenges stemming from inadequate organizational settings and mining procedures.

Diversification [30] is reported as an efficient strategy for mitigating market fluctuations. Failures are further linked to inept management, misaligned administrative selection, ineffective incorporation of technology, and capital shortage [31]. The importance of concrete reality and communication within the organizational hierarchy is underscored. External factors including insufficient resource scrutiny, environmental restraints [32], and undervaluing expenses are identified as contributors to failures. The influence of governmental red tape [33] is accredited, thereby creating challenges for the mining sector.

Actions Facilitating Employee Involvement

According to industry experts, encouraging increased employee participation [22] in the mining sector necessitates a multimodal strategy. Consultation with people closest to production facilities is a common approach, which recognizes the vital insights that junior employees may offer. Collaborative decision-making places [28] a strong emphasis on meaningful employee participation, which includes community representation in the

candidate selection process. However, it is advisable to participate in strategic planning with caution and responsibility, particularly when it comes to matters of health, safety, and financial viability [23].

Adopting an employee share ownership trust and designating 5% for staff members is another suggested approach. Through staff involvement in basic mining planning and general operation, this effort seeks to develop a cohesive family structure enterprise. It is important to have faith in the process, managers, and staff. Relating remuneration to production at all levels and implementing shareholding programs are suggested as ways to align employee interests with the success of the operation [21]. Information sharing, openness, honesty, and trust, along with leadership and management, are seen as crucial factors for greater involvement. De-regulating the industry, enhancing transparency, reducing political risk, and investing in mining education are proposed strategies for industry-wide improvement. Improving communication, recognizing employees, encouraging interaction, and prioritizing employee well-being are additional measures to foster greater involvement.

An inclusive management system [34] that involves all employees in achieving subset goals collectively contribute to strategic goals. Employee share participation schemes and profit-sharing are recommended to incentivize a focus on the commercial success of the enterprise. Improved communication, disciplined implementation, and senior, mid, and junior management collaboration are underscored to share the standing of the mine with employees and align efforts toward planned success. Proper consultation in the review of regulations and performance-based remuneration are mentioned as integral components of strategies to enhance employee involvement in the mining industry.

Transparency in the Strategy-Making

The degree of transparency [36] in the strategy-making and implementation process varies among respondents. Some organizations, particularly those facing security concerns due to militant staff, express limited transparency in their strategic processes. In contrast, others advocate for transparency, similar to multinational mining companies, suggesting the display of key principles on notice boards in public view, with detailed information on a need-to-know basis.

Certain organizations focus solely on final results, with little interest in the day-to-day managerial governance needed to implement strategies [27]. Transparency levels also vary regarding rehabilitation processes, legal rights, and employee communication. Some companies pride themselves on being the most transparent and open, involving employees in the strategic process [37]. However, others admit to poor communication, off-the-cuff decisions, and a lack of adherence to plans.

In instances where there is limited transparency [35], reasons range from considering strategic details as intellectual property to a lack of a formulated plan. While some businesses boast about being transparent, admit their inadequacies, and highlight the need for progress. The degree to which plans are implemented and followed through on differs as well. While some organizations keep their stakeholders informed about expectations and developments regularly, others report a lack of transparency because of not having a strategy in place.

Successful Mining Companies Through Strategic Planning

The replies from the survey and interviews offer a variety of viewpoints about the situation of strategic planning in the mining sector. A common element is that many businesses lack a dedicated, documented strategy; instead, they depend on other initiatives or take a more flexible stance. The difficulty of involving

employees is emphasized, and there are examples of tactics being neglected in favour of production objectives. There are differences in the level of transparency [35] in the strategic planning and execution process, depending on factors like workforce composition [34] and security considerations. The difficulties mentioned by the respondents include overly optimistic forecasts, a lack of involvement from operational staff [21], and the effects of outside variables like changes in the law and market fluctuations. Notwithstanding these difficulties, there are instances of mining firms that have attained notable expansion through strategic planning [38] and emphasizes the need for capable leadership and a methodical approach. Effective strategic planning in the mining sector depends on better employee participation [26], communication, and taking legal [7] and environmental issues into account.

Open Strategy

The respondents had differing degrees of familiarity with the idea of an open strategy as shown in Figure 3. Some indicate that they understand and agree with the open strategy principles [16], while others state that they are conversant with similar ideas such as supply-chain management and key stakeholder interaction. Some seem to acknowledge the use of open strategy in the mining sector; however, they distinguish between applying it to suppliers, consumers, and external partners. In general, opinions on the notion are divided into three categories: restricted, conditional, and agreement. The range of answers points to a comprehension of open strategy and its applicability in many businesses and situations.



Figure 1. Word Cloud Generated from Participants' Responses.

Benefits of Implementing an Open Strategy Process in the Mining Industry

According to the insights gained from several responders, the mining industry might potentially profit greatly from the implementation of an open strategy approach. The consensus highlights the benefits of inclusive and transparent decision-making.

There is a belief that needless secrecy may be eradicated by being open to alternative solutions and sharing information. An open strategy [39] approach is thought to promote employee buy-in and ownership, which in turn creates a sense of pride and accountability in terms of sustainable decision-making.

Incorporating suppliers and customers into the planning process is also seen to be a good way to cut expenses, minimize downtime, and get important knowledge.

Expanded engagement of diverse stakeholders, encompassing personnel at varying levels, is thought to promote expansion, enhance efficacy, and provide favourable results [40].

Open strategy's [41] collaborative character unites stakeholders to work towards the shared objectives of achieving success for the mining business, utilizing a range of viewpoints, and developing a more inclusive understanding of the organization's goals.

Overall, the potential benefits [38] extend to enhanced decision-making, increased efficiency, and a collective sense of commitment and ownership among stakeholders.

Encouraging Open Strategy for the Mining Industry

Encouraging and supporting open strategy in the mining industry to facilitate a broader collection of knowledge and experience requires a significant shift in the traditional closed communication loop within the sector as shown in Figure 4. Suggestions include initiating open collaborative meetings between miners, facilitated by organizations like the Mineral Council of South Africa, to share knowledge and experience. At a mine level, fostering corporate safety [42] and a production bonus system, rather than a scheme, can mitigate negative competition and incentivize collaboration.

Introducing incentives for all staff to contribute to the strategic planning process [34] and holding regular team meetings can enhance employee involvement. An open approach will be supported by being honest with suppliers, including them in the operational process, and providing a list of all requirements inside the mine. It's critical to have a secure and trustworthy workplace where staff members may voice their ideas without fear of retribution.

Collaboration can be encouraged by teaching upper management the advantages of an open strategy [16], resolving concerns, and placing a strong emphasis on team development.

Important components include information exchange within the organization, appropriate strategy distribution, and training on mining health and safety. To promote an open strategy in the mining sector, a mix of incentives, openness, communication, and cultural changes are necessary [38].

Open Strategy: A Novel Approach to Strategic Planning

In the mining industry, implementing an open strategy would indeed be regarded as an innovative approach to strategic planning as highlighted in Figure 4. This strategy deviates from the industry's customary tight communication loop and competitive mentality. Open strategy [16] is a beneficial and creative approach, especially for new entrants looking to prevent costly mistakes, because of its potential benefits, which include collaborative decision-making, greater efficiency, and improved information sharing.

Open strategy [41] is crucial for promoting cooperation, inclusion, and shared accountability, even while it recognizes the difficulties in lessening competition and centralizing some parts of planning. In the mining industry, which has historically taken a more authoritarian and internally oriented approach, the success of this innovative strategy depends on the cultural alignment and commitment of all players. In general, open strategy gives strategic planning in the mining.

sector a more collaborative, inclusive [34], and transparent aspect [35].

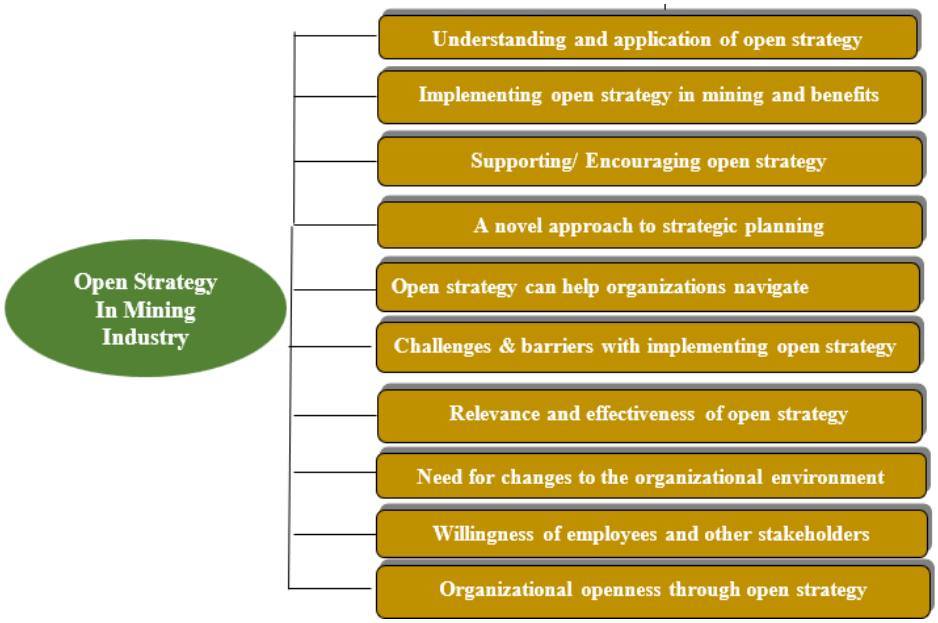

Figure 4. Open Strategy in the South African Mining Industry

Open strategy: A Means of Navigating Organizational Disruptions

Open strategy, which promotes efficient communication, teamwork, and proactive planning, can be a useful tool for organizations to manage disturbances. Organizations may overcome the misconceptions and misunderstandings that frequently lead to interruptions by maintaining open lines of communication.

Within the company, encouraging ethical reporting can aid in spotting any dangers and threats and enable prompt action. Disruptions can be minimized in the open approach involving important suppliers and customers. Suppliers develop into important collaborators that support operational stability by offering training, expertise, and spare parts. As stakeholders in the strategic planning process, customers guarantee sales, which is critical to the organization's sustainability.

Reduced political and union influence and keeping all relevant parties responsible for their activities can help make operations run more smoothly and with fewer interruptions.

Engaging frontline employees and other stakeholders in the process of developing strategies facilitates a more thorough comprehension of the organization's obstacles and a joint endeavor to manage disruptions.

Additionally, an open strategy encourages adaptability and agility in handling change. When there is a wide range of external parties interested in the organization's success, obstacles may be found and resolved together.

Transparency and open communication may also help handle unexpected interruptions and communicate during times of crisis. All things considered, an open strategy promotes a comprehensive and cooperative approach that strengthens an organization's capacity to successfully manage disturbances.

Challenges for Open Strategy in the Mining Industry

In the mining sector, there are several obstacles and difficulties [43] when implementing open strategies. Because they value privacy, executives could object, which might impede open communication. Another obstacle is labor distrust, which can be caused by past communication problems or a lack of awareness of the needs of the business. Effective change management [44] is necessary when moving away from traditional communication methods, and leadership opposition from closed-culture backgrounds

may obstruct development. Stakeholders' [45] inadequate understanding of the motivations underlying profit-making presents another difficulty. The process is made more difficult by problems including executive mistrust, outside influence, and reluctance to change.

Navigating government bureaucracy and striking a balance between intellectual property protection and openness are challenging tasks. It is crucial to consider the overestimation of employee expertise and the need to close educational gaps. A thorough change management strategy that prioritizes effective communication and trust-building at all organizational levels is necessary for successful implementation.

Effectiveness of Open Strategy

Several crucial steps may be made to improve the applicability and efficacy of open strategy in organizations. A more inclusive process is ensured by beginning the productivity planning process with a bottom-up strategy that values and incorporates input from all levels [34]. Accountability and progress tracking are encouraged by enlisting outside experts to create and execute programs that concentrate on important performance areas connected to an open incentive structure.

A key function of leadership is to emphasize collaboration with suppliers [47] and OEMs (Original Equipment Manufacturers), and place faith in capable staff members. It is possible to train colleagues who lack education [48] through education programs and building cross-functional teams that are knowledgeable about different mining difficulties can improve overall performance.

An open strategy's success [41] is influenced by leaders' focused determination, frequent communication, and transparency. The strategy's relevance is further increased by involving input from all organizational levels and external stakeholders, educating all stakeholders, and making outcomes publicly available. Implementing open strategies successfully depends on ongoing training, cultural changes, and an appreciation of the importance of group knowledge [49].

Changes in Organizational Environment & Open Strategy

To successfully implement an open strategy, significant changes to the organizational environment are necessary. Firstly, there must be a serious and positive mindset from the leadership, especially the Chairperson or Investor, demonstrating commitment to the program. Obtaining buy-in from leadership and creating a dedicated position with adequate resources are important steps. The organizational structure should be adaptive, removing ineffective individuals and ensuring that everyone is invested in the interests of the mine. An open approach may thrive in a setting that values openness, trust, and a rejection of micromanagement.

Creating a trusting relationship between different management tiers is crucial, and a relatively flat organizational structure with minimal silos can enhance efficiency. Importantly, the organization should promote an environment where employees are allowed to criticize, experiment, and contribute to decision-making. This cultural shift may involve moving from an autocratic to a more participative style of management, potentially facilitated by the next generation of top management.

Organizational cultures that are more transparent and participatory are facilitated by decreasing corruption, updating regulations, and improving training and communication.

Adoption of Open Strategy & Stakeholders

Changes connected to open strategy are often well-received by employees and other [45] stakeholders. Adopting an open approach has more benefits for stakeholders [46] and workers than drawbacks. Employee willingness is also impacted by their innate enthusiasm for the mining industry, which is frequently

inherited from previous generations. An open approach encourages a sense of pride and involvement by allowing people to feel appreciated in their areas of responsibility.

Furthermore, suppliers find it simpler to work with and invest in a mine that has an open strategy, fostering a partnership that is more cooperative and advantageous to both parties. The emergence of a more robust middle class suggests that people are generally open to these kinds of reforms. An open method is more successful when experts and seasoned miners are included in the decision-making process [27].

Nonetheless, obstacles from cultural and political disparities, as well as doubts from specific parties involved, could arise. Sometimes, top managers who see a challenge to their positions or a more conservative business culture are the sources of opposition. Despite these obstacles, most stakeholders, and workers [34] indicate a favourable attitude toward open strategy-related adjustments by expressing a desire to be included and have their ideas recognized.

Facilitating Open Strategy in the Mining Industry

The business of mining presents a complex challenge when implementing an open approach, with issues ranging from employee opposition to change to the possibility of sensitive information being revealed. A key component of guaranteeing the success of open strategy is the requirement for a fundamental change in the thinking of middle management. Financial factors [23] come into play and require a designated budget to prevent the efficacy of the program from being compromised. The dynamics of power and decision-making in organizations highlight the need to cultivate an environment of openness and trust.

Complicating matters further are outside variables such as political opposition [33] and difficulties in involving a variety of stakeholders [45], such as communities and labor unions. It becomes a tricky task to strike a balance between the advantages of diverse ideas [30] and employee empowerment and the demands of discretion [35] and methodical decision-making. Addressing these issues calls for an all-encompassing strategy that includes open communication, education, and a dedication to cultural change in the mining industry.

Conclusion

The correlation analysis's findings support the hypothesis that open approaches might have an impact on the mining industry by demonstrating several significant, positive correlations.

First, it was discovered that there was a significant positive correlation ($r = 0.636$, $p < 0.01$) between open strategy procedures and higher staff involvement, demonstrating the advantages of open strategy for employee engagement.

Additionally, a strong positive correlation ($r = 0.750$, $p < 0.01$) was shown between open strategy, encouraging transparency among employees and stakeholders, and achieving success without failing, indicating that open strategy may positively affect organizational outcomes.

The participants' experiences also showed a significant positive association ($r = 0.720$, $p < 0.01$) between the open approach and its contribution to the economic growth and job creation of the mining sector. The important role of strategic planning was further demonstrated by the finding of a strong positive correlation ($r = 0.833$, $p < 0.01$) between the successful integration of strategic planning into daily operations and the perceived relevance of strategic planning for mining enterprises' performance.

The significance and applicability of open strategy in the mining sector were further highlighted by the discovery of a robust positive correlation ($r = 0.687$, $p < 0.01$)

between participants' readiness to participate fully in the process and their opinions of the organization's overall strategic planning implementation.

In summary, the findings repeatedly highlight the potential advantages of an open approach for the mining industry in terms of boosting worker performance, engagement, and economic growth as well as reducing incorrect assumptions.

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Conflict of Interest

The study has been conducted with utmost transparency and integrity, and no conflict of interest has been found.

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Evaluation of the Suitability of The Established Standard Height of Occlusal Rim Blocks Among the Dental Clinicians in Makerere University Dental Hospital In Uganda

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Abstract

There's a growing demand for better dental prosthetics that combine function, aesthetics, and comfort. The therapy for edentulous patients can be realized through the use of conventional Removable Complete Dentures (RCDs), implant-supported prostheses, and Computer-Aided Design and Computer-Aided Manufacturing (CADCAM). This study was aimed at evaluating the suitability of the established standard height of ORBs among the dental clinicians in Makerere University Dental Hospital in Uganda. This was a cross-sectional study employing a qualitative approach using purposive sampling. Fifteen (15) participants were selected across social demographics. Thematic data analysis revealed insights into the suitability of the established standard height of ORBs. Interviews were recorded and transcribed and themes were generated to draw deeper meaning for suitability. A qualitative package, Open code version 4.2.1 was used to generate themes from the interviews followed by an interpretation of the data generated, and the result was presented as text and table. The findings revealed a prevalent trend in Uganda where occlusal rim block heights often fall below international standards, emphasizing the need for a patient-centered and individualized approach. There's a positive shift towards new measurements, improving chair-side efficiency, and reducing appointment duration. The findings highlighted economic efficiency, minimizing material wastage, and positively impacting patient-reported outcomes. This study highlighted the need for tailored ORB guidelines for Ugandan edentulous patients for better treatment outcomes. This will save time during the registration stage and help to improve accuracy.

Keywords: *Complete Dentures, Makerere University, Occlusal Rim blocks, Suitability, Standard Height.*

Introduction

According to the World Health Organisation (WHO) [1], the prevalence of edentulism in people aged 20 years and above is 1.8% in Uganda. The demand for esthetic restoration, comfort, and oral function has grown, emphasizing the importance of precise clinical practices. In sub-Saharan Africa, oral health problems greatly contribute to morbidity and in the case of edentulous patients, they lead to the desire to obtain Removable Complete Dentures (RCDs) to reinstate function and esthetics in the most comfortable way [2, 3, 4]. Moreover, apart from the predominant use of conventional RCDs, the therapy for edentulous patients can be realized through the use of implant-supported prostheses, and Computer-Aided

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Design and Computer-Aided Manufacturing (CADCAM) [5, 6].

The fabrication of an RCD entails several steps which include diagnosis, treatment planning, impression taking and border molding, dental model casts, occlusal rim blocks fabrication, bite registration, selection and set up of artificial teeth, wax denture try-in, denture processing and insertion, and patient's follow-up [7]. Occlusal Rim Block (ORB), which is employed in the third stage of denture fabrication consists of a rigid, accurate, and stable denture base and a rim made of a base plate wax. It is used to establish the occlusal plane level, the arch form, and the jaw relationship both horizontally and vertically, i.e. bite registration [8]. In addition, ORBs record the occlusal plane, Lip support, center line, high smile line, vertical dimension, centric relation, canine lines, and neutral zone which are used during the fabrication of the trial dentures and eventually conventional RCD [9, 10]. When ORBs are fabricated without considering the actual anatomical or scientific methodology, can lead to an increase in the clinical time and high chances of inaccuracy [11]. Furthermore, when these rims are made to the right 'average' dimensions and anatomical angles, the registration process is much easier, quicker, and more accurately carried out, but when the height and width of ORB are ignored during fabrication, may lead to restricting the tongue space and encroaching into the cheeks and lips, distorting the denture-bearing area resulting in inaccurate registration of the occlusion and sometimes selecting of slightly wider teeth during setting [9].

Considering the practical aspects, modifications such as the "Modified occlusal table/plane" have been explored to enhance the function of dental prosthetics [12]. Several other studies in different countries to determine the height of ORBs/teeth have been published. McGrane [13] used the unknown number of casts poured from muco-static impressions and found that the distance from the mandibular incisal edge of unworn teeth to the labial mucosal fold next to the lower labial fraenum was 18 mm and for the maxillary counterpart 22 mm, giving a total of 40 mm when mounted together. In Turkey, Yanikoglu [14] found that out of the 45 edentulous patients, the mean distance from the depth of the maxillary mucobuccal/vestibule to the tip of the buccal tubercle of the maxillary and mandibular posterior teeth was 17.2 mm and 16.4 mm, respectively, and Stananought and Newton [15] suggested 20 mm for the anterior upper jaw and 18 mm for the anterior lower jaw. In Uganda, Nono et al [16] on 240 pairs of ORBs, found the mean height for anterior maxillary and mandibular to be 19.4 and 16.4 mm, respectively, while for posterior maxillary and mandibular, 17.4 and 16.0 mm, respectively. Different height measurements of ORBs are reported from studies in different countries including Uganda. However, there is no readily available published literature about their suitability. Therefore, the purpose of the present study was to evaluate the suitability of the established standard height of ORBs previously recorded in Ugandan patients [16] among dental clinicians in Makerere University Dental Hospital in Uganda.

Materials and Methods

Study Design

The study employed a qualitative method of data collection using in-depth key informant interviews.

Study Site

The study was conducted at Makerere University Dental Hospital in Kampala. Kampala is the capital city of Uganda. The hospital is a teaching and health service delivery facility of Makerere University. It is the largest and adequately equipped dental facility employing the highest number of dental specialists in Uganda. It has a well-established prosthetic dental laboratory and offers specialized dental services including

rehabilitation of edentulous patients with RCD including staff and students of the University, and other communities outside the University at a minimal fee. The hospital attends approximately 660 outpatients per month of which about 20 are rehabilitated using RCD (Registry of Dental Records, 2022), the reason for choosing the study site, which could easily raise the required sample size.

Selection of Study Participants

The sample size was determined based on data saturation. The initially targeted number of interviews to be conducted was seven (7) participants, and the final number of interviewed respondents up to data saturation was fifteen (15) participants. A strategy of purposive sampling of key informants was used to collect data in consideration of areas of their expertise. The key informants included both male and female clinicians to ensure gender balance in participants' selection and diminish the possibilities of selection bias in thoughts, ideas, and perceptions. The selection also included variation in duration of practice, level of training, roles in denture fabrication procedures, and fitting to ensure a fair representation of the study population.

Inclusion Criteria

Dental clinicians participating in the provision of removable complete dentures in Makerere University Hospital.

Exclusion Criteria

Dental clinicians who were sick and unable to participate in the study.

Data Collection Procedure

Before participating in the study, written informed consent was provided by the participants. Additionally, participants were provided with confidentiality such that no identifiers like names were used in any reports prepared from the data collected. Dental clinicians attending to edentulous patients carried out an oral examination took the primary and secondary impressions of the patient's arches and sent them to the prosthetic dental laboratory for the technologist to fabricate the ORBs. The dental technologists fabricated two pairs of ORBs: one, the gold standard based on the internationally accepted heights (22 and 18 mm for anterior and posterior maxillary arch, respectively; 18 and 18 mm for anterior and posterior mandibular arch, respectively) [17], while the second one was made based on the newly estimated height (19.4 and 17.4 mm for anterior and posterior maxillary arch, respectively; 16.4 and 16.0 mm for anterior and posterior mandibular arch, respectively [16]. The clinicians carried out bite registration on the patients using both pairs of ORBs to achieve a freeway space of 2-4 mm. They also took part in the in-depth interview (IDI) using an interview guide to establish the suitability of using the newly estimated height of the ORBs in comparison to the internationally accepted standard height, i.e. the gold standard. With the suitability of ORBs, the investigator explored clinicians' views regarding how easy/hard it is to use the ORBs with new estimated height values, the duration involved to achieve bite registration to determine the free-way space of 2 to 4 mm, fitting ability, and how much height of wax was trimmed/added to attain the required harmonious bite registration. The in-depth interviews involved taking notes and audio recordings. The interview took between 30 to 45 minutes by a trained research assistant who is a social scientist with experience in qualitative research. After data collection, every tool that was filled out was verified again every day with utmost care toward consistency.

Quality Control

The data collection tools were pretested by the principal investigator and amendments were made to improve their validity and reliability. The research assistants were trained in data collection. The IDIs were audio-recorded to capture any discussion that may have been

missed in taking notes. Additional notes capturing body language and gestures during the interviews were taken by the trained research assistant.

Data Management and Analysis

Transcription of the audio recordings was handled by a person experienced in qualitative research. The English grammar mistakes were also corrected before the end of the interview. This was to ensure that good quality information is collected and is also kept in context. All soft copies of the transcripts were backed up on an external device and in Google Drive with password protection. The hard copies were kept under lock and key and only accessible to the investigating team. Open code software, version 4.2.1 was used to generate themes from the interviews, coded and transcribed. The results were presented as text and in a table.

Ethical Consideration

Ethical approval of the protocol was obtained from the Makerere University School of Health Sciences Research Ethics Committee (Reference Number: MAKSHSREC-2023-486) as well as the Uganda National Council for Science and Technology (Reference Number: HS3092ES). Permission to carry out the study was obtained from the administration of Makerere University Dental Hospital. Written informed consent was obtained from all the participants who took part in the study. The purpose of the study was explained to the participants and their participation was voluntary. Their agreement to participate in the study did not waive their rights in any way and this was in accordance with the Helsinki Declaration [18]. All the data collected was kept securely in a cabinet under lock and key and only accessible to the investigator.

Results

The study involved fifteen (15) participants with varying demographic characteristics (Table 1). All the participants had a Bachelor of Dental Surgery degree: 9 were registered dental surgeons and 6 interns. Eleven participants had 0 to-5 years of professional experience category while 4 were dental surgeons with 6- 10 years' experience. Participants' ages ranged from 24 to 39 years old. All the fifteen (15) individuals participated in the Key Informant Interviews (KIIs) (Table 1).

Table 1. Socio-Demographic Characteristics of the Study Participants (n=15)

Participant	Age	Sex	Professional Status	Years of Experience
1	27	Male	Dental Surgeon	0-5
2	27	Male	Dental Surgeon	0-5
3	33	Male	Dental Surgeon	0-5
4	24	Female	Dental Intern	0-5
5	39	Male	Dental Surgeon	6 -10
6	33	Male	Dental Surgeon	6 -10
7	33	Male	Dental Intern	0-5

8	38	Male	Dental Surgeon	6 -10
9	28	Male	Dental Intern	0-5
10	30	Male	Dental Intern	0-5
11	38	Male	Dental Surgeon	6 -10
12	26	Male	Dental Intern	0-5
13	33	Male	Dental Surgeon	0-5
14	27	Female	Dental Surgeon	0-5
15	26	Female	Dental Intern	0-5

Themes from the Study

The findings were summarized into two (2) main thematic areas, each with sub-themes:

Theme 1: Dentists' Experience With Using the Internationally Accepted Height of Orbs During Bite Registrations

Experience with Determining Freeway Space of 2-4 mm for Edentulous Patients Using the Internationally Accepted Standard Height of ORBs

The study participants highlighted that they employed speech and pronunciation exercises as central methods for evaluating the 2-4 mm freeway space. This patient-centered perspective goes beyond traditional clinical measurements, emphasizing patients' comfort. One respondent articulated this approach, stating that: *"Normally, I have been using words or speech by asking the patients to pronounce out some words or letters" (Participant 1).*

Regarding occlusion functionality and comfort, a participant noted:*" Freeway space is got by the difference between the occlusion vertical dimensions at rest and after swallowing" (Participant 3).*

A similar observation was also made that: *"…by determination of freeway space of 2-4 mm as per the calculations, it's got by subtracting the measured distance in millimeters between the occlusion vertical dimensions at rest and in occlusion." (Participant 4).*

It was noted that clinicians integrate both clinical and mathematical approaches to determine the 2-4 mm freeway space. One participant revealed: *"…What I used to do, was using a difference between vertical dimension at occlusion (VDO) and vertical dimension at rest (VDR). So, you get the difference between the two by getting VDR minus VDO. So, that's how you get the free-way space" (Participant 5).*

Influence of the Internationally Accepted Standard Occlusal Rim Block Height in the Treatment of Edentulous Patients

Clinicians acknowledged the influence of international guidelines (ORBs made with 22 and 18 mm for anterior and posterior maxillary arch, respectively; 18 and 18 mm for anterior and posterior mandibular arch, respectively) but emphasized the importance of tailoring the ORB's height to individual cases. The findings revealed that ORBs play a crucial role in treatment success, impacting various aspects including jaw relations, tooth size, height determination, the establishment of the neutral zone, and freeway space. As one participant

observed, the impact of ORB height is evident in its significant influence on the success of edentulous patient treatment: *"The height of the occlusal rim block significantly influences the success of edentulous patient treatment. It plays a pivotal role in achieving the multifaceted goals of prosthetics, including occlusion, functionality, and patient comfort. The height becomes integral to creating dentures that fulfill their intended purposes" (participant 1).*

The study highlighted that the standard international ORB heights do not offer a one-size-fits-all and that different patients require different occlusal rim heights. This emphasizes the importance of considering each case independently, as explained below: *"Different patients require different heights of occlusal rim blocks, emphasizing the importance of considering each case independently. The international standard heights may not practically work for all cases, and in my setting, most heights are below those standards, typically in the range of 17 for upper anterior and 15 to 16 for lower mandibular anterior" (participant 3).*

The findings revealed a trend in their setting, where heights often fall below international standards, implying the significance of individualized approaches in determining optimal heights of ORBs. One participant narrated: *"the heights of occlusal rim blocks wield too much influence. not every case would require the same height as the international standard heights are so, it depends on which case to me, but in most cases, they are always in about 17 mm for the upper anterior height, and to me, it is 15 mm to 16 mm on the lower mandibular anterior height from the vestibular/sulcus to the occlusal surface" (Participant 4).*

Experience in Using the International Guidelines in Making Occlusal Rim Blocks for Treating Edentulous Patients

Dental clinicians reported that they faced difficulties in implementing international guidelines, leading to time-consuming adjustments and compromises in patient comfort, and therefore recommended more localized standards, which reflects the need for guidelines tailored to the Ugandan population and which take into account the variations in dental anatomy and patient preferences. This is highlighted in the example below: *"Definitely in Ugandan setting, the clients we have, most of them are not of that value. So, we use extended time to adjust the rims and then have something better" (Participant 3).*

Impact of Using the International Guidelines on Time and Resources During Clinical Practice

Dental clinicians expressed the need for updated guidelines as the existing ones posed challenges in meeting the expectations of Ugandan patients. The negative impact on chair-side time, material wastage, and patient satisfaction called for a reconsideration of the standard height. As narrated by the participant in the examples below: *"I think the old guidelines, most of our clients, would not fit into those guidelines and measurements. we probably need to change to have new guidelines or new measurements so that we don't have to go through a lot of adjustments doing let's say the bite registration" (Participant 1).*

"The impact is there because I am going to waste material, I am going to waste time reducing on the occlusal rims. the impact is negative, and I am happy that we are doing this research because we are going to reduce the impact" (Participant 3).

The challenges related to chair-side time and frustration are noted with the occlusal rim blocks made using the international guidelines, as one participant noted: *"It makes my chair-side time a lot, then you're losing more resources because that's wasted work that you're going to discard. as a doctor you are frustrated, at times you end up having more visits for the patient and also yourself" (Participant 7).*

Challenges and Complaints With the Previous Measurements of Orbs Height (Internationally Accepted Standard Height of Orbs)

The study revealed a range of perspectives on the implementation of ORB guidelines. Dental clinicians reported that they faced challenges in delivering removable complete dentures fabricated using the internationally accepted standard height of ORBs hence necessitating post-delivery adjustments to enhance patient satisfaction. Patient feedback, though limited, suggested potential benefits and improvements with the newly established standard height of ORBS, as shown in the examples below: *"It was tricky because it was not definite, there was a lot of guesswork and testing here and there. sometimes the clients will need the whole process to be repeated so sometimes there is a lot of discomfort and dissatisfaction of the client." (Participant 2).*

Theme 2: Dentists' Experience With Using the New Estimated Height of Orbs During Bite Registration

Awareness and Adoption of the Newly Estimated Height of Occlusal Rim Blocks That Has Been Measured Among Local Patients

The study highlighted a positive shift in dental clinicians' acceptance of new estimated ORB heights, resulting in enhanced chair-side efficiency and reduced adjustment needs during bite registration. *"I think this is more efficient. because I am doing it all the time and I think it also depends on the patients, but it looks better" (Partpatients, 2).*

Clinicians particularly expressed contentment with the adoption of new occlusal rim block heights, incorporating individualized instructions for technicians. They also reported minimal adjustments, particularly in the posterior region, leading to significant time savings. The preference for localized measurements was also emphasized, highlighting the difficulties faced with previous guidelines requiring constant adjustments. An example is given below: *"The clients/patients are appreciating that they are no longer taking a lot of time on the chair than they used to take. they appreciate that we are becoming more advanced and more learned because we are doing what they want. they are referring more clients to us" (Participant 3).*

"With experiences that I have gone through, I have adopted that because it is showing accurate kind of occlusion bites to a patient because of minimal reduction compared to the ones which are already documented" (Participant 7).

The study participants acknowledged a significant change in the characteristics of the ORBs, emphasizing increased efficiency. They said that clients/patients appreciated the reduced chair-side time and viewed the adoption of new guidelines as a sign of advancement. The study also highlighted the importance of localized measurements catering to the specific needs of the Ugandan population. *"I think it's a great change, the measurements that they are currently following in the laboratory, of course, they are different. So, there is a great change in the rims that we are now receiving from the lab" (Participant 1).*

However, as pointed out by one participant, the move towards an established standard height introduces challenges in reconciling standardized measurements with individual patient needs. For instance, one participant highlighted the challenge of quickly learning and implementing the new guidelines: *"I have not fully adapted to it because it's a new system, but the few edentulous patients I got, it works well" (Participant 5).*

Treatment Outcomes and Patient Satisfaction With the Use of the Newly Established Height of Occlusal Rim Blocks

The qualitative analysis revealed positive sentiments towards the adjustment to the new estimated height of ORBs. Dental clinicians

reported improved treatment outcomes, reduced adjustment time, and enhanced patient comfort. *"I believe the new measurements are now of great advantage because even after delivery or post-delivery of our dentures, we have not received a lot of complaints from the patient" (Participant 1).*

The shift to the new measurements was associated with increased patient satisfaction, reduced chair-side time, and efficient treatment processes. Clinicians appreciated the accuracy of the newly established standard height of ORBs and its potential impact on business growth. Time efficiency emerged as a prominent theme in the narratives, with clinicians highlighting the reduced time spent on adjustments and post-insertion visits. The findings further highlighted that the adoption of new measurements had proven highly advantageous, with dental clinicians noting a significant lack of post-delivery compliments or complaints from patients. One participant emphasized the enhanced accuracy and absence of guesswork, predicting a prosperous future for the practice due to increased precision and overall patient comfort.

"It's more accurate and there is no guesswork here, you just look at exactly what is in the patient's mouth. there will be a lot of business in the future. Automatically, there is more comfort here than before" (Participant 2).

Another participant highlighted the anticipation of better treatment outcomes and simplified chair-side work, ultimately making procedures significantly easier. Patients, on the other hand, expressed satisfaction with the streamlined chair-side experience, leading to a positive impact on referral patterns. Dental clinicians observed a rise in referrals, attributing it to improved treatment outcomes and more straightforward chair-side procedures. The positive feedback from clients reinforced the effectiveness of the new ORB measurements as explained below: *"The clients are appreciating that they are no longer taking a lot of time on the chair than they used to take. they are referring more clients to us" (Participant 3).*

"Time, you take little time and chair-side time from the time once you have done a good job in the lab clinically you don't have a lot of time, so you take limited time, it saves a lot of time" (Participant 6).

Clinical Time and Resources with the Use of the Newly Established Standard Height of Occlusal Rim Blocks

The qualitative analysis highlighted the positive impact of the newly estimated standard height of ORBs on clinical time and resources. Clinicians reported a significant reduction in chair-side time, attributing it to fewer adjustments and streamlined processes. The efficient use of time was complemented by the positive feedback from patients who experienced enhanced comfort with the new prosthesis. The findings emphasized the potential for improved resource utilization, with reduced material usage leading to cost savings. Participants further highlighted the positive effect of new measurements on clinical time and resources. One participant observed that: *"Clinical time has reduced now that, of course, we don't make a lot of adjustments, so the appointments are shorter" (Participant 1).*

This sentiment was echoed by another participant, who emphasized the noticeable reduction in appointment duration and improved measurements, noting patients' increased comfort and satisfaction with the prosthesis as explained below: *"They are very comfortable, they are talking well, they are having their masticatory muscles not overstrained, and the complaints they used to have of ulcers, wounds, they are reducing drastically" (Participant 4).*

Furthermore, participants acknowledged the economic benefits associated with the new measurements. This economic advantage was further emphasized by the observation that lower dimensions led to reduced material usage, contributing to cost savings in dental

procedures. One clinician noted that: *"The cost is lowered because if I am having a higher dimension I am using more materials, if I am reducing the dimension, it means reducing the amount of materials I am using, meaning that the cost of production is also lowering" (Participant 6).*

How have the New Measurements Impacted Managing Edentulous Patients

The qualitative analysis revealed that participants were positive toward the adjustment to the newly estimated height of ORBs. Dental clinicians reported improved treatment outcomes, reduced adjustments, and enhanced patient comfort. The shift to the new measurements was associated with increased patient satisfaction, reduced chair-side time, and efficient treatment processes. Clinicians appreciated the accuracy of the new system and its potential impact on business growth. Time efficiency emerged as a prominent theme, with clinicians highlighting the reduced time spent on adjustments and post-insertion visits. *"I believe the new measurements are now of great advantage because even after delivery or post-delivery of our dentures, we have not received a lot of complaints from the patient" (Participant 1).*

"The clients are appreciating that they are no longer spending a lot of time on the chair than they used to take. they are referring more clients to us" (Participant 3).

Any Barriers, Limitations, and Recommendations Associated with Adopting Locally Measured Height of Occlusal Rim Blocks

The qualitative analysis revealed a positive reception of the new measurements among dental clinicians. Recommendations by the participants focused on encouraging dentists to adopt the new measurements, emphasizing the potential for improved efficiency and better patient outcomes. Suggestions included the need for comprehensive research that considered both the height and width of ORBs. Clinicians particularly expressed the desire for practical implementation, such as incorporating video documentation during the bite registration process. *".there are two things, the new findings would be great to us if they are going hand in hand with the width of the rims because we shall look at the height well, we shall get the occlusal vertical dimension, but we also need to find the size of the teeth that we use on these rims" (Participant 5).*

"Not so much just may be pushing for documentation of these and trying to share this information as wide as it can because I believe the majority of the practitioners don't know about it yet or they could know about it, but they are just waiting for that documented evidence to support it or to back up their practice" (Participant 6).

Discussion

This was a cross-sectional study employing a qualitative approach using purposive sampling to evaluate the suitability of the established standard height of ORBs among the dental clinicians in Makerere University Dental Hospital in Uganda. The goal was to generate findings that could be used to formulate strategic planning in the treatment of edentulous patients and the training of dental students. To our knowledge, there is no published information regarding the suitability of the determined height of ORBs for Ugandan edentulous patients. The present study established the baseline data of the suitability of the estimated standard height of ORBs among the dental clinicians who were purposively selected. The present findings will inform policymakers in reviewing existing guidelines in fabricating ORBs that are suitable for Ugandan edentulous patients [17].

The Study highlights the consideration of practices related to the 2-4 mm freeway space for edentulous patients in the established standard height of ORBs. This patient-centered approach incorporates speech dynamics and

directly influences denture wearers' satisfaction and adaptation. This aligns with previous research by Mishra et al., [19] that urged that changes in Occlusal Vertical Dimension (OVD) certainly affect functional activities such as chewing and speech due to their intrinsic relationship with the freeway space and the speaking space indicating the variability in adapting to new dentures and the influence of speech on patient experience. The present study further aligns with the broader literature that recognizes occlusion as a key determinant of prosthodontic success, impacting aesthetics, speech, and overall patient satisfaction [20]. Participants were observed to integrate both clinical (patients' pronunciation of words like Church, Mississippi, Musisi, Nalumansi, and then count from 50 to 70 with the close watch when they say 66 and 55) and mathematical approaches which involve getting the difference between Rest Vertical Dimension (RVD) and Occlusal Vertical Dimension (OVD), (RVD-OVD) when determining the 2-4 mm freeway space. This is in line with the recommendation made by Driscoll & Golden [21], that height can be confirmed by having the patient pronounce words that have fricative sounds (55 or any words with F and V sounds). Have the patient count from 50 to 60 and watch closely when they say 55. This comprehensive method indicates a multifaceted approach, considering both qualitative clinical assessments and quantitative measurements. Such integration leads to accurate evaluation and enhances the precision of determining freeway space for optimal denture function [22].

The participants in the present study acknowledged the impact of international guidelines while emphasizing the need to tailor the ORB height to individual cases. Indeed, such a perspective is in support of previous studies [23] on the OVD for complete dentures, which stress the importance of individualized approaches in achieving treatment success.

The present study highlighted a trend where the height of ORB in the Ugandan setting often falls below international standards. This is in line with other studies [24, 25, 26, 8,16] where most heights range from as low as 17 mm for the upper anterior to 15-16 mm for the mandibular anterior. Similarly, Gupta [27] emphasizes the significance of considering each case independently, aligning with the principle of patient-centered care. In addition, a study by Esan et al., [28] emphasized the importance of adapting to the ORB heights guidelines to cater to diverse populations. Furthermore, the difficulties highlighted in our study resonate with Bishop's [11] study on designing ORBs to save clinical time and improve accuracy where designing ORBs is based on facial measurements and analysis of existing dentures, acknowledging the need for personalized approaches. The call for more localized standards in our study aligns with findings from other regions, emphasizing the customization of the lower ORB height to patients' esthetic requirements [29]. The study's argument for tailored guidelines is further supported by the challenges clinicians face, as highlighted in the examination of mandibular edentulous bone height, where patient satisfaction is a critical aspect impacted by anatomical considerations [30].

The negative impact on chair-side time and material wastage is aligned with the findings of the Uganda Dental Association Journal, which discusses the clinical effectiveness of new surgical approaches [31]. The study has revealed that there are mixed reactions and limited experience with the new measurements to necessitate a comparison and some participants also noted that not being aware of the new measurements will impact positively on the treatment of edentulous patients since there were few patients seen yet to make a concrete conclusion. The study highlighted a positive shift in dental clinicians' acceptance of the newly estimated ORB heights, emphasizing improved chair-side efficiency and reduced

adjustment needs during bite registration. However, this transition towards an established standard height brings forth challenges in aligning standardized measurements with individual patient needs, as noted in the study considering African morphology and the time-saving benefits of adopting locally derived measurements. The adoption of new measurements is a game-changer, addressing concerns raised by dental clinicians reshaping patient experiences, and aligning with patient-reported outcome measures [32]. The positive impact on referral patterns reinforces the findings, as patient satisfaction often influences their likelihood to recommend services to others.

The positive effect of new measurements on clinical time is evident in the reported reduction in appointment duration, echoing the significance of time management in dental settings reported in [33]. This further correlates with a study emphasizing the importance of efficient procedures in enhancing overall dental practice outcomes [34]. Our study emphasizes the cost-saving benefits associated with lower dimensions and reduced material usage aligning with Smith et al., emphasizing the economic efficiency of dental procedures and the importance of minimizing material wastage in dental practice [35]. Most participants emphasized that the ORBs should be fabricated while considering the individual and anatomical features of the edentulous patients, not forgetting the right dimensions, angles, and measurements. This is in line with the recommendation made by Wood and John. They emphasized that when the rims are made to the right 'average' dimensions and anatomical angles, the registration process is much easier, quicker, and more accurately carried out, but when the height and width of ORB are ignored during fabrication, this may lead to the ORBs restricting the tongue space and encroaching into the cheeks and lips, distorting the denture-bearing area hence movements of the rims during registration, resulting in inaccurate registration of the occlusion and sometimes selecting of slightly wider than the teeth they will eventually carry [9].

Implications for Clinical Practice

The present study showed that the newly localized ORB height for patients in Uganda has the potential to improve patient management as well as the development of more tailored and effective clinical protocols for edentulous patients. Furthermore, the findings of the present study among the Ugandan population will set the center stage for improved rehabilitation of edentulous patients. This will save time and resources during the registration stage and help to improve the accuracy of the removable complete dentures.

Implications for Future Research

Building on the study's observation of ORB heights often falling below international standards in the Ugandan setting, future research should explore the effectiveness of individualized treatment approaches that correlate between individualized ORB heights and patient satisfaction to provide valuable insights into optimizing treatment outcomes in diverse populations.

Limitations of the Study

This study relied on the self-response of participants, and it was facility-based, participants who were interviewed might have given responses favoring the healthcare provider resulting in social desirability bias. In addition, the study centered in Makerere University Dental Hospital, Kampala, Uganda, may face limitations in generalizability to the Ugandan edentulous population, and other cultural and demographic contexts.

Recommendations

The study findings advocate for a comprehensive understanding that goes beyond standard height considerations but also looks at incorporating tooth size alongside the occlusal

vertical dimension. Furthermore, participants advocated for increased documentation and knowledge-sharing within the dental community.

Conclusion

Being able to assess/evaluate the clinical suitability of a patient's established ORB height will allow ORBs to be constructed that have the correct dimensions and anatomical features for a particular patient. This will save time during the registration stage and help to improve accuracy. The study supports the adaptation to tailored ORB guidelines, emphasizing improved treatment outcomes, patient satisfaction, and efficient utilization of clinical time and resources in dental practice. There is still insufficient understanding concerning the new standard height of ORBs within the dental community. This kind of tailored set of guidelines can only be adhered to successfully after the gap in awareness has been bridged.

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Conflict of Interest

The authors declare that there is no conflict of interest.

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Author's Contributions

DN, IO, BNS, and CMR participated in the conception, study design, data analysis, and manuscript preparation. DN and GB participated in data collection. All authors read and approved the final manuscript.

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Traits and Skills Required by Project Managers to Complete Construction Projects in Guyana's Civil Engineering Firms

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Abstract

This paper will highlight the important features of Project Management Traits and Skills and identify the most effective skill set to produce a successful Construction Project. The paper is laid out with a general introduction of the key concepts of Project Management, specifically Construction Project Management, it then examines the crucial traits, skills, and characteristics and determines based on research of works completed as to the combination that is most likely to achieve project success. It was established that Interpersonal skills, leadership, effective communication, and prompt technical skills were likely to produce the most successful project. The purpose of the research study is to place, in the research linguistics, the methods and instruments to be used in the research model, from the location of the type of study and the design of the research; its world or population; its samples; and the instruments and techniques of data collection. The techniques used in this study will be based on the literature, review of standards of traits and skills, studies, and research undertaken previously, which will allow to gather the information needed to make findings and conclusions and develop the Risk Management Plan. The result was identifying traits and skills needed by Project Managers to compete and complete construction projects and how project managers must operate and respect the professional codes of their field, particularly the responsibilities that surround all facets of project management.

Keywords: *Communication, Ethics, Emotional Intelligence, Project Manager, Skills, Traits.*

Introduction

Project Management existed in practice for centuries before the term was formally coined. Projects were imagined and executed very differently from what is obtained in today's world. The skills and traits of a Project Manager have been studied, tested, and documented for decades but the debate continues into what exactly assures the desired outcome.

Historically, projects were managed by technical specialists (architects, engineers, etc.) who would be integrally entwined in the project. It is common for a Project Manager to be a specialist of sorts and then progress through the rank and file, ultimately becoming a manager for projects after significant knowledge and experience have been earned. This tradition gives support to the trend of becoming technically proficient before acquiring the managerial skills needed. They would possess technical knowledge which translated to trust from clients and others who would be comfortable with a technical expert as the Project Manager. He would be able to demonstrate an in-depth knowledge of the project details and operations.

The skills and traits suggested by many scholars and authoritative bodies boast an extensive list. Given these lists, it seems

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wishful to expect one person to be competent in all. As delegating is a key skill for a manager, it would follow that a project manager only needs to manage people with the required skills. It is acceptable for project managers to only possess awareness in some skill areas. In those areas where they lack proficiency, they can recruit professionals with the technical skills to fill those gaps. Civil Engineering firms also require a wider array of skills, especially in the Consultancy Management focus and how this aspect can better equip and aid construction management.

There are many reasons why projects fail and similarly so for projects that succeed. Is there a recipe for success or are there some distinct characteristics that define failed projects? Alternatively, is there a set of characteristics that define successful projects? This paper seeks to explore the established theories about the skills and traits required of a Project Manager to deliver successful construction projects. It will further evaluate the most critical skills identified for success.

The design of this research is non-experimental, and trans-sectional as we make the description of the variables, as demonstrated in the analysis of the same, considering its interrelation and incidence, in these designs the data collection will be carried out only once, and in a unique time frame.

Literature Review

Project Manager Traits, Skills, and Project Characteristics

Many experts have contributed to developing comprehensive task lists which each believed to be the definitive list of a Project Manager's tasks. [1] published comprehensive lists of tasks that share many commonalities. As the description of these tasks overlaps with those of much older professions, (architect, quantity surveyor, civil engineer, etc.) there are bound to be conflicts arising out of a claim for turf. The project manager will have to distinguish himself by adopting the essential characteristics and traits that are believed and proven to empower him to be successful.

This literature gap sets out to identify and explore the gaps/current relationship between key managerial competencies, and the lack of them within the industry.

Sources to be used are as follows:

Construction Industry Council

The publication [1] outlined five topic areas in which the skills of a project manager are grouped into strategic, project control, technical, commercial, organization, and people. Each skill is further grouped into two areas in which the project manager should be competent (i.e., must have received training and gained experience by regularly practicing) and aware (through formal education, technical reading, and being exposed to others practicing the various skills).

The below diagram (figure 1) as published by [1] illustrates the skills that the project manager should be aware of and those in which he/she must be competent.

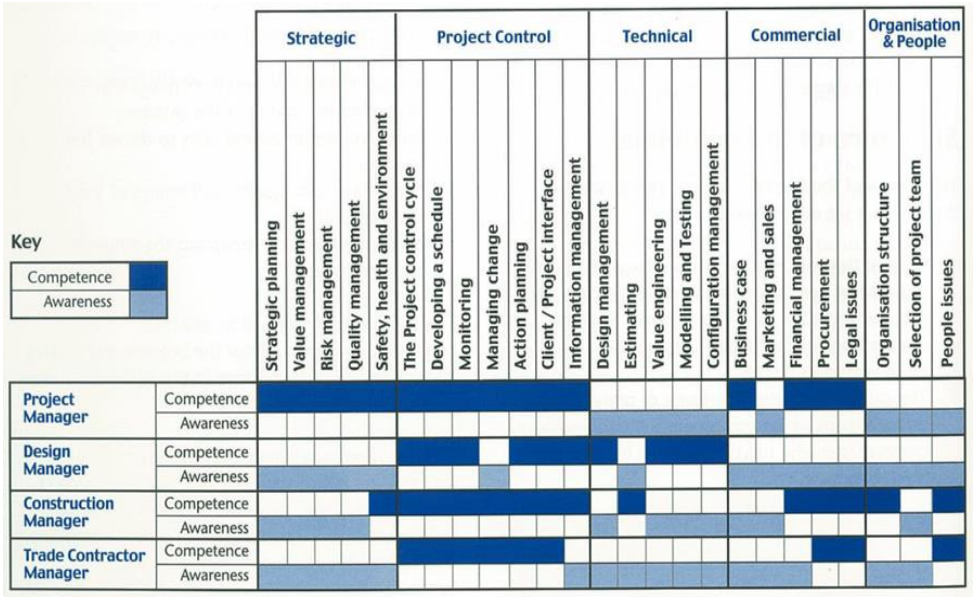

Figure 1. Figure Showing Skill Type Requirement for Project Managers

The result of the figure above outlines a picture of the project management situation in the global construction industry and the increased demand for this skill set. New industries are adopting project management and reaping its benefits along the way. PMI job growth to these competencies and awareness are important contributors to productivity.

According to [2]

"The Skills and career path of an effective project manager" [2]. Through questions posed to project managers and reviewing existing management literature, he concluded that there are three main skill areas as described below.

1. **Human Skill**
   The Project Manager will need to work in a team recognizing the attitudes of his managers, equals, and staff about how he behaves.
2. **Conceptual and Organizational Skills**
   The Project manager must be able to visualize the entire project from the beginning to the end so that if there is a change in a certain aspect of the project, he should be able to understand how it would affect the outcome and adapt accordingly.
3. **Technical Skill**
   Technical skill refers to the Project Manager being skilled in a specific activity. He must be able to use the tools and techniques required of the specific discipline.

Based on the data acquired and displayed by graphs and tables in his presentation, human skills have the greatest influence, and technical skills have the least influence on project management practices.

Project Management Institute [3]

Although a project may be well funded and consist of highly trained and experienced individuals, if these resources are not skillfully coordinated there is still a risk of falling short of the project goals [3]. They stated that a Project Manager should be competent in the following areas:

1. **Knowledge Area**
   The Knowledge area identified is broken up into three skill groups: general management skills, project management skills, and industry skills. General Management skills refer to those skills that are required when functioning in a management position (leadership, negotiation, communication, team building, and other human resource management skills). The project management skill area speaks of the knowledge of basic processes, tools used,

and the scope, time, and cost management factors. Industry-specific management knowledge refers to the management of the lifecycle of specific projects and methods of product development concerning specific industries.

2. **Proven Experience**
   This area speaks to several factors such as the extent of the Project Manager's professional experience, his reputation, actual hours spent on projects, and the complexity of those projects.
3. **The Personality Area**
   Both personal characteristics and people management skills make up this area and are often touted to be the most important. Personality characteristics refer to such things as confidence, enthusiasm, open-mindedness, adaptability, and personal integrity, while people management skills are those that enable the Project Manager to effectively communicate, motivate, influence, and be politically sensitive. Emphasis is placed on the political sensitivity attribute as projects are executed in an environment highly influenced by politics.

Additionally,

Project Management Institute [4]

Hard skills versus the soft skills of a project manager. He noted that [4],

It is impossible to realize the value of a powerful microprocessor unless it has contacts outside of itself, is connected to them, and can communicate with them. Likewise, technical professionals must master communication to be effective.

Project Managers must possess two types of hard skills – technical skills within the project area (if a bridge-building project, then the Manager should know about bridges) and project management skills (specific items such as Gantt Charts, calculating Earned Value, etc.). Soft skills are required to realize the value of these hard skills. He posited that soft skills are more about behavior and the application of those behaviors rather than about knowledge and can be narrowed down to a few foundational skills, such as the ability to engage and interact effectively with others. He concluded that the foundational soft skill is simply and definitively about communication.

Results and Discussion

Evaluation of Skills and Characteristics Considered Essential for Successful Project Management using Consultancy Services

While the extensive lists of skills and characteristics of successful project managers are generated and categorized (technical, social, etc.), it is unclear as to which skills a project manager should exhibit consistently high competency levels or whether these should vary concerning the nature of the project [5]. They did, however, point out that it is well established that the environment in which projects are executed is changing along with the teams associated with those projects.

According to [5], Others agree that project manager performance and project success are strongly linked. The main cause of project failure is a lack of project manager leadership [6]. Project manager ability is among the most essential elements leading to strong project performance [7].

Some of the most important skills in which the project manager is required to be competent are discussed below.

Emotional Intelligence

Every project is unique in its details, scope, team, and skill required. While there are certain standard skills required for project success, in some cases one skill will take precedence over another. One specific skill that continues to evolve and play a major part in project success is Emotional Intelligence. Emotional Intelligence is identified as a soft skill as it does not require technical expertise or traditional knowledge of the project. According to [8], the

term was first partially identified by Edward Thorndike in 1920 as Social Intelligence. However, the definition was limited as it only covered the "ability to understand and manage people." Davis went on to credit Wayne L. Payne who in 1985 expanded on this to create a more complete definition by acknowledging the elements of outward as well as inward considerations.

“Project management is at least 50% people management” [9]. Strohmeier in 1992 posited that project managers spent approximately 88% of their working hours interacting with different stakeholders [10].

Emotional intelligence as defined by [11] is the “ability to monitor one's own and other’s feelings and emotions, to discriminate among them and to use this information to guide one's thinking and actions”. Therefore, a Project Manager should be able to effectively manage his emotions, the emotions, and interactions of his team, and even extend as far as managing the client.

Emotional Intelligence is becoming a common element of focus amongst organizations and evidence of its link to successful leaders is emerging. Having a Project Manager who is emotionally intelligent means that he is sensitive to the team members’ reactions and can foster an environment of communication and cooperation. Lots of highly qualified and intelligent individuals are unable to interact meaningfully with people, which often creates barriers and conflicts.

The Project Manager will need to possess this skill to transform the stakeholders from a group to a team, as professionals will be bringing their unique experiences and ideas. Conflicts will often arise which are not necessarily detectable at first. A Project Manager with high emotional intelligence will be able to penetrate these barriers.

There are a host of real-life examples and research that proves that Project Managers need to possess this quality. According to [12], “Research shows that people with strong emotional intelligence are more likely to succeed than those with high IQs or relevant experience.” He went on to list a few examples of research that was conducted in this field:

1. The Center for Creative Leadership found that the primary causes of executive derailment involve deficiencies in emotional competence.
2. A global executive search firm worked with hundreds of executives and discovered the ones that had a higher probability to succeed were the ones with a high emotional intelligence trait as opposed to those with a high IQ or experience in a relevant field [13].
3. The study by the Carnegie Institute of Technology highlighted that 85% of financial success is due to “human engineering” skills, personality, and the ability to effectively communicate. Technically the component was ascribed to 15% [14].
4. “After supervisors in a manufacturing plant received training in emotional competencies such as how to listen better, lost-time accidents decreased by 50% and grievances went down from fifteen per year to three per year [9]. The plant itself exceeded productivity goals by $250,000”, [15] went on to analyze productivity as being the key measure of manufacturing companies.

Communication

The ability to communicate effectively is an essential characteristic for a Project Manager to cultivate. There is a popular adage that communication is a two-way street, but in the case of project management, communication requires a much wider "road" network. The Project Manager needs to be able to regularly communicate effectively with his team, clients, and third parties and manage the communication among these parties as well. He is required to act on behalf of the client as well as sustain an efficient and well-functioning

project team. Because of this, communication is of paramount importance [16].

In the Caribbean, CARICOM promotes the free movement of the workforce among the Caribbean Community. Similarly, migration trends and globalization indicate that a Team may be comprised of people with varying backgrounds, ethnicities, languages, and dialects. Due to the need for cultural sensitivity, such factors can lead to miscommunication on certain key facts which can affect a project's success. Even though the Caribbean community is mostly English-speaking, dialects and slang often skew conversations giving rise to gross misinterpretations which in turn feeds conflict and confusion.

In the case of the Boeing 747 Dreamliner Project, [17] noted that one of the aims of outsourcing was to increase profits and reduce the timeline, but the opposite occurred as the Project overran its schedule in all conceivable aspects and overall costs. The Project did have a few success stories, but one downside was due to issues about communication. While the language differences proved challenging, which often led to no or inaccurate information being transmitted, the failure to input correct information into a new web-based computer system was even more evident. Boeing increased its costs and schedule as it had to put measures in place to combat these challenges by sending representatives on the ground in each country to resolve the issues identified.

As evident in the diagram below (figure 2), by [9], communication depends on the number of people involved in a project as well as understanding and utilizing the best method of actual communication for the project. The Manager must decide on the perfect recipe for meetings, emails, memos, verbal communication, etc. In a construction project, for example, email may not be an effective means of communication with the actual construction team who will spend more time on site than at a desk. In the same project, however, communication via email with the client may be the most effective way of communication. As such, the Project Manager is tasked with managing these methods and essentially "translating" all elements into one standard "language" to ensure that all relevant parties are clear on the critical elements of the project.

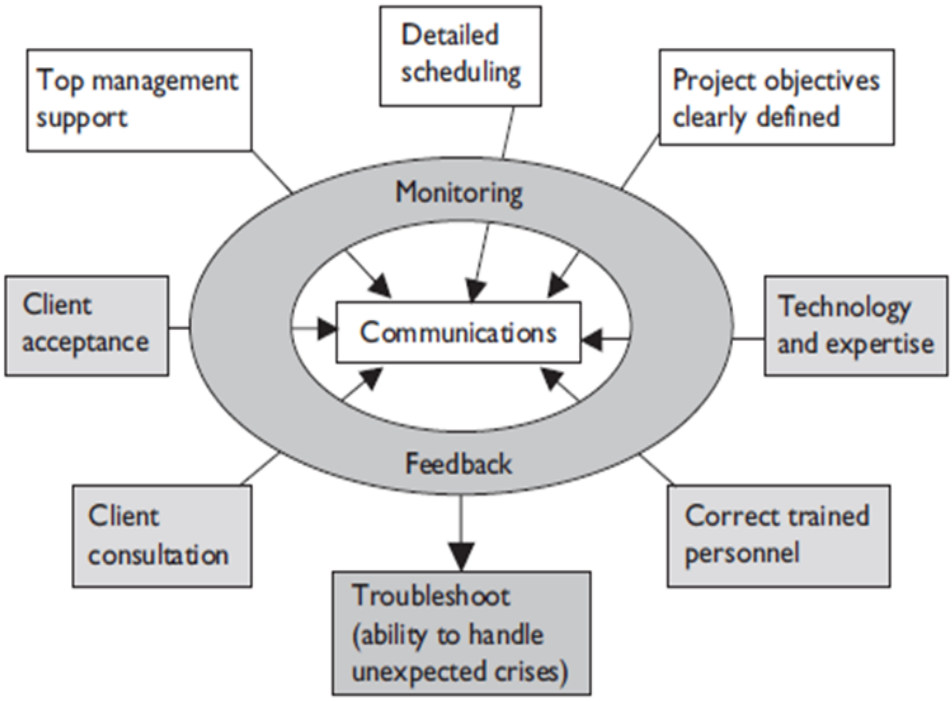

Figure 2. Factors of Success

Ethics

Ethics is particularly relevant in construction project management [9]. It is tied directly to the Project manager's reputation. Ethics refers to "the duties owed to the public, to each other, and themselves regarding the exercise of their profession" or doing that which is right. [18], went on to say, "The cause of ethical failure in an organization can often be traced to its organizational culture and the failure on the part of the leadership to actively promote ethical practices." This can be expanded to include an entire country such as those with small populations where everyone is influenced and exists in the same environment. A conviction of what is right and wrong is often relative and justified based on one's belief and experience [18].

In a developing country like Guyana, with a small population of less than 800,000 people, qualified Project Managers are few whereas available public construction projects are many. Construction contractors are constantly and often tempted to solicit information such as engineer's estimates and other internal information in exchange for money which can give them a significant advantage in securing a bid. During the execution phase of projects, the detailed and thorough inspection and certification can be marred by corrupt clerks of works and engineers who inflate Bills of Quantities and approve shoddy work to ensure a kickback after the project is closed.

Construction companies, government agencies, financial and funding institutions, and insurance companies face significant threats due to unethical practices such as bribery and under-the-counter gifts. These often end up in extorting, embarrassing investigations, criminal prosecutions, fines, and damage to the economy at large. The Project Manager with a poor ethical code will jeopardize not only his reputation but the project with potentially wider effects [19].

Since the construction sector is a major revenue generator for most countries it can become a great danger when unethical practices are rampant as economic growth can be stymied. Transparency International in a report in 2011 stated that the construction industry is the most corrupt of any sector and that it not only enriches the corrupt but adversely affects the supply of essential goods and services to the population such as medicine and housing. Companies are now required by some agencies to demonstrate adequate steps have been taken to assure that their representatives will not engage in bribery and corruption.

Conclusion

There have been many academic contributions about the traits and characteristics of a Project Manager. In some cases, the only distinction between submissions is in the words used to describe the attribute or when one contributor leans towards what is referred to as the technical versus strategic traits or soft versus hard skills. Two themes remain common amongst the popular theories, however – strategic/managerial and operational/technical.

Although historically Project Managers were technically proficient which derived from experience and training, it is more widely accepted today that there is a direct path to becoming a successful and competent Project Manager with the skills and traits hinging more towards soft skills.

As the discussion and research continue, the importance of soft skills will continue to be widely researched and tested. It is without doubt that the Project Manager is the central element of the Project Team who acts as the gel amongst all stakeholders. Although projects vary and so do individuals, some key traits and skills will influence project success. There is certainly no single recipe to follow, and the proof of a successful outcome depends on the right combination of specific ingredients.

Humanistic traits and skills are an important aspect in all working environments, the construction sector has no exceptions, therefore, a meaningful plan must be instituted

to allow this parameter to be met. This plan will enable the implementation of the objectives to increase the probability of achieving the goals within the scope, time, cost, and quality.

A great Project Manager has high-quality training, an evolved set of skills, and the constant hunger to improve themselves, be able to instantly think of all the most possible consequences of any decision made on a project, and determine the most probable outcome, be able to collaborate with your team and be capable of asking for and taking advice and need to be a quick thinker.

The project manager must recognize and respect the professional codes of the other disciplines, and particularly the responsibilities of all disciplines to society, the environment, and each other.

It is essential, to ensure an effective and cost-effective service, that the project should be under the direction and control of a competent practitioner with a proven project management track record developed from a construction industry-related professional discipline.

Projects and project performance may vary along with the individuals who partake, but the traits and skills will influence the project's success. While there is no one precise format to have execution done, it will ultimately depend on the project team and manager.

Conflict of Interest

I, Latchman Singh declare that there is no financial, commercial, legal, or professional relationship with other organizations, or with people collaborating with them, that could influence this research.

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Digitalisation and Economic Inclusion: Lessons from Rural Women in Umguza District Zimbabwe

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Abstract

This article explores the usefulness of digitalisation in the economic inclusion of rural women in the Umguza district of Zimbabwe. An inductive approach was used, and information was collected through semi-structured interviews with 250 rural women in the 19 wards of Umguza district between the ages of 16 and 65, as well as reviewing secondary data in the form of government, non-governmental, industry reports and scholarly articles. Thematic analysis was used to draw insights on pertinent themes and patterns related to the role of digitalisation in the economic inclusion of rural women. The key findings indicated that the lives of rural women who accessed and used digital technology improved through active participation in economic activities and had greater, faster access to information and skills resulting in higher productivity. The findings highlight the necessity of adopting a gender-sensitive approach in rolling out technology-based initiatives to ensure the sustainable economic inclusion of rural women, ultimately contributing to the broader goals of gender equality and economic development. The study concluded that access to and usage of digital technologies opens up economic prospects for rural women, enriches their financial status, increases their access to education, and nurtures social connectivity. The findings also show that when elements like the provision of cheaper broadband solutions and low-cost smartphones are not attended to, digitalisation has the potential to adversely affect rural women resulting in the widening of the digital gender divide. The recommendations from this study provide insights to government, private sector, and civil society seeking to drive women's economic inclusion through digitalisation and contribute to the body of research on digitalisation and rural women's economic inclusion.

Keywords: *Digitalisation, Digital Infrastructure, Digital Public Platforms, Digital Skills, Economic Inclusion, Financial Services, Rural Women.*

Introduction

Digitalisation is a process that integrates digital technologies into various aspects of life, making use of digital tools, platforms, and systems to enhance commerce, communication, education, and other relevant sectors [1]. The rise of mobile banking applications and online payment systems is key to digitalisation efforts and has made financial transactions more convenient and efficient. Digital wallets and contactless payments have become increasingly popular, offering quick and secure purchase methods to individuals and businesses regardless of physical location.

There has been an increasing recognition that economically empowering women is critical in achieving community development goals such as economic growth, poverty reduction, health, education and welfare [1]. Over the past few years, digital empowerment has emerged as a global trend with the potential to transform societies and address immediate challenges faced by women residing in rural parts of Zimbabwe [2]. Secondly, digitalisation gives rural women access to knowledge-based resources, training programs, and information that improve their

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economic activity abilities and competence. Online platforms provide rural women with flexible job options, enabling them to manage their work and other obligations. Digital financial services facilitate safe transactions, savings, and credit availability for efficient money management and support financial inclusion.

This research explores the impact of digitalisation on rural women across multiple domains. The study examines how digital technologies have influenced rural women's marketing and selling of agricultural produce, financial inclusion, and access to commercial platforms. It also identifies the challenges that arise from digitalisation. The research drew on data collected through interviews with rural women and from various scholars to provide an up-to-date analysis of the digitalisation journey in rural Zimbabwe and its effects on women's lives. Understanding digitalisation's role in advancing rural women's economic inclusion in Zimbabwe paves the way for tailored policies and interventions that address existing barriers and create new opportunities. The results of this study help to shed light on how access to technology, digital skills training, and online resources can empower women in rural areas to enhance their economic prospects.

Rural women can reap many benefits from integrating digital technologies into their everyday routines and economic endeavors. Firstly, digitalisation can expand the rural women's market reach by introducing them to a clientele base that is larger than that of their neighbourhood, thereby creating new business prospects. Digital platforms encourage networking and collaboration among rural women, promoting knowledge sharing, collaboration, and mutual support in their economic endeavours. Additionally, by simplifying conventional business processes, digitalisation can result in cost savings, increasing the affordability and sustainability of entrepreneurship. Digital technologies make market research easier, allowing rural women to analyse trends and modify their offerings to satisfy customers better. Ultimately, participating in digital economic activities can help rural women become more self-assured and confident, enabling them to follow their business dreams.

Moreover, by highlighting successful digital initiatives and identifying areas for improvement, this study can inform stakeholders, including policymakers, non-governmental organisations, and businesses, on effective strategies to promote gender equality and economic empowerment in Zimbabwe's rural communities. Ultimately, research in this domain contributes to sustainable development efforts, fosters inclusive growth, and helps unlock the untapped potential of rural women in Zimbabwe.

Literature Review

The internet penetration rate in Zimbabwe stood at 59% in 2021, indicating a substantial increase from 27% in 2017. Mobile phone usage has also surged, with mobile subscriptions reaching 14.1 million in 2021, compared to 12.9 million in 2017 [3]. These statistics demonstrate the growing access to digital technologies in Zimbabwe. Financial inclusion of the rural areas improved from 62% in 2014 to 79% in 2022 [4]. The financial exclusion gap declined from 28% to 16% respectively, largely driven by increased uptake of banking and mobile money financial products.

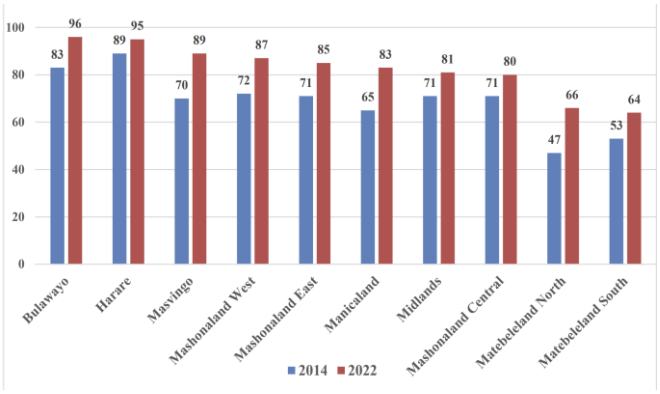

Figure 1. Access Strand by Province - Total (% of Adult Population)

Matabeleland North province, of which Umguza district is one of the districts in this province, has one of the lowest financial inclusion rates in Zimbabwe despite the gap slowly closing as seen by the provincial financial inclusion numbers growing from 47% to 66% between 2014 and 2022, as depicted in Figure 1. Digitalisation has made financial inclusion important for rural women's economic empowerment in Zimbabwe and the district of Umguza [5]. The impact of digitalisation is encapsulated in the ICT-enabled Social Inclusion Theory which focuses on the potential of information and communication technologies to promote social inclusion and economic empowerment. The theory emphasises the role of digital tools in expanding opportunities for marginalised groups, facilitating access to education, healthcare, financial services, and employment, and promoting inclusive economic growth [6]. Studies support this theory and show that mobile money services enable transactions, savings, and credit without bank infrastructure, benefiting women in economic participation. The introduction of mobile money platforms such as EcoCash, OneMoney, and Telecash in Zimbabwe has provided these women with an expedient and secure method of storing and transferring money using mobile phones [7]. These platforms have necessitated that women overcome the obstacles of distance and limited access by substituting physical banks and replacing them with digital platforms to conduct financial transactions [8]. Undoubtedly, this eliminates the risks related to stashing cash at home or carrying it around.

Digital banking has simplified access to credit for rural women farmers. Through digital platforms, women can apply for loans and access credit services without needing tangible collateral or rigorous paperwork. Digital lending platforms such as Steward Bank's Kwenga and Agribank's e-Access have occupied space and covered the gap concerning the needs of rural women farmers [9]. These facilities ensure efficient and convenient loan disbursements, enabling women to invest in agricultural undertakings, purchase inputs, and improve productivity [10]. It is worth pointing out that the benefits of savings and credit, through these web-based or electronic platforms, have also enabled rural women to access insurance services. Insurance institutions in Zimbabwe have introduced mobile-based insurance products that satisfy the specific needs of rural women farmers [11]. These services cover crop losses due to drought, pests, or diseases, ensuring women farmers are shielded from financial shocks. Rural women can, without difficulty, enrol in insurance schemes, pay premiums, and file claims, increasing their resilience to agricultural risks via electronic means [16].

There is a need for comprehensive strategies, which include technology, financial literacy, and education for women's empowerment through education and skill development [12]. These interventions are

intended to remove barriers that prevent rural women from accessing and utilising digital financial services. Various initiatives have been implemented by the government and non-governmental organisations (NGOs) to promote digitalisation in rural areas. The government's National ICT Policy, launched in 2016, sought to bridge the digital divide and enhance connectivity across the country [13]. As a support vehicle, the Postal and Telecommunications Regulatory Authority of Zimbabwe (POTRAZ) has implemented the Universal Service Fund (USF), which supports the provision of ICT services in underserved areas, including rural communities [14]. This fund has aided the digital transformation of the district and by extension the rural women allowing the women to access various social and financial platforms.

Studies have shown that digital technologies can provide rural women with market prices, weather forecasts, and crop- and location-specific agronomic advice to boost agricultural productivity and market connectivity [15]. With market price knowledge from mobile apps, women can negotiate better product prices, potentially boosting income and economic resilience [16]. Women farmers can sell directly to customers on digital platforms, thereby maximising profit margins [17]. The digital entrepreneurship theory supports these market observations in Umguza, emphasising the role of digital platforms and online marketplaces in fostering entrepreneurship and economic inclusion [18]. The ICT-enabled Social Inclusion Theory highlights how digital technologies can lower barriers to entry for aspiring entrepreneurs, especially women and marginalised groups, by providing opportunities to start and grow businesses in the digital economy.

Technology usage has demonstrated the potential to overcome barriers such as distance, cultural norms, and control, as well as improve the quality of education or training opportunities by allowing flexible, accessible and diverse content [16]. Online platforms, courses and support, allow women to study from home and not have to commute to an education facility for hours [19]. The Zimbabwe Women's Resource Centre and Network (ZWRCN) implemented projects empowering rural women through digital literacy training and establishing community information centres so that women would not have to travel long distances for physical classes [20]. The success of such initiatives demonstrates how providing digital platforms and resources positively impacts underprivileged groups and women.

The study also explores the importance of overcoming digitalisation obstacles to maximise the impact of digital technologies on rural women's education and training by increasing digital infrastructure, such as internet connectivity and affordable tools, which is crucial [16]. Studies suggest that digitalisation has a positive correlation to higher income-generating potential. Successful implementation and provision of digital tools in rural farming communities of Zimbabwe has resulted in increased productivity and net income for women as evidenced by pilot projects and case studies [12]. An example is the 'Mobilizing Access to Sustainable Agriculture and Rural Transformation' (MASTER) project introduced by the International Fund for Agricultural Development (IFAD) in partnership with the Government of Zimbabwe, where farmers were given smartphones which had agricultural apps and access to digital platforms that offered weather forecasts, market prices and up-to-date agricultural related information [21]. These digital tools enabled rural women to make informed decisions in crop selection, pest control methods and market opportunities leading to increased productivity and net income [22].

One of the limiting factors of the use of digital tools for rural women has been digital literacy, which hinders their ability to use,

understand, and benefit from digitalisation vehicles[17]. Rural women are said to lack the knowledge and skills to use digital resources [15]. This can hinder their ability to access and use agricultural apps, digital platforms, and technological resources. Rural women struggle to navigate these digital tools and do not fully benefit from the information and services [22]. Providing community-based digital upskilling programs is critical to further rural women's adoption and usage of digital tools.

Cultural obstructions also play a role in prohibiting the effective digitalisation of rural societies [23]. Cultural norms prioritise men's control over financial matters, disregarding women's access to digital financial services. Traditional views prioritise women's primary roles as caregivers and homemakers, limiting their time and focus on their education and entrepreneurship skills, thus compromising personal development. Some communities subjugate women and girls' education to men and boys, leading to lesser levels of literacy.

The lack of internet and device infrastructure makes it difficult for rural women to use ICTs [17]. Various studies stress the need for targeted interventions to reach rural women and provide them with access to digital tools, training to operate them and handholding to acquire confidence in using the technology [24]. The digital divide in Africa has worsened educational disparities between urban high-income and rural low-income groups. Rural women's access to e-education and skills training is further limited by high-cost data bundles and low ownership of digital devices [19]. In Umguza the Digital Learning Centres (DLCs) established by the Ministry of Primary and Secondary Education in Zimbabwe, in partnership with non-governmental organisations, have been used as a strategy to reduce the barriers to access. These centres have computers and internet connectivity, allowing rural women and girls to access educational materials and partake in online courses for free [25]. The DLCs also provide digital literacy training to enhance rural women's skills in using technology for learning purposes. Research was conducted that evaluated the impact of DLCs on educational outcomes among rural women and found that they meaningfully improved access to learning resources and enhanced digital literacy skills [25]. Community-based initiatives play a pivotal role in raising awareness and supporting rural women, helping them overcome societal barricades and gain confidence in using digital platforms [26].

Improving digital access is one of the requirements to bridge this gap. Investments in internet and mobile network infrastructure in rural areas can improve digital access [5]. Making digital devices cheaper, through subsidies or financing can increase rural women's uptake of these devices. Tailored digital literacy programmes that consider rural women's needs and constraints can help them use technology [7]. A framework for how rural women can take part in designing digital solutions so that they cater to their unique issues is necessary [19]. The participatory design process argues that rural women can make digital tools user-friendly and resourceful for their everyday lives, which will settle the habituation and usage factors. Financial education complemented with digital literacy training helps women understand and be more confident in using digital financial services, thereby increasing rural women's participation in the digital economy [5].

Overall, rural women who incorporate digital tools and infrastructure can uplift their economic status and access better resources, information and markets. Digitalisation also gives these women a competitive edge as they can achieve greater productivity, market access, and efficient use of digital financial services [27].

In conclusion, the literature review highlights the importance of inclusive digital transformation strategies that address rural women's needs. It also highlights the need to

limit the barriers rural women face so that they can maximise the benefits of digitalisation. The case of Umguza women provides valuable insights into how the economic empowerment of rural Zimbabwean women requires the rollout of digital infrastructure and the creation of programs to improve digital literacy, affordable solutions for services like the internet, and a participatory design of digital solutions.

Research Methods

The study employed a survey method utilising a questionnaire with open-ended and closed-ended questions administered to 250 Umguza women in all 19 wards in the district.

The article methodology involved a literature review of various articles, theories, and frameworks relevant to the study topic. These theories and frameworks enabled determining the current and desired states and the gap in digitalisation's impact on rural women and this process informed the research questions.

Primary and secondary data sources were used in data collection. Primary data was collected through questionnaires, and secondary data collection was done through government reports, various articles by financial institutions and non-governmental organisations, journals, and papers. Statistical analysis techniques were used on the quantitative survey data, and thematic analysis was used on the qualitative data from interviews and other qualitative sources.

Results interpretation combined findings from both qualitative and quantitative analysis and drew conclusions about the relationship between digitalisation and the economic inclusion of rural women in Umguza. The existing literature and the study research questions provided a guide and context for interpreting results. Recommendations have been made on how to increase the ubiquitous inclusion of rural women through the implementation of several digitalisation strategies in Umguza, guided by the study findings. The study findings have an important bearing on policymakers, organisations who deal with women empowerment and the rural women themselves in providing suitable strategies to increase rural digitalisation, improve the welfare of women in Zimbabwe and drive improved livelihoods, revenues, and contributions to economic growth. The study also contributes to the existing body of research on digitalisation and how it impacts the economic inclusion of rural women. The main channel for disseminating these findings will be academic publications, industry reports and presentations to various and relevant conferences, workshops, and seminars.

Results and Discussion

The Table below summarises the study's findings on the role of digitalisation on the economic inclusion of rural women. The feedback is from the interview questions administered to the rural women in Umguza district in Zimbabwe:

Table 1 Summary Results on the Role of Digitalisation on Economic Inclusion

Digitalisation initiative	**Outcome**	
	Positive	**Negative**
Infrastructure	93%	7%
Public platforms	78%	22%
Financial Services	72%	28%
Digital skills	86%	14%

Table 1 summarises the rural women's opinions on the impact of the various digitalisation initiatives on the economic inclusion of rural women in the Umguza district.

On digital Infrastructure, the positive and negative percentage distributions on impact are 93% and 7% respectively. The overwhelmingly positive opinions on the impact of digital infrastructure highlight its importance in providing rural women with access to essential digital tools and connectivity. By improving access to reliable internet services and technology, rural women can overcome geographical barriers and tap into a wider range of economic opportunities. The positive impact suggests that investments in expanding digital infrastructure can significantly enhance the economic inclusion of rural women in the Umguza district.

The percentage distributions on positive and negative impact are 78% and 22% respectively. The results indicate that public platforms have a predominantly positive impact on the economic inclusion of rural women. Public platforms such as social media, online marketplaces, and communication channels play a vital role in connecting rural women to markets, customers, and information. The findings suggest that leveraging public platforms effectively can enhance market access, networking opportunities, and visibility for rural women entrepreneurs, contributing to their economic empowerment.

The impact of Digital Financial Services shows 72% (positive) and 28% (negative). The study reveals a positive impact of digital financial services on the economic inclusion of rural women, albeit with some negative aspects. Access to digital financial services such as mobile money, online banking, and digital payment systems can facilitate financial transactions, savings, and access to credit for rural women.

Lastly, Digital Skills show 86% (positive) and 14 (negative). The high percentage of positive impact associated with digital skills underscores the critical role of skills development in enhancing the economic inclusion of rural women. Digital skills such as computer literacy, online marketing, and e-commerce proficiency are essential for rural women to effectively navigate digital platforms and tools for their economic activities. The findings suggest that investing in digital skills training programs can empower rural women to harness digital technologies for business growth, market access, and financial management.

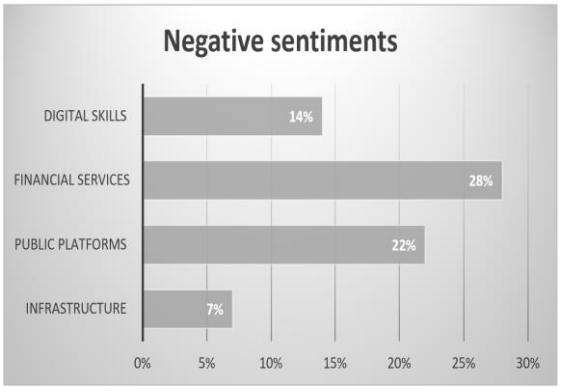

Figure 2. Negative Sentiment Tabulation

There were negative sentiments identified by the research in relation to the four pillars of digitalisation that the study is focusing on. The greatest negative sentiments came from the digital financial services pillar which had 28% negative opinions about the value of digital financial services in propping women up economically. The contributing factors to the negative sentiments included limited financial literacy of the rural women who highlighted how they did not understand most of the financial terms and concepts which in turn made them unsure of the products and limited their trust in using the digital financial

products. The Global Findex Database supports this finding and highlights that a number of the unbanked population lacks financial literacy, and this affects their ability and appetite to engage in digital financial services [28]. Concerns about trust in the banking system were also raised by the rural. The issues revolved around the cost of monthly transactions and how these erode their savings rather than augment them. Digital Public platforms had a 22% negative sentiment. Key drivers of this position were related to design and usability issues. Most of the platforms available were in English and not available in the local Ndebele language preferred by the women. The platforms were not zero-rated and required the women to purchase data bundles to access information which affected their ability to consistently access and benefit from the digital platforms. Digital skills and digital Infrastructure 14% and 7% negative sentiments a piece. The negative sentiments were mitigated by the efforts being driven on the ground by the government and independent organisations to upskill rural women through courses and workshops to drive up digital literacy. The importance of mentorship and support was raised as an important issue that affected the women negatively as some programs were run as once-off events. The women felt that continued engagement would help them better. The Umguza district has partial network coverage with some wards experiencing poor connectivity while others have no signal at all. This was highlighted as a major drawback. This limitation was coupled with electricity outage challenges that affected their ability to charge their phones and access the internet. Addressing these concerns is essential to maximize the benefits of digitalisation for rural women in the Umguza district.

Table 2. Use of Digital Infrastructure and its Impact on Weekly Takings

Use of digital infrastructure	**% of Respondents**	**Average Weekly Income USD$**
Not at all	7%	19
A little	11%	23
Moderately	41%	40
Almost always	23%	65
Always	18%	117

Table 2 summarises the respondents' access and usage of digital infrastructure. The study results show that building and improving digital infrastructure, such as broadband connectivity and reliable networks, ensures women have access to critical digital tools and services. This infrastructure in Umguza has enabled the women to participate in online markets, education, and communication.

7% of the respondents did not have access to and have never utilised any of the digital infrastructure. This was mostly due to lack of ownership of devices, long travelling distances to the ICT centres and age factors and 90% of the respondents in this category were above the age of sixty years old. 93% of the women had access to and use of the digital infrastructure, in varying degrees of frequency of use. The glaring observation is how, with increased frequency of use, women can increase their weekly income and economic productivity. This was driven by the fact that they could communicate with buyers and sellers and organise deliveries of their farm produce and goats timeously. The women could also reach out to customers in the nearby city of Bulawayo, increasing their market coverage. On the downside, access to digital infrastructure was hampered by the high costs of data, smartphones and electricity, which in some instances is unavailable. The women indicated that the share of their wallets they

could allocate to purchase data bundles was limited by their meagre earnings and they therefore used most of what they earned to provide food and clothing for their families. This suggests that deliberate efforts need to be made by device resellers, network operators and the Government to provide affordable devices and lower broadband prices so that more women can own a smartphone and be able to connect to their market so that they increase their income-generating activities. Failure to address this requirement can increase the digital divide. The main platforms accessed by these rural women were WhatsApp, Facebook and Facebook Marketplace. The women also accessed Government platforms like Zim-AgriHub and Goho and applications from service providers like Hamara and SeedCo where they could access information on farming methods, markets, and weather and also advertise and sell their wares or search for other pertinent information. The women indicated that reliance on technology for their economic activities is a challenge, specifically in areas prone to connectivity and power outages as those with online-based selling activities usually suffered loss in sales as some outages lasted from a few hours up to a couple of days.

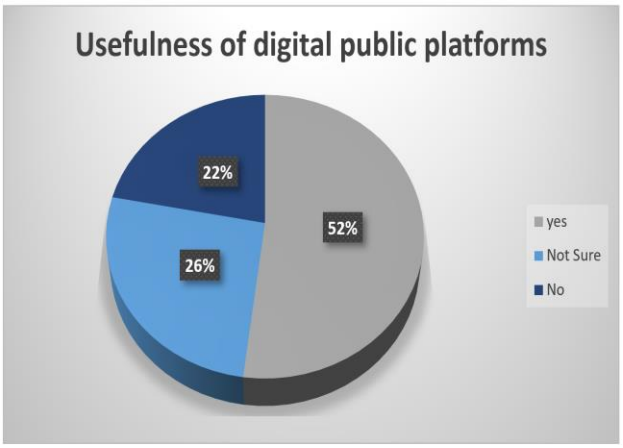

Figure 3. Perception of the Usefulness of Digital Platforms

Figure 3 illustrates the perception of the usefulness of the digital public platforms the women use in propelling their economic activities. 52% of the women use these platforms to access information, services, and opportunities and sell their wares and positively confirmed that these positively impacted their economic activities. 26% of the women were unsure of the impact as they used a mixture of traditional selling and communication modes with erratic use of digital platforms for their business. However, this group still uses digital platforms for social purposes and the women indicated that the platforms provided networking opportunities that sometimes translated to business opportunities or linkages with people who assisted them in their business. One of the major drawbacks indicated by using digital platforms was a lack of understanding of how the platforms could be used for business. About 22% did not find the platforms useful. The limited language options were cited as a barrier, with the women indicating that all the platforms were in English, whereas they preferred to use their local language, Ndebele, which they could understand better. Secondly, some of the farming platforms concentrated on crop farming, whereas the area was largely into animal husbandry and hence the rural women did not access the information they needed. This need for varied language and information options highlighted the importance of personalization of the digital platforms in order to drive acceptance and usage. One worrying negative effect that is gaining

prominence around the world is that some of these platforms have created environments where women are being exploited, working long hours, being cyberbullied, and earning low wages. As the gig economy platforms gain prominence, there is a need for a clear legal framework to protect vulnerable users. Also, key to note is that these digital platforms are not uniformly accessible to all rural women. This potentially can increase the digital divide which in turn can increase the existing inequalities and limit the scope of economic inclusion.

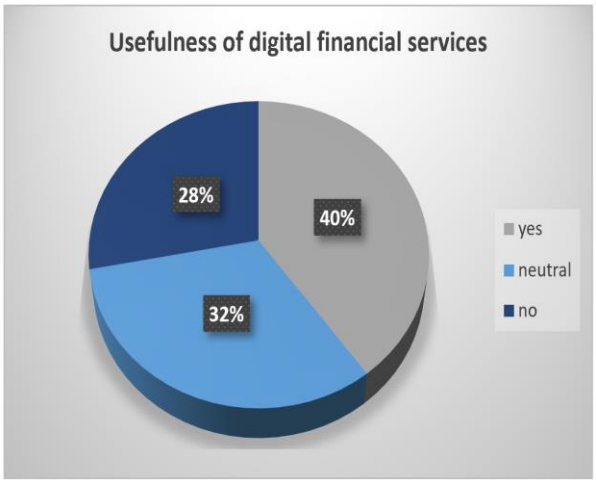

Figure 4. Perception of the Usefulness of Digital Financial Services

Figure 4 above looks at the respondents' views about the usefulness of digital financial services which include Bank-Based Digital Services e.g. mobile, internet and SMS banking services, mobile money services, remittances, digital payment platforms and digital wallets. 40% of the respondents found digital financial services useful as they were able to transact, save and pay for various services using the platforms. Accessing micro-loans without additional KYC (know your customer) documents was a key plus for rural women as they could transact via USSD or Internet banking with no need to visit the service provider's premises. Invariably the feedback shows that expanding access to digital financial services, including mobile banking, e-wallets, and digital payment systems, allows women to manage their finances more efficiently and facilitates entrepreneurship and economic participation. 32% did not feel strongly in either direction about digital financial services. Their utilization of the facilities was basic and felt that the current services suited their needs when they needed to use the platforms. 28% did not have confidence that digital financial services had a positive impact on their economic inclusion. The administration fees and interest rates were a concern for the women as they considered the rates too high, at between 5% and 10% of the value of the loans. Some of the challenges highlighted included high transaction fees and a preference to deal in physical cash instead of digital money. This highlights the need to tailor-make low-cost solutions for transacting. There is also a need for the provision of micro-loans with low paperwork requirements as most of the rural women do not have collateral, payslips and proof of residence in their names, which form part of the requirements for higher-value loans to fund their businesses. Digital financial services carry a risk related to security breaches and financial fraud. Rural women, being new users of financial platforms may be vulnerable to scams which may result in financial losses. It is therefore critical to ensure these platforms provide adequate protective measures and education on risk and

mitigations of online transaction fraud. Lastly, the ease of accessing financial loans can lead to over-indebtedness, driven by borrowing without adequate financial literacy on interest rates and payback terms and conditions.

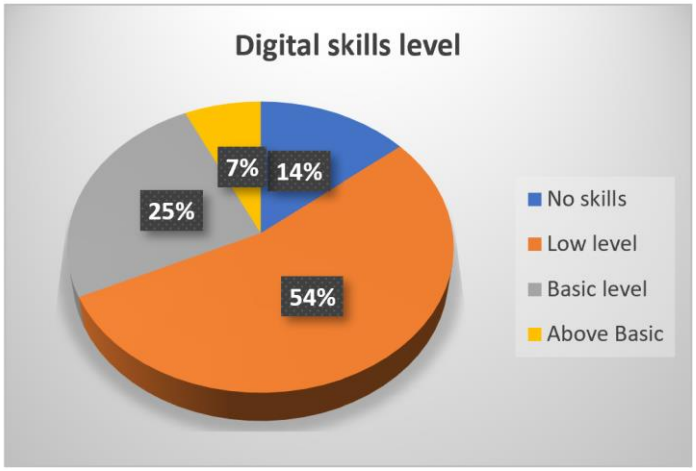

Figure 5. Assessment of Digital Skills Level of Respondents

Diffusion of digital skills is important especially among rural populations particularly rural women in order to close the digital divide. Figure 5 depicts the assessment of women's digital skills, which showed that 86% of the rural women had some level of basic digital skills. These entry-level skills allowed rural women to do basic processes and use basic applications for their economic activities. This came in handy for the women to access USSD-based mobile banking and mobile money platforms, which were the most used financial services offerings by the respondents. In the study, 7% were able to impressively use digital platforms of greater intricacy like accessing chatbots and internet banking to do all their transactions. internet banking to do all their transactions. This group found that their digital skills were key to attaining greater productivity and generating higher revenues through digital tools. 79% of the respondents consisting of the basic and above basic level skill users, indicated that they had attended a course or two on how to use digital platforms for business. They indicated that several non-governmental and governmental organisations had provided the training through community engagements over the last five to seven years. Negative outcomes were also observed in the study, with 14% of the respondents indicating that they had no digital skills at all. The major hindrance indicated by those whose digital skills were lagging, was a failure to attend the courses and workshops, due to the long distances travelled to training centres and the prohibitive cost of boarding buses. Timing was also a factor as some of the programs ran during farming season, and the women had to prioritize their field activities. A key point to note from the study is that while equipping women with digital literacy and technical skills is fundamental, information overload can have a negative impact on the rural women as the volume of information and the pace of technology change can be overwhelming. This can make it difficult for rural women to discern useful information and sift out noise. This can derail rural women's economic activities, if they focus on the wrong or irrelevant information. Training programs and educational initiatives should focus on closing the gender gap in digital competencies, enabling women to thrive in the digital economy.

Conclusion

In a nutshell, this article has emphasised the life-changing prospects of digitalisation for rural women in Zimbabwe. The key discoveries of this discourse have established that better access to digital technologies can open up new economic prospects for rural women, enrich their financial inclusion, increase their access to education and healthcare, and nurture social connectivity. These conclusions underscore the importance of digitalisation as a tool for empowering rural women and underwriting their economic and social development. Women need a well-adjusted approach to utilising digitalisation in their mode of operating and engaging in their drive to private enterprise. The research clearly showed that to realise the full potential of digitalisation requires concerted efforts by all stakeholders. The government, private sector, NGOs, and international organisations must work together to ensure that digitalisation benefits are equitably distributed among rural women. This includes addressing challenges such as reliable internet connectivity, affordability of digital devices and services, promoting digital literacy, and addressing gender inequalities that may limit women's access to and use of digital technologies. Policies and regulations must also be put in place to protect women's rights and privacy in the digital space. This can be achieved through well-articulated education programs on e-commerce and internet use to acquaint women with internet use. Women's economic inclusion is not merely a gender issue but a fundamental aspect of broader economic development and social justice.

Future Research

Future research in the Umguza District could delve into the impact of targeted interventions aimed at enhancing digital literacy among rural women to unlock the full potential of digital technologies for market access and economic empowerment. This should involve exploring the effectiveness of tailored training programs in bolstering confidence and familiarity with digital financial services among rural women. This will assist in examining strategies to enhance the relevance and usability of digital tools for rural women's economic needs, by considering their satisfaction levels and expectations regarding digital technology availability. Such research can unearth new ways to bridge the accessibility gap and promote greater utilization of digital technologies for inclusive economic growth among rural women and can pave the way for empowering rural women, promoting gender equality, and driving socio-economic development in rural areas. By addressing this research area, policymakers, organizations, and communities can contribute to the meaningful advancement of rural women through digitalization.

Conflict of Interest

To ensure that no conflict of interest occurred, the author clearly defined the research questions. The questions focused specifically on the role that digitalisation plays in the economic inclusion of women. The literature review was diverse and extensive, including a range of government reports, reports of non-governmental organisations, industry reports, and scholarly articles. The reviews were done independently. Data was collected through interviews and surveys of rural women who are resident in the Umguza district to ensure the reliability and validity of the findings. Participation was voluntary, no one was interviewed against their will, and information and opinions were given freely. By following the above procedure, the writer ensured that conflict of interest was circumvented concerning the quest to spotlight the role of digitalisation in the economic inclusion of women, thereby ensuring greater transparency and accountability to the research subject.

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The Ten Business Values System Theory: A Literature-based Analysis

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Abstract

The study sought to contribute to the general body of knowledge and research work in business value system (BVS). The research work also aimed to establish the most prominent types of values from the literature and ascertain how BVS elements are interconnected and influence business performance toward success. The concept of business values as a system is relatively new. However, this paper's purpose is to bridge the various pieces of BVS knowledge in literature by systematically reviewing a collection of articles on the subject and drawing valuable conclusions relating to the various paradigms or schools of thought. The researcher, for this study, identified and critically reviewed a minimum of forty (40) old and recent articles on BVS that were gathered from highly recognized and profiled research databases, including Google Scholar, Research Gate and Elsevier (database), Persistent themes on the prevalent forms of BVS; their interconnectedness and their influence on business performance were observed. It became clear that defining BVS exists because of the systematic connectedness of the values. There is enough evidence from the literature that when implemented well, BVS yields successfulness to the companies and consequently, development of the respective local and national communities in a mutual manner.

Keywords: *Business value system (BVS), Basic business values (BBVS), Higher-order Business Value System (HBVS), Profitability, Sustainability, Successfulness.*

Introduction

Every business originates by founder(s) using their own core values [1] forming the basic business value system (BBVS), functioning as the philosophical framework of a natural or legal individual person or groups connected by the same business ideology. This is because, as values they serve to be a yardstick for determining what is important and not, in the best interest of business. As a system therefore, business value system has integral components including and not limited to vision, mission, corporate social responsibility, strategy plan and ethical beliefs which together regulate an organisation's business to achieve its vision and objectives through the mission. As such, the BBVS consequently, forms an important part of an organization's internal environment and factors contributing to its wholistic business value system (BVS) inclusive of higher order business values (HBVS) consisting of corporate governance, productivity, profitability, sustainability and success, in both the task and industry environments.

Unfortunately, there is limited exposition in literature regarding the interconnectedness of these business values, resulting in treating them more as independent business variables than elements of a system. This study aims to demystify the relationship between BBVS and HBVS of a company, forming watchwords in most business discussions of the 21st century.

Hence, this study's aim is to assess the relationship between the basic business value system (BBVS) and Higher-order Business Values (HBVS) namely corporate governance, productivity, profitability, sustainability and

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success of a company. The manuscript includes three objectives: first finding out the meaning of BBVS. Second, to find out the meaning of corporate governance. Third, to establish the meaning of productivity. Fourth, to establish the meaning of profitability. Fifth, to understand the meaning of sustainability. Last but not least, to understand the meaning of successfulness in relation to business performance.

Study Question and its Significance

The research question for this study is, what is the relationship between the BBVS and HBVS of a company? A business value by nature is one of the integral parts which regulate and affect a company's progression such that discussion of its nature becomes significant to the development of a business and its community. Through the study, the author answered this question emanating literature review on the subject matter and reached a conclusion that could contribute to improving the successfulness of a business operating in these hard global economic times.

Methodology

This study employed a systematic literature review because it best served to answer the questions and the purposes of the study [2, 3]. Critical review of selected topical literature-based research is aimed at contributing to the literature by revealing the relationship between BBVS and the five remaining of the ten prominent business values as HBVS of a company and their impact on the successfulness of business's performance. Since study-based research refers to methodical review of a specifically and intentionally collected set of academic literature and other publications to discover new links connecting the already existing knowledge from empirical research, it therefore, helps reveal these associations between knowledge in the literature that are implicated and mostly overlooked. Therefore, the study contributes more to existing knowledge in literature, than adding new knowledge similar to empirical laboratory studies [4]. For that reason, to answer the study's articulated questions the researcher purposefully selected and critically reviewed research from multiple databases.

Data Collection

The researcher, for this study, used only secondary data, which refers to data that has already been collected for some other purpose. Secondary data was helpful in this study's purpose of assessing the relationship between ten business values: vision, mission, strategic plan, code of ethics, corporate social responsibility, corporate governance, productivity, profitability, sustainability and successfulness of a company. About forty (40) selected articles in the last three decades since 1993, minimum of four (4) each on vision, mission, strategic plan, code of ethics, corporate social responsibility, corporate governance, productivity, profitability, sustainability and their impact on the successfulness of business's performance were collected from Academia.edu, Elsevier, Google Scholar and ResearchGate research databases.

Data Analysis

About four (4) research articles each on vision, mission, strategic plan, code of ethics, corporate social responsibility, corporate governance, productivity, profitability, sustainability and successfulness of business's performance were picked by the researcher. Using thematic analysis, the articles were analysed to draw out persistent themes on the prevalent forms of business values components and their impact on the successfulness of business's performance. The thematic analysis allows for the analysis of data sets selected from the literature on a particular topic area – in this case, research articles from the literature that focused on revealing the relationship between the BBVS and vision, mission, strategic plan, code of ethics, corporate social

responsibility, corporate governance, productivity, profitability, sustainability and successfulness of a company. Relevant and prevalent themes related to the practice by business managers that were associated with business performance were extracted from excerpts from the selected papers. These themes were then analyzed to extract, among the wide variety of findings on the relationship among the business values, vision, mission, strategic plan, code of ethics, corporate social responsibility, corporate governance, productivity, profitability, sustainability and successfulness of a company in its business environment.

Results

Business value system results from four (4) research articles each on vision, mission, code of ethics, Strategic management, corporate governance, corporate social responsibility, productivity, profitability, sustainability and successful business performance were picked by the researcher and analyzed using thematic analysis, and presented following:

Basic Business Value System

Any business as a venture undertaken with a prospect of a sale to make profit requires values which are permanent beliefs that guide a way of business life [5]. TAU [6] explains that values indicate local beliefs about personal, natural person (founders) or legal (business/company) principles of what is important and not [7]. The collection of these values forms the BBVS and constitutes of the vision, mission, strategic plan, code of ethics, corporate social responsibility.

The Vision

The vision is a business's statement of overarching aspirations regarding its intended achievements or industry status is known as a vision statement [8, 9]. Usually, the statement does not provide identifiable goals. It is a broad description of the value an organization provides. It is a visual transcribed image of what the organization is trying to produce or become. It should inspire people and motivate them to want to be part of and contribute to the organization. Vision statements should be clear and concise, usually not longer than a short paragraph [10]. Thus, Vision is the ultimate or terminal value statement of purpose of a business bearing a focus intrinsic and internal to an organisation.

The Mission

While the vision and mission are often confused, with many companies using the terms interchangeably, each has a different purpose [11]. While the vision describes where the organization wants to be in the future; the Mission statement transcribes what the organization needs to do now to achieve the vision. The Mission defines how the organization is or will be different from other organizations in its industry [10]. Since the mission is more specific, it is more actionable than the vision statement [12] since it plays a major role in strategic management process and strategic goals formulation.

By describing the existence of an organization, where and how it will compete, the mission statement allows leaders to define a coherent set of goals that fit together to support the mission. As such, in its nature the mission is the continuous and transactional value statement of purpose of the business [10], with an intrinsic value bearing external focus to an organisation.

The Code of Ethics

The values statement or the code of ethics entails the company specific universal beliefs system prescription of what is considered morally right and wrong in the daily business operations, and for decision making [8]). Therefore, a code of ethics differs from both the vision and mission statements [11]. It provides a moral direction for the organization that guides decision making and establishes a standard for assessing actions. Moroka [13] asserts that code of ethics by itself is not

sufficient to make a company good; without other values which form the foundation for all activities in an organization. It also provides a standard for employees to judge violations [5].

Strategic Management

Strategic management as a development of set of decisions and actions to formulate and execute the strategies to achieve the organizational goals and objectives [14]. It clearly illustrates how a business founds its business value system by way of setting vision, mission, objectives, analysis, strategy choice, implementation and evaluation and CSR to ultimately render it successful, in serving the stakeholders satisfying their needs and wants [10].

On the other hand, “A firm’s strategy is its theory of how to gain competitive advantages” [12]. For this reason, David [15] stresses that, without strategic management it is very difficult for a business to gain and maintain a competitive advantage for productivity and profitability. Strategic management has now evolved to be the primary value which helps an organisation operate successfully in a dynamic, complex global environment [10]. Thus, it entrenches the argument of "the double-edged sword” of organizational legitimation theory introduced by Ashforth and Gibbs [16], quoted by Pratama et al., [17] Hence, strategic management is a business value which is inherent and coherent ingredient of a successful business.

The Corporate Social Responsibility

CSR is the pledged business’s responsibility to handle the social, economic and environmental consequences of its activities responsibly and in accordance with public standards [6, 10]. The concept of CSR is not new to business entities but is as old as the existence of human beings on earth [18]. This is because every business is formed by people, for the people and community in a particular environment. This therefore illustrates the human and environmental faces of a business and as a moral obligation for the community [18, 19, 20]. This means that it is quite significant to both the business and community as it ensures the prosperity of both industry and life into the future [21].

To show a company’s social performance, the board of directors assumes a greater responsibility for defining CSR goals and objectives as well as CSRD [22]. Gray et al. [21, p.53] were unambiguous in asserting that “we can understand CSR reporting as a part of the dialogue between the company and its stakeholders.” By providing CSRD, a company can legitimize its behavior and influence perceptions and expectations of stakeholders [22, 23, 24].

Higher-Order Business Values

Corporate Governance

As revealed by Shleifer & Vishny [25, p. 737], traditional view has been that Corporate Governance (CG) should deal “with the ways in which suppliers of finance to corporations assure themselves of getting a return on their investment” agreeing with Mitton [26] who postulates CG as the act of protecting shareholders from expropriation by managers. Progressive change now emphasises CG as a “set of relationships between a company’s management, its board, its shareholders and other stakeholders.” [27, p. 11) as a more inclusive approach to CG [11, 22].

Thus, using the lens of stakeholder theory, CG is regarded as “the system of checks and balances, both internal and external to companies, which ensures that companies discharge their accountability to all their stakeholders and act in a socially responsible way in all areas of their business activity” [28, p.14].

Irresponsible behavior by unscrupulous managers in recent decades has increased the importance of CG, business ethics, trust, and accountability thereby leading to wide acceptance that companies have formal and/or

informal obligations beyond shareholders to a large set of stakeholders [29]. Additionally, there has been greater acknowledgement of the links between CG and CSR [21, 22]. Stakeholder theory links CG and CSRD by suggesting that both should aim to enhance stakeholder engagement and organizational legitimacy [24].

Productivity

A well-functioning business-services sector is important to the overall economic performance of a country and has the potential to be an important source of employment and productivity growth [17]. Productivity is a measure of economic performance that compares the amount of goods and services produced (output) with the amount of inputs used to produce those goods and services [1] and can be measured at individual worker, company, industry or sector, business sector and national productivity levels [30]. It also measures how well a business at any level generates revenue from input, labour, and materials [31] or a measure of how efficiently a person completes a task [32].

We can also define it as the rate at which a company or country produces goods and services (output), usually judged based on the amounts of inputs (labour, capital, energy, or other resources) used to deliver those goods and services [11]. Increased productivity is vital to individuals, businesses, and analysts because among other reasons, drives economic growth, meaning an economy can produce and consume more and more goods and services for the same amount of work and that every section of society, viz., consumers, workers, employers, can benefit from a productivity [32].

Profitability

Profitability is the primary goal of all traditional business ventures such that without it the business will not survive in the long run. Conversely, a non-profitable company will fail to reward its owners with a large return on their investment. So, measuring current and past profitability and projecting future profitability is very important [33].

Using profitability ratio, a company can determine how it is profitable, from the money a company has left after deducting all expenses like income and operating costs, from the activities of the business production [33]. Therefore, profitability is a measure of an organization's profit or ability to make a profit relative to its expenses. Organizations that are more efficient will realize more profit as a percentage of its expenses than a less-efficient organization, which must spend more to generate the same profit [1, 10].

Meanwhile, a positive relationship exists between profitability and entrepreneurial innovativeness, [34] and has various settings in computational practices, also strategic and rhetorical calculations where profit and profitability are situated within social and power relationships]35].

A study by Pestonji and Wichitsathian [36] reveals that a firm’s performance is a combined measure of profitability and its market value, with the profitability mediating market value of a firm. By adopting conservative working capital investment policy and conservative working capital financing policy, companies increase their profitability and market value.

Sustainability

A Primer on sustainable business is concerned with the larger picture, or the combined three-dimensional social, environmental, and economic impacts of a sustainable business:

1. The ability to meet the needs of the present without compromising the ability of future generations to meet theirs.
2. A business that is concerned about the social, environmental, and economic impacts (referred to as the triple bottom line: people, planet, and profit) that are associated with its current and future operations. A sustainable business is

concerned with its ability to meet present needs while ensuring its and others' long-term survival.

3. A business that focuses on its environmental impact rather than on the triple bottom line emphasis of a sustainable business [37].

Training and development opportunities for employees in future will focus on personal growth and development, instilling corporate values and ethics, and promoting sustainability [37]. According to Schmitz Andy [38] sustainable business is one that operates in the interest of all current and future stakeholders in a manner that ensures the long-term health and survival of the business and its associated economic, social, and environmental systems.

Therefore, business sustainability refers to extended business immortality, long term success or a company's strategy to reduce negative environmental impact resulting from their operations in a particular market. An organization's sustainability practices are typically analyzed against environmental, social, and governance (ESG) metrics [30].

In the past three centuries human progress and development have been remarkable such that even the poorest and the least developed countries have realized substantial improvements in living standards, health care and access to education [39]. However, these developments have come with minimum regard to social evolution and environmental protection. In the long run such a form of development is unsustainable.

The private sector is a key stakeholder having significant impact on the sustainability effort. In addition, the 3Ps of sustainability are a well-known and accepted business concept. The Ps refer to People, Planet, and Profit, also often referred to as the triple bottom line. Sustainability has the role of protecting and maximising the benefit of the 3Ps and is a business imperative which should be core to the strategy and operations of every business [40]. Besides bringing both ethical and financial, sustainability in business also increases competitive advantage, investor appeal, compliance with regulatory requirements, increased longevity of transformation investments, talent acquisition and revenue growth among others.

Furthermore, Employees are increasingly looking for mission-driven, purpose-led employees who care about the planet when deciding where to work [40].

Successfulness

Successfulness is achieving or having achieved success where success is when one reaches own aim or purpose. It is also having attained wealth, position, honours, or reaching your aim or purpose [41, 42]. It is the condition of prospering; having good fortune, prosperity, good luck or luckiness and an auspicious state resulting from favorable outcomes [43].

Oxford Reference [44] assert success as the achievement of a goal, adding that in sport, the concept of success can be very personal and is not always dependent on winning a competition or obtaining a very high standard of performance.

Therefore, one who is successful has achieved or is currently working to achieve personal greatest desires in life and career. However, different individuals often have different understandings of what success means to them. When success sis achieved by a subject, the subject is described as being successful. A successful party, or a successful person, or a successful operation. Adding the suffix -ness converts the word successful into a noun. It is the 'act of becoming successful' or the 'state of being successful' [41].

Successful businesses are concerned with making long-term profits and generating sustainable growth, rather than achieving short-term gains [13]. Successful companies effectively meet the changing needs of their customers by developing new products or services that will make people happy [10].

Discussion

In this section the discussion and analysis are done considering the study's aim and objectives, as stated above. From the list of minimum forty (40) research articles on the ten-business values system (BVS) elements that were picked by the researcher, an analysis was undertaken using thematic analysis to draw out persistent themes on the prevalent forms of values and their impact as BVS, on business performance.

Definitions and Schools of Thought of Business Values System

Literature review shows that any business venture undertaken with a prospect of a sale to make profit requires values to guard and guide its business life [5]. These values are local beliefs about personal; natural person (founders) or legal (business/company) principles of what is important and not [1, 7]. These values work collectively for a business, thus constituting the BBVS (vision, mission, strategic plan, code of ethics, corporate social responsibility) from which ensue other and higher-order business values.

The strategic management has now evolved to be the primary value which helps an organisation operate successfully in a dynamic, complex global environment [10] clearly enabling a business to found its business value system to formulate and execute the strategies and achieve the organizational goals and objectives [14]. Additionally, it is very difficult for a business to gain and maintain competitive advantage for productivity and profitability without strategic management [12, 15]. As a result, strategy and its management form a crucial part of the BBVS of an organization's internal environment and factors contributing to its success, in the task and industry environment.

The Vision is a business's statement of overarching aspirations regarding its intended achievements or industry status [8, 9]. Usually, in visual transcription form, the Vision statement does not provide identifiable goals but a broad description of the value an organization provides, and a clear and concise image of what the organization is trying to produce or become, thus inspire people and motivate them to want to be part of the organization team [10].

Thus, Vision is the ultimate or terminal value statement of purpose of a business bearing a focus intrinsic and internal to an organisation. For this reason, the Vision forms a crucial part of the primary business value system [1, 7, 8] of an organization's internal environment and factors contributing to its success, in the task and industry environment.

On the other hand, the Vision of a company is linked to the mission, although the two should not be confused or used interchangeably because they are different from each other [11]. Unlike the Vision, the Mission defines how the organization is or will be different from other organizations in its industry as well transcribes the specifics of what the organization needs to do now to achieve the vision [10]. Furthermore, it is more actionable than the vision, thereby allowing leaders to define a coherent set of goals that fit together to support the mission [12]. Therefore, the mission is the continuous and transactional value statement of purpose of the business with an intrinsic value bearing external focus to an organisation [10]. Hence, the mission also forms a primary part of the primary value system [1, 5, 7] of an organization's internal environment and factors needed for its success, in the task and industry environment.

Organizations are established by people and run with people and for the people such that it is necessary to have the code of ethics also called code of conduct or values statement to provide for a company's specific universal beliefs system prescription of what is considered morally right and wrong in the daily business operations, and for decision making [8]. Thus, while linked to BBVS elements, code of ethics also differs from others [11] since it

provides a moral direction that guides decision making and establishes a standard for assessing actions for an organization. It also provides a standard for employees to judge violations [5]. The code of ethics by itself is not sufficient to make a company good; without other values which form the foundation for all activities in an organization [13]. Subsequently, code of ethics also forms an integral part of the value system of an organization's internal environment and factors adding to its success, in the task and industry environment.

The corporate social responsibility (CSR) is the pledged business's responsibility to handle the social, economic and environmental consequences of its activities responsibly and in accordance with public standards [6, 10]. It is a business concept as old as the existence of human beings on earth [18] since every business is formed by people, for the people and community in a particular environment [5]. Thus, it illustrates the human and environmental faces of a business; as a moral obligation for the community [19]. This means that it is quite significant value to both the business and community since it ensures the prosperity of both industry and life into the future [21].

To show a company's social performance, the board of directors also assumes a greater responsibility for defining CSR goals and objectives as well as CSRD (CSR disclosures or directives) practices [22]. There should be no ambiguous in asserting that CSR reporting is a part of the dialogue between the company and its stakeholders [21, p.53]. Irrevocably, through participation in CSR disclosures (CSRD), a firm can legitimize its behaviour and influence perceptions and expectations of stakeholders [22, 23, 24]. Consequently, CSR also forms a connected part of the primary business value system of an organization's internal environment and factors contributing to its success, in the task and industry environment.

The long-established view of Corporate Governance (CG) was dealing with the ways in which suppliers of finance to corporations assure themselves of getting a return on their investment [25, p. 737), as the act of protecting shareholders from expropriation by managers. The contemporary change now underscores CG as a set of relationships between a company's management, its board, its shareholders and other stakeholders." [27, p. 11] and as a more inclusive approach to CG [22, 28].

Accordingly, this postulation positions CG as one of the basic values and yet a link between BBVS and subsequent higher-order business values [21, 22] aimed at enhancing stakeholder engagement and organizational legitimacy [24]. Thus, from the stakeholder theory perspective, CG offers the checks and balances system, both internal and external to companies, which ensures that companies discharge their accountability to all their stakeholders and act in a socially responsible way in all areas of their business activity" [28, p.14). Irresponsible behaviour by unscrupulous managers in recent decades has increased the importance of CG, business ethics, trust, and accountability thereby leading to wide acceptance that companies have formal and/or informal obligations beyond shareholders to a large set of stakeholders [29]. So, CG concept also is a component of the value system of an organization's internal environment and factors contributing to its success, in the task and industry environment.

Productivity, as a measure of how efficiently a task is completed [32] or a measure of economic performance that compares the amount of goods and services produced (output) with the amount of inputs used to produce those goods and services [1], is important to a well-functioning business. This is because it helps a company contribute to the overall economic performance of a country (larger community) and has the potential to be an important source of employment and productivity growth [45]. It can be measured at different business levels namely; individual person, sector and national, to indicate how

well a business at any level generates revenue from input, labour, and materials [31]. So, without it, a business is worth not existing in the first place.

We can also define it as the rate at which a company or country produces goods and services (output), usually judged based on the amounts of inputs (labor, capital, energy, or other resources) used to deliver those goods and services [32]. Increased productivity is vital to individuals, businesses, and analysts because among other reasons, it drives economic growth; an economy can produce and consume more and more goods and services for the same amount of work and that every section of society, viz., consumers, workers, employers, can benefit from a productivity [32]. Consequently, productivity in business is important and as such, also forms an integral part of the value system of an organization's internal environment and factors contributing to its success, in the task and industry environment.

Business venture is an undertaking with a prospect of a sale to make profit [5]. This requires values to guard and guide the business life of a going concern; whether natural or legal person [1, 7]. Profitability is the primary goal of all traditional business ventures such that without it the business will not survive in the long run. Accordingly, measuring current and past profitability and projecting future profitability is very important [33]. Usually, a company uses its profitability ratio to determine how it is profitable [33] to measure its profit relative to expenses.

In other words, profitability measures a company's ability to make a profit. Organizations that are more efficient will realize more profit as a percentage of its expenses than a less-efficient organization, which must spend more to generate the same profit [10]. Conversely, a non-profitable company will fail to reward its owners with a large return on their investment and run at a loss inconsistent with primary business values and others.

Meanwhile, a positive relationship exists between profitability and entrepreneurial innovativeness, but the relationship is not statistically significant [34]. The profitability has various settings in computational practices, also strategic and rhetorical calculations where profit and profitability are situated within social and power relationships [35]. This analysis places profitability beyond monetary (economic) value to include other business needs; social and environmental [6, 10].

Literature reveals that a firm's performance is a combined measure of profitability and its market value [36], with the profitability mediating market value, and adoption of conservative working capital investment policy and conservative working capital financing policy capable of increasing the profitability and market value. This requires entrepreneurial innovativeness [34] and shows the link with CG [25 p. 737, 21, 22]. Accordingly, as the primary goal of all traditional business ventures [33] profitability also forms an important part of the value system BVS of an organization.

Every business today is concerned with the larger picture comprising the three-dimensions of sustainability namely economic, social and environmental impacts of a sustainable business; operating in the interest of all current and future stakeholders, ensuring the long-term health and survival of the business and its associated economic, social, and environmental systems [38]. This is prioritised in the 21st century training and development opportunities for all stakeholders [37]. Therefore, sustainable business is one has sustainability which ensures extended business life and success [10]. The business sustainability also refers to extended business immortality [10] this way ensuring sustained extended firm's performance.

In the past three centuries human progress and development have been remarkable such that even the poorest and the least developed countries have realized substantial

developments [39]. However, these developments have come with minimum regard to social evolution and environmental protection and in the long run such form of development is unsustainable, against CG and CSR principles and must be avoided by all businesses. The private sector is a key stakeholder having significant impact on the sustainability effort [40].

Sustainability is a business imperative and should be core to the strategy and operations of every business because besides bringing both ethical and financial discipline, also increases competitive advantage, investor appeal, compliance with regulatory requirements, increased longevity of transformation investments, talent acquisition and revenue growth among others [40]. Undoubtedly, this makes sustainability another treasured business value inclusive part of the value system of an organization.

Most businesses whether as natural and legal persons desire success in their operations. **S**uccess is the achievement of a goal, having attained wealth, position, honours, or reaching your aim or purpose [41, 42]. The concept of success, can be very personal and is not always dependent on winning a competition or obtaining a very high standard of performance [44].

Successful is achieving success while successfulness is having achieved success a condition of prospering; having good fortune, prosperity, good luck or luckiness and an opportune state resulting from favourable outcomes [21, 43]. This articulates as self-actualization the ultimate level in Maslov's hierarchy of needs; every business's need.

Therefore, one who is successful has achieved or is currently working to achieve personal greatest desires in life and career. However, different individuals often have different understandings of what success means to them. When successful is achieved by a subject, the subject is described as being successful. A successful party, or a successful person, or a successful operation. Adding the suffix –ness, converts the word successful into a noun. It is the 'act of become successful' or the 'state of being successful' [41].

To be successful in the long term, businesses have to create value, not only for their shareholders but also for the society as a whole; thus, creating Shared Value [13] and successful companies effectively meet the changing needs of their customers by developing new products or services that will make people happy [9, 10]. Thus, successfulness is also an integral part of the value system and the ultimate value, of an organization's internal environment and factors contributing to its success and self-actualization, in the task and industry environment.

Based on the above reviews, the model below, in Figure 1, is developed to guide the study's analysis.

In the model "P" represents the direction of business operation and performance.

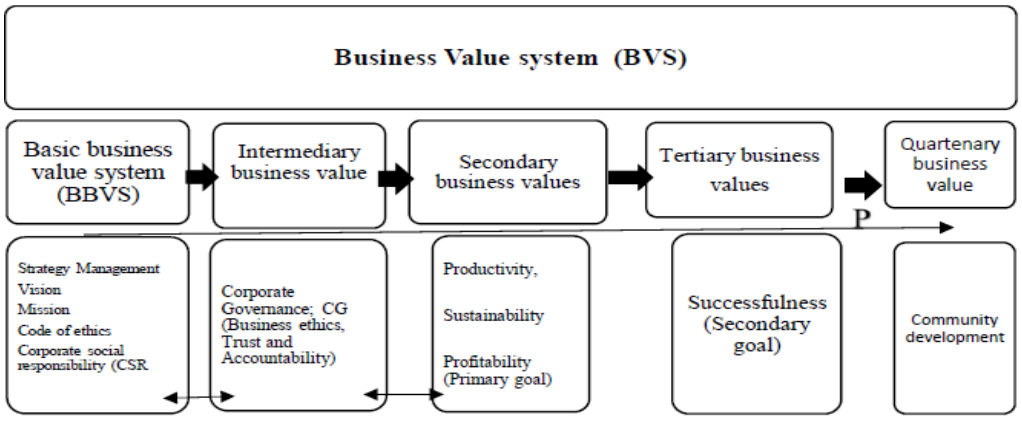

Figure 1. BVS Model Framework

The model classifies the business value system into four main categories namely primary business values, followed by intermediary linking the BBVS with subsequent HBVS namely secondary business values, tertiary business values and quaternary business values as the highest order level of values.

As businesses seek prosperity of both industry and life into the future [21] they may enjoy success at different levels and types (Figure 2). In this study therefore. businesses striving well with BBVS experience lower level of success termed as first generation (G^{1st}) success. The second generation (G^{2nd}) success is experienced by companies operating better in most secondary business value system components, inclusive of BBVS. The third generation (G^{3rd}) success is for those firms enjoying their sustained or extended business immortality while fourth generation (G^{4th}) success is due by balanced consideration given to the BVS as a whole and mutually participating as a community development partner with its government. This also depicts the potential different levels of business performance.

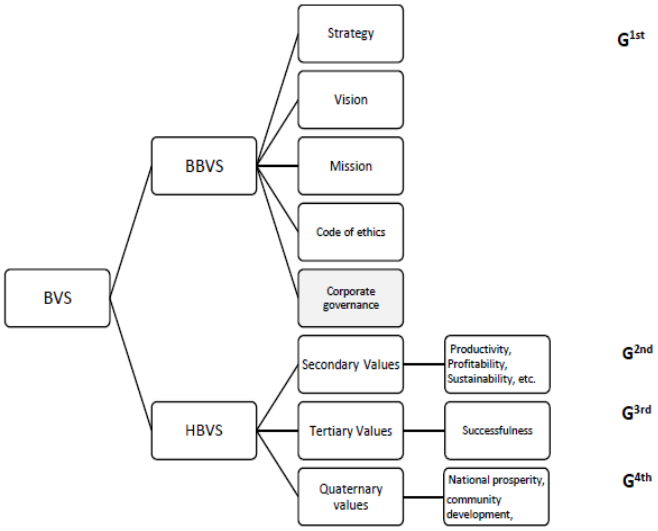

Figure 2. Business Successfulness Model levels

Successful companies develop themselves and their communities easily [13]. In effect, a developed community mutually will build the businesses in their locality in a reciprocal and proportionate manner.

Conclusion

From the selected 45 publications and the subsequent analysis, it became clear that every business has BVS consisting of ten prominent values viz. vision, mission, strategic plan, code of ethics, corporate social responsibility from which ensue other business values namely corporate governance, corporate social responsibility, productivity, profitability, sustainability and successful. These values are interconnected and working collectively for a business as factors contributing to its successfulness and self-actualization, in the task and industry environment.

In addition, research is needed to establish decisively the connectedness of the relationship between BVS and HBVS, A single study on a topic of this magnitude is not adequate in explaining the variables conclusively.

Conflict of Interest

Lindunda Wamunyima, the researcher, hereby declares, in relation to this research work, that there is no conflict of interest.

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Relationship Between the Application of ICT and Effective Planning in Federal Universities of Northern Nigeria

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Abstract

Information and communications technology (ICT) plays a vital role in enhancing planning effectiveness in higher education institutions. This study investigated the relationship between ICT application and effective planning in federal universities in Northern Nigeria. A correlational research design was used with population is ten thousand five hundred and seventy-seven (10,577) staff and the sample size of 2,114 university staff. The sapling procedure was simple random sampling; proportionate sampling and accidental sampling. Participants completed a modified likert scale questionnaire measuring ICT use and effective planning. Descriptive statistics of frequency counts and percentages was used. At a significance level of 0.05, Pearson's Product Moment Correlation coefficient (PPMCC) was employed to evaluate the formulated null hypotheses. Results showed a significant moderate positive correlation ($r = 0.528$, $p < 0.05$) between ICT application and effective planning, indicating technology use associates with improved planning. The findings were that there is significant relationship between the application of ICT and effective planning in Federal Universities of Northern Nigeria. Based on these conclusions, it is recommended that universities develop ICT plans integrated with their strategic goals, while conducting regular evaluations to refine technology management practices. This will empower effective data-driven and collaborative planning activities. The study provides empirical evidence on the relationship between ICT capabilities and planning effectiveness in Nigerian higher education.

Keywords: *Application of ICT, Effective Planning, Information and Communication Technology, Northern Nigeria, University.*

Introduction

Information and communications technology (ICT) has become deeply integrated into urban planning and development processes over the past few decades. As Jim and Chen note, "advancements in computer processing, data storage, analysis capabilities, and visualization have propelled the application of advanced information technologies in the planning field" (2010). ICT encompasses a broad range of technologies, from geographic information systems (GIS) to online engagement platforms to smart city infrastructure and the Internet of Things (IoT).

A key way that ICT enables more effective planning is through data collection, analysis, modeling, and simulation. GIS, for example, allows planners to layer multiple data sets, analyze spatial patterns and relationships, and model potential impacts of plans and policies [10]. This enhances evidence-based decision making. Building information modeling (BIM) creates digital 3D models of buildings and infrastructure, allowing better visualization and coordination of development projects [8]. Big data and analytics enable more sophisticated modeling of dynamics like transportation patterns, population trends, and land use demand.

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ICT also facilitates improved stakeholder consultation and community engagement in the planning process. Web-based engagement platforms create new channels for planners to communicate with and gather input from citizens [7]. Interactive maps, 3D visualizations, and virtual reality allow stakeholders to better understand proposed plans. Technologies like crowdsourcing, social media, and online surveys enable broader outreach [6]. This enhances transparency and public participation.

Smart city infrastructure and the IoT provide real-time data to inform dynamic, responsive planning and management of urban systems. Sensors can monitor noise, air quality, traffic, energy use, etc., while automated control systems allow adjustments to things like traffic signals or building energy systems to optimize efficiency [2]. This creates a feedback loop between the urban environment, planning objectives, and policy implementation. Advancements in ICT are supporting more data-driven, visualized, participatory, and adaptive approaches to urban planning - enabling practitioners to create smarter, more livable cities. The technologies facilitate improvements in analysis, modeling, communication, coordination, and responsiveness across all stages of the planning process.

Hypothesis

There is no significant relationship between the application of ICT and effective planning in Federal Universities of Northern Nigeria

Methodology

The researcher used a correlational research design for this investigation [11]. A non-experimental research method known as correlational analysis measures two variables and evaluates the statistical relationship (also known as the correlation) between them with little to no effort to control unrelated variables. According to [12], a correlation test uses statistics to identify whether there is a propensity for two (or more) variables or two sets of data to change in a predictable way.

All Federal Universities in Northern Nigeria make up the population for this study. The population is ten thousand five hundred and seventy-seven (10,577) staff. The Table 1 below shows the estimated sample size from a particular population used to extract twenty percent (20%) from the whole population for this study, which includes selected employees from Federal Universities in Northern Nigeria. And the sample size is two thousand one hundred and fourteen (2,114) staff.

Table 1. Population and Sampled of Federal University in Northern Nigeria

S/Nos	Universities	State	Population	Sampled
1	Ahmadu Bello University, Zaria	Kaduna	2919	584
2	Bayero University, Kano	Kano	1630	326
3	Usmanu Danfodiyo University	Sokoto	1252	250
4	University of Ilorin	Kwara	1489	298
5	University of Jos	Plateau	1337	267
6	University of Maiduguri	Borno	1333	266
7	Modibbo Adama University, Yola	Adamawa	617	123
	Total		**10,577**	**2,114**

The technique for sampling the study's sampled states will be chosen using the Dip-Hand sampling method of Adegboye (2001), and respondents will be chosen from each department in the selected states using the

proportionate sampling method. The following method was employed:

North Central (6 states), North East (6 states), and North West (7 states) are the three geopolitical zones that make up Northern Nigeria's 19 states. There will be three students assigned to different sampled states. Each student represented a different zone, and the names of each state were written on pieces of paper and placed in a container for the zone-representing student to choose from.

Students from the North West chose three times, while those from the North Central and North East each chose twice. Due to the additional variances in one state, three states from the North West region, two from the North East region, and two from the North Central region will be chosen. Seven federal institutions from each of the chosen states will serve as a representative sample of those states.

The seven federal institutions in each state will be sampled using a proportional sampling method, and respondents were chosen from the four colleges and departments.

The departments and faculties that will be used for the study will be chosen using a Dip-Hand sampling approach. A process known as accidental sampling will be utilised to distribute or allocate copies of the questionnaire to responders.

The questionnaire on application of ICT in Effective Planning (QAICTEP) created by the researcher, will be the instrument utilized for the study. The instrument was divided into three parts. The instrument's initial section asks for background information on the respondent status. ICT applications will be covered in the instrument's second section, and management practices and ICT will be covered in its third component. Section C of the instrument will be divided into seven sections titled effective planning using ICT,

A four-point Likert Rating Scale with the options strongly agree, agree, disagree, and strongly disagree was used to structure the surveys. These will each receive a 4, 3, 2, 1 grade. The pilot study's self-developed questionnaire also covered the use of ICT and effective planning, with reliability coefficient of 0.75. Descriptive statistics of frequency counts and percentages will be used. At a significance level of 0.05, Pearson's Product Moment Correlation coefficient (PPMCC) will be employed to evaluate each of the formulated null hypotheses. Using SPSS version 29, a statistical tool for social science.

Results

Table 2. Demographic Characteristics of the Respondents

AGE		Frequency	Percent
Valid	20-30	496	23.6
	31-40	350	16.6
	41-50	379	18.0
	51-60	527	25.0
	61 above	352	16.7
Years of experience			
Valid	1-10	525	25.0
	11-20	371	17.6
	21-30	505	24.0
	31 above	703	33.4
Qualification			
Valid	BSC/BED/BA	175	8.3
	MSc/MA	700	33.3

	PhD	1229	58.4
Sex			
Valid	Male	1578	75.0
	Female	526	25.0

Table 2: indicted the demographic characteristics presented in the age distribution shows a wide range, from young adults in their 20s to older adults over 60 years old. The most frequently observed age group was 51-60 years (25%). About a quarter were also relatively young, aged 20-30 years (23.6%). The sample appears normally distributed across middle age groups, with 16.6% aged 31-40, 18% aged 41-50, and 16.7% aged 61 and above. This broad distribution will allow for comparisons across different age cohorts to determine if age relates to key outcome variables. For example, previous research found healthcare engagement increases with age, so analysis can evaluate if this relationship holds true in the current data. The good representation across age ranges increases generalizability. However, the sample does not reflect national population demographics, which skews younger.

The sample is skewed towards more experienced respondents, with 33.4% having 31+ years of experience. Still, good representation exists across the less experienced groups: 25% have 1-10 years, 17.6% have 11-20 years, and 24% have 21-30 years of experience. The higher proportion of veteran respondents is logical if sampling targeted subject experts. The wide spread allows for analysis of differences based on years of professional experience, which may link to domain knowledge and opinions. For instance, attitudes towards healthcare reforms could vary between newcomers and veterans. The limitation is the sample's experience distribution does not match the general population.

The respondents are highly educated overall, with 58.4% holding doctorate degrees and 33.3% having masters qualifications. Only 8.3% have bachelor's degrees and no other categories are represented. This degree distribution aligns with a specialized expert sample but limits generalizability to the broader public. However, the education levels enable examining views by degree type. For example, previous studies found higher education associates with more progressive attitudes. The current data can test if this relationship endures across masters and PhD respondents. Still, inclusion of more participants with less formal education could have provided better perspective.

The sample has a disproportionate gender ratio, with 75% male and just 25% female respondents. This 3:1 imbalance could result from sampling methods or reflect male dominance in certain professions or positions surveyed. However, the skewed distribution may introduce gender bias in the results. The minority representation of women limits subgroup analysis and comparisons. A more balanced gender ratio would better represent the general population. Additional steps to include more women respondents could have enhanced the integrity and generalizability of the findings.

Ho_1: There is no significant relationship between the application of ICT and effective planning in Federal Universities of Northern Nigeria.

Table 3. Pearson Product Moment Coefficient of Relationship between Application of ICT and Effective Planning among Federal Universities of Northern Nigeria

Variables	Mean	Std. Dev	N	df	r	Prob	Decision
Application of ICT	3.01512	0.701851	2104	2102	0.528*	0.0001	Rejected
Effective planning	3.29613	0.631613	2104				

Table 3 indicated that there is no significant relationship between the application of Information and Communication Technology (ICT) and effective planning in Federal Universities of Northern Nigeria. To test this hypothesis, a Pearson Product Moment Coefficient of correlation was calculated using data from Federal Universities of Northern Nigeria. The results presented in Table 3 show that there is a significant positive correlation (r = 0.528*) between the application of ICT and effective planning among Federal Universities of Northern Nigeria. This means that as the level of ICT application increases, the level of effective planning also increases. The Pearson correlation coefficient shows a positive correlation between application of ICT and effective planning, indicating that higher use of ICT is associated with higher ratings of effective planning. The p-value of 0.0001 tells us this correlation is statistically significant. Specifically, it is significant at $p<0.05$ level. Therefore, we would reject the null hypothesis Ho1, as there does appear to be a significant positive correlation between ICT application and effective planning among the respondents.

Discussion

There is significant relationship between the application of ICT and effective planning in Federal Universities of Northern Nigeria. The followings studies are in support, Learning Management Systems (LMS) like Moodle and Blackboard to facilitate e-learning. This enhances teaching and learning by providing course materials, online assessments, discussion forums etc. [1]. Library management systems to automate library operations like cataloguing, circulation, acquisition etc. This improves access to learning resources for students and lecturers [5]. Administration software like result processing systems, payroll systems and student information management systems. This enhances planning, decision making and service delivery [4]. Research databases like Hinari, AJOL, and EBSCOhost for access to academic journals. This promotes quality research by providing access to global research [3]. Websites and portals for information sharing and service delivery. This improves communication and university branding [9].

The application of ICT enhances effective planning in federal universities in Northern Nigeria in the following ways Provides timely and accurate data for planning at institutional, departmental and individual levels [4]. Facilitates collation, analysis and modeling of data for forecasts, projections and scenario planning [2]. Promotes evidence-based planning rather than intuition or guess work [1[. Enables benchmarking with other institutions to set realistic goals [5]. Allows seamless information sharing and collaboration for unified planning [9]. Increases transparency and stakeholder participation in planning through information access [4]. Enhances monitoring and evaluation to track progress and amend plans [2]. Therefore, there is a significant relationship between ICT application and effective planning in federal universities in Northern Nigeria. Proper ICT

implementation empowers the universities to make data-driven plans aligned to their strategic vision.

Conclusion

There is a significant positive relationship between the application of ICT and effective planning in Federal Universities of Northern Nigeria. The Pearson correlation analysis showed a statistically significant moderate positive correlation ($r = 0.528$, $p < 0.05$) between ICT application and ratings of effective planning. This indicates that greater use and integration of ICT in the university system is associated with higher perceived effectiveness of planning activities.

Recommendations

1. Develop a comprehensive ICT strategy: Federal universities in Northern Nigeria should develop a comprehensive ICT strategy that aligns with their overall strategic plan. The strategy should identify the specific needs of the university, prioritize ICT initiatives, and allocate resources accordingly. The strategy should also include a timeline for implementation and a mechanism for monitoring and evaluating the effectiveness of ICT initiatives.
2. Conduct regular evaluations: Federal universities in Northern Nigeria should conduct regular evaluations of their ICT initiatives to assess their effectiveness and identify areas for improvement. The evaluations should include both quantitative and qualitative measures, such as student satisfaction surveys, staff performance metrics, financial analyses, and impact assessments. Based on the evaluations, federal universities in Northern Nigeria can refine their ICT strategies and management practices to maximize their benefits while minimizing their costs.

Conflict of Interest

The author declared no conflict of interest in this study.

Acknowledgments

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Risk Management Considerations for Civil Engineering Consultancy sServices in Guyana

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Abstract

Identification of the possible risks that will affect the projects, knowing them will allow control of these, will increase the probability of success of the projects, and the level of confidence of the involved will increase by decreasing the level of uncertainty of the project. The development of this work is comprised of five phases, first was a planning to structure the processes to follow evaluating,, stages, then the risks that will affect the project and their characteristics, the qualitative analysis was performed, prioritized for actions, evaluating and estimating their probability of occurrence and their impact, then the plan was designed for the treatment and response to risks to reduce, retain and transfer their threats during the development of the project itself and finally give the guidelines for the monitoring and control of risks. Based on the above, the following question is generated: What are the risks to consider in consultancy services for the Project of Construction, to guarantee success in the execution, monitoring, and control of the same? The purpose of the research will be to: Analyze qualitatively the risks identified that meet the standards mandated by the construction oversight body in the construction sector. This research would have used a qualitative approach by utilizing information gathered from secondary sources as the main source of data and presented an office study approach rather than a fieldwork data structure. The result was identifying Risk Management factors for the Project of Construction to offer a tool that helps in better decision-making and to establish implementing strategies that guarantee the fulfillment of the objectives of quality, and costs of the Project.

Keywords*: Management, Plan, Project, Risk.*

Introduction

One of the most important aspects of the success of a project is the ability to deal effectively with the risks that are part of each process. According to studies carried out by the Project Management Institute (PMI), the area of knowledge less applied and practiced on projects is the management of the risks that may arise from time to time, in many projects an informal approach to risk management is taken to ignore the possible risks that may arise in the progress of the project. Every project is associated intrinsically with a set of risks requiring an established, documented, and effective implementation plan; it is here that the risk management process is vitally important to allow the planning and prevention of possible risks, avoiding delays in execution times, quality problems, poor estimation of resources or, at worst, the failure of the project. The purpose of Risk Management is to minimize the impact of negative risks (threats) and maximize the positive risks (opportunities) identified for the project. This is achieved by identifying all

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the risks of the project, assessing their probability of occurrence and potential impact, and creating action plans to manage the risks identified.

Literature Review

The background of any investigation to be executed in its works and reports must have similarities or form a relationship with the research objective, in terms of data, methodologies, and tools used.

The Ministry of Natural Resources and the Environment and the Geology and Mines Commission; were the first in Guyana to attempt to investigate the study and deal with the same problem or others related to it. This information serves as a guide to the researcher and allows him to make comparisons and to have ideas on how the problem was dealt with at that previous time of investigation. The result of the study was as follows:

1. Elaboration of a Preliminary Risk Management Plan that represented a very useful approach to the considerations necessary to consider by the Project team from the perspective of the probability of occurrence of events that negatively affect the execution of the same.
2. Some risks arising in the early stages of the project may be avoided by clarifying the requirements, obtaining information, improving communication, or acquiring experience. Also, taking early actions to reduce the likelihood of a risk occurrence and/or its impact on the project is often more effective than trying to repair the damage after the risk has occurred.
3. The proposal developed in this study provides a solid platform for the subsequent establishment of a Better Consolidated Plan, which provides for a more precise quantitative analysis of risks, its affection to the variables of time, cost, and scope of the Project, its measurement and finally an adequate strategy of monitoring and control to dissipate the probabilities of occurrence of the same ones.

Research Gap

The development of this work was to identify, draft, and discuss a type of relationship for consultancy services and civil engineering firms and the effect of risk management applications, for a viable management model.

Project Risk Management

The definition of risk is viewed as offering a double benefit in terms of opportunity and threat within a single project [1].

Risk is perceived as the flipside of value, implying that risk and value management are two interrelated concepts that should be undertaken as paralleling in a project [2].

According to [3], project risk is, "… an uncertain event or condition that, if it occurs, has an [positive or negative] effect on at least one project objective."

Risk Analysis and Management

Risks associated with the construction industry can be broadly categorized into:

1. **Technical Risks:** The risks associated with Incomplete Design, Inadequate specification, inadequate site investigation, change in scope, Construction procedures insufficient resource availability, etc. are termed as technical risks.
2. **Construction Risks:** These risks include Labor productivity, Labor disputes, Site conditions, Equipment failures, Design changes, high-quality standards, and new technology.
3. **Physical Risks:** The risks arising from Damage to structure, Damage to equipment, Labor injuries, Equipment & and material fire and theft, etc. are known as physical risks.
4. **Organizational Risks:** The organizational risks consist of Contractual relations, Contractor's experience, Attitudes of participants, inexperienced workforce, and Communication.

5. **Financial Risks:** Increased material cost, Low market demand, Exchange rate fluctuation, Payment delays improper estimation taxes, etc. are related to financial risks.
6. **Socio-Political Risks:** Changes in laws and regulations, Pollution and safety rules, Bribery/Corruption, Language/Cultural barrier, Law and order, War and civil disorder, and Requirement for permits and their approval.
7. **Environmental Risks:** Natural Disasters and Weather Implications.

Risk vs Uncertainty

Risk is defined as the "cumulative effect of the probability of uncertain occurrences that may positively or negatively affect project objectives". Although the terms risk and uncertainty are often used interchangeably, they are not the same. Risk unlike uncertainty, which considers only the event and where the probability is completely unknown [4].

Reference is made to uncertainty as something unknown and risk as something that can occur. According to these authors, much of the risk in projects comes from uncertainty, but other factors contribute to project risk, for example, the timeframes and deadlines, costs, scarcity of resources, inadequate abilities, and competencies, among others [5].

The traditional forms of dealing with risk tend to concentrate on variability events and little consider the view of existing ambiguities in projects. For them, variability refers to the elements of a project that can assume distinct, though uncertain, values, such as deadlines, costs, and quality. Ambiguity is already associated with the lack of clarity of the data, the details, and structures among other factors since there is bias in the behavior of those involved, restricted knowledge, and unclear situations [4].

Risk is commonly considered as a negative, uncertainty is a more up-to-date concept, it includes the positives and negatives, the first being the opportunities and the second the threats.

Risk Management Process

The risk management process is defined by [6] as: "The systematic application of management policies, procedures, and practices to the tasks of reviewing communicating, establishing the context, identifying, analyzing, evaluating, treating, monitoring and communicating risk".

The Risk Management Plan is not an optional activity, it is essential for the success of the project, it must be present in all phases of execution, and therefore, be included in the plans and operational documents of any project from the beginning to the culmination, in this way, it becomes an integral part of all the aspects of the management of the same, in each phase and each group of processes.

Six (6) processes within risk management were established by [7], which are the following:

1. Risk Management Planning: The objectives of this process are to develop strategies for how risk management will be carried out and to integrate project risks with all other project management activities. Careful and explicit planning improves the possibility of success of the other five risk management processes, in this process, we decide how to tackle and carry out the risk management activities of a project. The planning of risk management processes is important to ensure that the level, type, and visibility of risk management are consistent with the risk and the importance of the project for the organization, to provide sufficient resources and time for risk management activities, and to establish an agreed basis for assessing risks.

2. Identification of risks and their classification: Risk identification determines what risks can affect the project and documents its characteristics; in this process, all project stakeholders must participate. Risk identification is an iterative process because

new risks can be discovered as the project progresses through the lifecycle, it is impossible to identify all the risks at the beginning of the project. Over time, the level of risk exposure in the project increases because of changes in decisions and measures taken internally and externally. The frequency of iteration and who will participate in each cycle will vary from case to event. The project team must participate in the process to develop and maintain a sense of belonging and responsibility for the risks and actions associated with responding to the risks. Those interested outside the project team can provide additional information about the objectives.

The establishment for the process of identification of risks, some critical factors of success, which are the following [8]:

1. Iterative identification.
2. Pop-up ID.
3. Complete identification of risk sources.
4. Multiple identification prospects.
5. Risks must be linked to the objectives of the project.
6. The identified risks should be described clearly and unambiguously.
7. If necessary, identify the risks with various levels of details.
8. Target identification of risks.

3. Qualitative Risk Analysis: This process includes the methods to prioritize the risks identified for other analysis or subsequent actions, evaluating, and combining their probability of occurrence and their impact. Organizations can effectively improve project performance by focusing on high-priority risks. This process evaluates the priority of the risks identified using the probability of occurrence, the corresponding impact on the project objectives if the risks occur, as well as other factors such as the deadline and risk tolerance of project restrictions such as cost, time, scope, and quality. Critical success factors, according to [8] are as follows:

1. Use the agreed approach (analysis based on probability of occurrence and impact on individual objectives).
2. Use agreed definitions (probability and impact levels on objectives).
3. Collect high-quality information about the risks.
4. Perform Iterations to the qualitative analysis of risks.

4. Quantitative risk analysis: The quantitative analysis of risks is done concerning the risks prioritized in the previous process because it has a significant impact on the concurrent demands of the project. This process analyzes the effects of these risks and is assigned a numerical rating. By conducting the quantitative risk analysis process, a numerical estimate of the overall impact of the risks in the project objectives is obtained, based on the current plans and the available information, by considering all the risks simultaneously [9]. The results of this type of analysis can be used to assess the probability of success in achieving project objectives and to estimate contingency reserves, usually at appropriate time and cost, and risk tolerance for the project. A quantitative method can also be applied to make decisions in the event of uncertainty, using Monte Carlo's simulation techniques and the analysis by decision tree. Critical success factors for this process, according to the [8] are as follows:

1. Follow the logical sequence: identify – prioritize – qualitative analysis – quantitative analysis.
2. Use an appropriate project model as a basis for quantitative analysis.
3. Collect information from high-quality hazards.
4. Impartiality in data-taking and risk information.
5. Identify the relationships between common root risks if they are likely causes to occur.

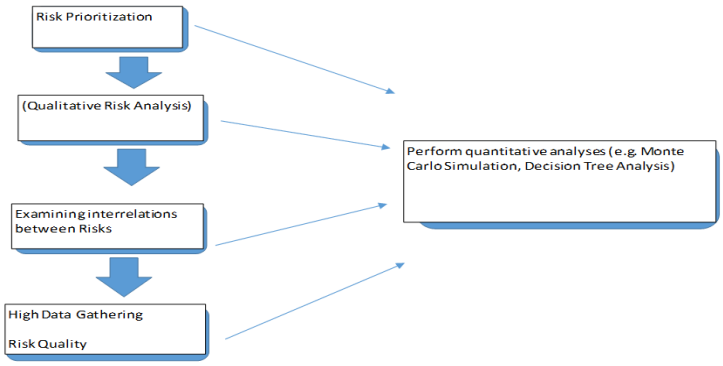

Figure 1. Structure of Quantitative Risk Analysis [3]

Figure 1; depicts the various sequences in project risk management to identify risk or uncertainty and how they are applied to garner an outcome using quantitative analysis techniques such as the Monte Carlo simulation techniques.

5. Risk-response planning: Risk-response planning is the process of developing options and determining actions to improve opportunities and reduce threats to project objectives, at this stage risks are addressed based on their priority, introducing resources and activities in the budget, schedule, and management plan of the project, as needed, in addition to assign the people to take responsibility for each response to the risks agreed and financed. The contingency response actions of a risk must be executed at an optimal time, for this reason, the answer specified for each of these risks should include a description of the corresponding activation conditions.

6. Risk Monitoring and Control: It is the process of identifying, analyzing, and planning new risks, tracking identified risks, re-analyzing existing risks, tracking residual risks, and reviewing responses while assessing their effectiveness.

The effectiveness of the Risk Management Plan depends on how the approved plans are carried out. These plans must be successfully executed, reviewed, and updated regularly. If this is done correctly, the effort invested will be rewarded and future projects will benefit from the experience of this project. The main objectives of surveillance and risk control are to monitor the risks identified, monitor residual risks, identify new risks, ensure that response plans are implemented at the right time, and assess their effectiveness throughout the project's lifecycle [10]. The corresponding set of responses and activation conditions have been defined and specified for each risk-set situation. It is the responsibility of the holder of the action to ensure that these conditions are monitored effectively and that the corresponding actions are carried out as defined timely.

Results and Discussion

Identification of Risk Factors Relating to Consultancy Services in Civil Engineering

Risk factors in construction projects can be split into two major groups [11]:

1. Internal risks, which fall within the control of clients, consultants, and contractors.
2. External risks, which include risk elements that are not in the control of key stakeholders.

Risks need to be identified and managed at an early stage of the construction process.

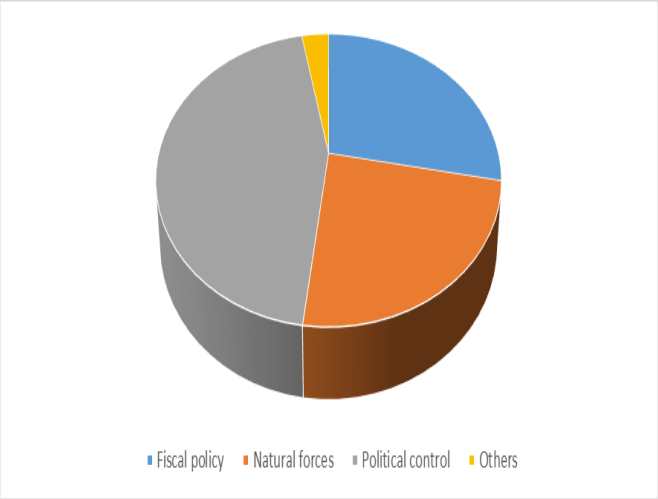

Figure 2. Representation of External Project Risks

Figure 2; highlights the top three external risks identified:

1. Fiscal policy (28%)
2. Natural forces (24%)
3. Political control (45%)

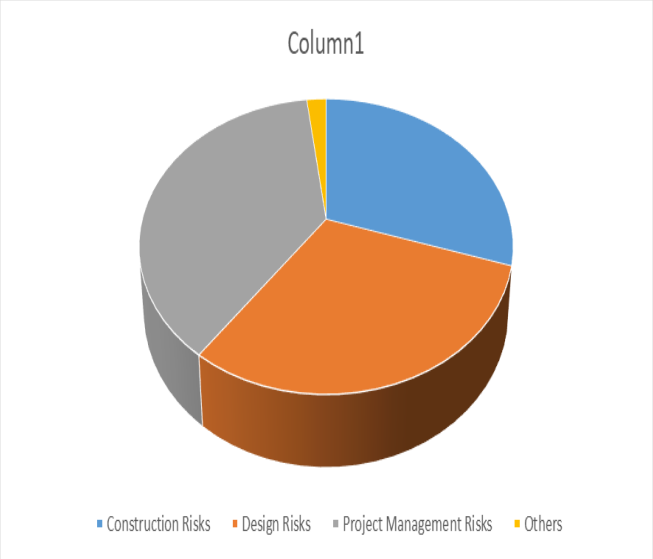

Figure 3. Representation of Internal Project Risks

The above figure identifies project-level risks according to their possible effect on construction project objectives. The top three important categories of internal risks identified are:

1. Construction risks (30%)
2. Design risks (30%)
3. Project management risks (38%).

These risk factors were established to be important under the internal risk categories. Under the design risk category, design errors/omissions and design process delays were the most frequently mentioned risk factors attributed to the contractors [12]. Under the project management risk category, scheduling errors and failure to comply with contractual quality requirements were the most frequently mentioned risk factors. Under the construction risk category, construction cost overruns and technology changes were the most frequently mentioned risk factors attributed to the contractors. Respondents believed that these risk events are responsible for poor quality of work, delays, and associated losses.

According to the methodology proposed by [7], the knowledge of project management is grouped into 9 areas which are as follows:

1. Project Integration Management.
2. Project Scope Management.
3. Project Time Management.
4. Project Costs Management.
5. Project Quality Management.
6. Human Resources Project Management.
7. Project Communications Management.
8. Project Risk Management.
9. Project Acquisition Management.

The Project under study showed the application of the knowledge management areas mentioned above, except for the areas of Risk Management and Quality Management, where the first represents a fundamental factor in the probability of its success [13]. The project developed by the consulting firm does not have a Risk Plan, which is a great weakness for the company. By this and given the requirements and requirements of the organization to want to ensure and guarantee the success of the project, it is imperative to evaluate the risks of consultancy services, before beginning its execution, to guarantee the success and achievement of the objectives posed [14].

Risk Management Planning

To develop the proposed risk plan, the model of the PMI was used as a base methodology, developed around Project Risk Management, which aims to ensure that the project's risks are identified, analyzed, documented, mitigated, and controlled during the project's life cycle. In this phase, the process was raised to manage the risks of the project, which was structured in five phases: planning, identification, analysis, development of the plan of response monitoring, and risk control [15].

Risk Identification

Risk identification is an organized, thorough approach to finding real risks associated with a project. It is not, however, a process of inventing highly improbable scenarios to cover every conceivable possibility. Risks cannot be assessed or managed until realistic possibilities are identified and described understandably. The key failing of project managers in risk identification is the actual description of risk events. Many project managers attempt to identify risks simply as “schedule” or “cost.” [16], (The schedule in and of itself is not a risk.) A risk event is something that may happen to the benefit or detriment of the project.

Qualitative Analysis of Identified Risks

According to [17], Qualitative methods for risk assessment are based on descriptive scales and are used for describing the likelihood and impact of a risk. These relatively simple techniques apply when quick assessment is required in small and medium-sized projects. Moreover, this method is often used in case of inadequate, limited, or unavailable numerical data as well as limited resources of time and money.

As identified by [18] an exemplary range of probability from 'very unlikely' to 'almost certain’; however, the corresponding numerical assessment is admissible. The impact scale varies from 'very low' to 'very high'. By applying the method called risk probability and impact assessment, the likelihood of a specific risk occurring is evaluated.

Development of Plan for Treatment and Response to Risk

Risk response development is a critical part of the risk management process that determines what action will be taken to deal with risk issues assessed in the identification, qualification, and quantification efforts. All information generated to date becomes crucial in determining what the organization will do, that is in keeping with the risks, the organization’s tolerance, the project tolerances, and the client's behavior as identified by [19]. To some degree, risk is a cultural phenomenon. Different countries, regions, and organizations have

different traditional tolerances for risk and risk responses. [20] Determining what limits exist early in the risk response planning process is important to ensure that time is not lost on approaches that are unbearable. Risk thresholds are as important here as they are in establishing basic probability and impact for the risks. These risk thresholds should become a component of the risk management plan.

Conclusion

An effective risk management process inspires the construction firm to identify and quantify risks and to consider risk control and risk reduction policies. Construction firms that manage risk effectively and efficiently relish financial savings, greater productivity, improved success rates of new projects, and improved decision-making [21]. According to [22], Qualitative methods of risk valuation are used in construction firms most frequently, ahead of quantitative methods. In construction project risk management, risks may be compared by assigning them to a risk impact matrix against probability. Mitigation options are then derived from predefined restrictions to ensure the risk tolerance and appetite of the construction firm.

Risk management not only helps in avoiding crises but also aids in remembering and learning from past mistakes. This improves the chance of successful project completion and reduces the consequences of those risks [23].

Risk management in the construction industry requires a complementary, interdisciplinary, flexible approach to capture the changing character of risk factors (qualitative, quantitative) as well as a precise description and explanation of the mechanisms involved in the organization of construction production. Therefore, in developing a risk assessment model in construction projects it should be emphasized on the compilation of even available and already recognized tools to use a hybrid approach [24].

The purpose of the analysis is to summarize the observations carried out in such a way that they provide answers to the questions of the investigation [25].

The purpose of presenting this work was to identify the Risk Management factors for Project Construction in Civil Engineering firms and their nature in relationship to consultancy services, based on the methodology established. Analyzing the sources of the most relevant risks it was found that most of the risks whose classification belong to the class on High-Risk have their origin of being External Risks or Outer Risk.

Based on the qualitative analysis, a risk listing can now be elaborated, prorating, and selecting only the high and moderate risks that could impact projects, excluding the risks whose classification in the Matrix Probability Impact was low.

Conflict of Interest

I, Latchman Singh declare that there is no financial, commercial, legal, or professional relationship with other organizations, or with people working with them, that could influence this research.

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The Effect of Internal Factors on Financial Performance of Pharmaceutical Wholesale Companies in Zimbabwe

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Abstract

The study examined the effect of internal factors on financial performance of pharmaceutical wholesale companies in Zimbabwe. The research objectives set to guide the study were to ascertain internal factors influencing the financial performance of pharmaceutical wholesale companies; establish operating mechanisms that are deployed to improve financial performance of pharmaceutical wholesale companies; identify adverse effects resulting from the poor financial performance of pharmaceutical wholesale companies and proffer recommendations on how pharmaceutical wholesale companies in Zimbabwe can improve financial performance. The study adopted a quantitative research design and employed convenient sampling to gather data from 103 pharmaceutical companies in Zimbabwe. Data was analyzed using descriptive statistics and the results from the study were presented using tables and figures. Results from the study show that information technology systems and marketing systems may influence financial performance of pharmaceutical wholesale companies, while organizational culture, financial mechanisms and distribution systems may not influence financial performance. Adverse effects of poor financial performance identified in the study include economic loss, bad operational decisions, poor staff retention and bankruptcy. Key recommendations from the study include the need to leverage information technology (IT) systems and marketing systems to improve the financial performance of pharmaceutical wholesale companies in Zimbabwe. While the study did not find significant influences of organizational culture, financial mechanisms and distribution systems on financial performance, it is essential for companies to continuously assess and adapt these internal factors to align with organizational goals and market dynamics.

Keywords: *Financial Performance, Internal Factors, Pharmaceutical Wholesale Companies, Zimbabwe.*

Introduction

The pharmaceutical sector in Zimbabwe plays a pivotal role in delivering essential healthcare products to its population. Zimbabwe has a populace exceeding 14 million and encounters significant healthcare challenges [1]. These significant health challenges include a high disease burden, restricted healthcare access, and a scarcity of medical resources [2]. Acting as vital intermediaries in the healthcare supply chain, pharmaceutical wholesale companies distribute medications, vaccines, and medical equipment to healthcare facilities, pharmacies, and other healthcare providers nationwide [3].

Zimbabwe hosts just nine pharmaceutical manufacturing companies, encountering operational hurdles that hinder growth and have led to a decline in the local production market share of medicines to a mere 10% in 2014 [3]. The inadequate local capacity for medicine manufacturing has resulted in critical medicine shortages in the market. Zimbabwe has 120 registered pharmaceutical wholesale companies [2].

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Imported medicines constitute 50% of the market, while donated medicines, also imported, make up 40%, with locally produced medicines accounting for only 10% [3]. To enhance the financial performance of pharmaceutical wholesale companies, effective operational mechanisms are crucial to meet the essential medicines demanded in the market. The limited local procurement of medicines, contributing only 10% of available market medicines, results in diminished market share and profitability for wholesalers [3].

Operating within a dynamic and challenging environment marked by economic volatility, regulatory intricacies, and healthcare system limitations, companies in Zimbabwe face various hurdles, including currency instability, supply chain disruptions, and regulatory compliance demand [4]. Pharmaceutical wholesale companies employ a mixed pricing strategy [2] and this poses challenges for wholesalers, with currency conversions incurring substantial taxes, thereby impacting companies' profitability.

Despite these challenges, the pharmaceutical sector remains instrumental in ensuring the availability and accessibility of crucial medicines, particularly in rural and underserved regions [3]. The critical role played by pharmaceutical wholesale companies in Zimbabwe is vital for ensuring availability of essential medicines. However, there is a lack of comprehensive understanding of internal factors that significantly impact financial performance. Despite Zimbabwe facing challenges such as economic volatility, regulatory constraints, and supply chain complexities [5] the specific internal factors influencing financial outcomes of pharmaceutical wholesale companies have not been thoroughly explored. However, other studies conducted highlight the difficulties of pharmaceutical wholesale companies in sustaining profitability due to poor economy performance and severe regulatory restrictions in Zimbabwe [6]; [2].

This knowledge gap hinders the ability of pharmaceutical wholesale companies to manage operations effectively, allocate resources optimally, and maintain profitability in a competitive business environment. Without a clear understanding of these internal factors, pharmaceutical wholesale companies, policymakers and industry practitioners may struggle to identify areas for improvement, implement strategic initiatives, and mitigate financial risks, putting their long-term sustainability and the healthcare supply chain in Zimbabwe at risk. This research is crucial for filling knowledge gaps and guiding evidence-based decision-making to strengthen the resilience and effectiveness of the healthcare supply chain in Zimbabwe.

This study aims to examine the effect of internal factors on financial performance of pharmaceutical wholesale companies in Zimbabwe. The research objectives set to guide the study were to ascertain internal factors influencing the financial performance of pharmaceutical wholesale companies; establish operating mechanisms that are deployed to improve financial performance of pharmaceutical wholesale companies; identify adverse effects result from the poor financial performance of pharmaceutical wholesale companies and proffer recommendations on how pharmaceutical wholesale companies in Zimbabwe can improve financial performance. By identifying and analyzing these factors, the research seeks to provide valuable insights that can inform strategic decision-making, enhance financial management practices, and ultimately elevate the performance and competitiveness of the pharmaceutical sector in Zimbabwe.

Methods

The geographical scope of the study is centered in 5 cities of Harare, where most pharmaceutical wholesale companies are located (Harare, Bulawayo, Mutare, Gweru, Kwekwe) [6]. Harare is the capital city of Zimbabwe. It has a population of 1,542,813

million people, Bulawayo- 699,385 people; Mutare- 184,205 people; Gweru- 146,073 people; and Kwekwe- 99,149 people [7]. Most businesses have their headquarters in Harare since it is the capital city of Zimbabwe. Also, these locations were selected because of the presence of registered pharmaceutical wholesalers actively trading in these cities of Zimbabwe.

In this study, a non-probability sampling technique was used. According to [8], non-probability sampling was used to select sample units based on the researcher's judgement or on availability of the sampling units. Company owners, directors, marketing managers, finance manager, procurement managers, and distribution managers at pharmaceutical wholesale companies were selected conveniently.

The formula adopted from [9] was used to calculate the sample size for a population of 120 pharmaceutical wholesale companies in Zimbabwe, using a confidence interval of 95%, and 5% margin of error.

$n = N/(1 + N(e2))$

n= represent the Sample size

N= represents Total Population under study.

e2 = represent the level of significance (0.05)

n =120/(1+120(0.0025))

n=120/(1+0.4225)

n=120/1.4225

n=92.3

n=92

Therefore, with the instrumentation of the formula [9], the minimum sample size for the study is ninety-two (92) respondents. Accounting for non-response

$$Required\ sample\ size = Minimum\ sample\ size/(1 - f)$$

$where\ f\ is\ 10\%$

The required sample size n = 103.

According to [10] response rates approximating 60% should be the goal of researchers for research studies.

The researcher pretested the questionnaire in 3 locations, that is Harare, Mutare and Kwekwe to ensure that the questionnaire is clear, valid, and reliable. The researcher pretested the questionnaire with company owners, financial, procurement, distribution, and marketing managers of key technical areas at 10 pharmaceutical wholesale companies that did not participate in the study (5 companies in Harare, 3 in Mutare and 2 in Kwekwe). The researcher adjusted the questionnaire based on the feedback from financial experts.

The researcher analyzed the effect of internal factors on financial performance of pharmaceutical wholesale companies in Zimbabwe using descriptive Statistics with Microsoft Excel to analyze data collected. The diverging Stacked Bar Graphs was used to present data graphically and provide some insight into where most responses lie [10], [11], [12]. Further interpretation was done using mean scores [13] using the formulas below:

$$Total\ scores = \sum(fi\ xLikert\ Scale\ Score)$$

Where: $\boldsymbol{f_i}$ = frequency of each Likert scale score (number of respondents)

$\boldsymbol{i}$ = Likert Scale Scores, namely SD (1), D (2), Neutral (3), A (4), SA (5). Mean score was calculated by dividing the total scores by the total number of respondents:

$$Mean\ Score = \sum(fi \times Likert\ Item\ Score) \div Number\ of\ Respondents.$$

Likert scale mean scoring: The attitude of respondents was determined based on the inference that a mean score of 3 in Likert scale represents neutral attitude, a mean score of less than 3 represents negative attitude and a mean score greater than 3 represents a positive attitude. The range of interpreting the Likert scale mean score was given as follows: 1.0-2.4 (Negative attitude), 2.5-3.4 (Neutral attitude), and 3.5-5.0 (Positive attitude).

Results

Respondents Background Characteristics

Demographic Information

Requests for interviews were sent to the 103 pharmaceutical wholesalers in Zimbabwe through email. Respondents were reached using email in which an online link with google forms was shared. Out of the sample of 103 pharmaceutical wholesalers, 98 (95%) pharmaceutical wholesale companies were available for interviews. The respondents were categorised into top management, middle management, and supervisors/low level management [14]. Table 1 below shows the respondents background characteristics.

Table 1. Respondents Background Characteristics

Variable		Proportion	Percentage
Position in company	Top Management	49	50.0%
	Middle Management	18	18.8%
	Supervisor	31	31.2%
Education level	Postgraduate level	56	57.1%
	University level	22	22.4%
	College level	20	20.4%
Years in operation	≤3 years	19	19.4%
	4-5 years	15	15.3%
	6-10 years	27	27.56%
	≥10 years	37	37.8%
Number of employees	1-10	40	40.8%
	10-49	48	48.9%
	50-250	10	10.2%
	Above 250	0	0%
Company location	Harare	75	77%
	Bulawayo	9	9%
	Mutare	7	7%
	Gweru	5	5%
	Kwekwe	2	2%

The results from the study show that half of all the respondents (50.0%) were top management while 18.8% were middle management level, and 31.2% were supervisory staff. The majority (37.8%) of wholesalers that responded to the study had been operational for more than 10 years, 27.56% with 6-10 years' operating and 19.4% with less than 3 years operation. Ten percent (10%) were medium size pharmaceutical wholesale companies with 50 employees and above, while 48.9% were small size companies (10- 49 employees) and 40.8% were micro-size pharmaceutical wholesalers with below 10 employees [15]. The majority, 80% of medium size companies had been operational for more than 10 years.

Internal Factors Influencing Financial Performance

Organizational Culture

Most respondents (57%) agreed that organizational structure affect company financial performance, while 38% disagreed. On whether the organization fosters adaptability and change management, most

(53%) of the respondents disagreed and 41% agreed that the organization fosters adaptability and change management. Majority (82%) of the respondents agreed that there is a strong alignment between organizational values and financial performance. Figure 1 below shows results from the respondents on how organizational culture influence financial performance of pharmaceutical wholesale companies.

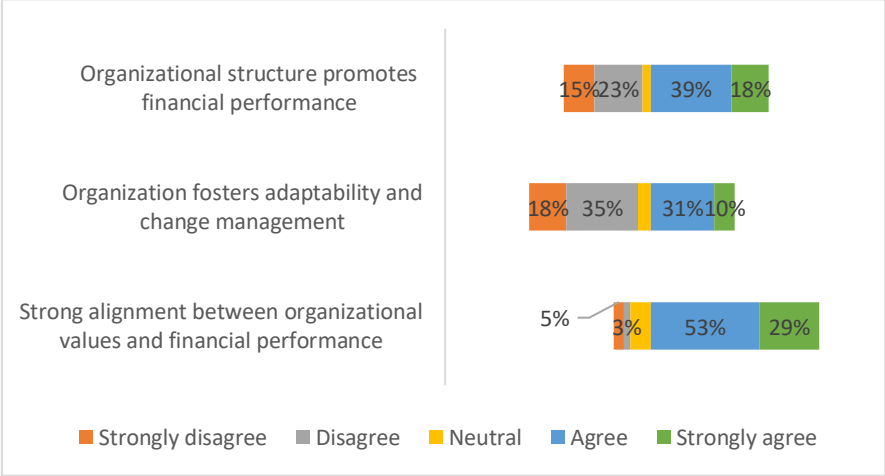

Figure 1. Organizational Culture and Financial Performance

As shown in Table 2 below, respondents' opinions were also measured using mean scores. The overall attitude of respondents toward the relationship between organizational culture and financial performance is neutral, with an overall mean score of 2.7.

Table 2. Mean Scores for Organizational Culture and Financial Performance

S/N	**Organizational culture and financial performance**	**SD**	**D**	**N**	**A**	**SA**	**N**	**Mean Score**	**Attitude**
1	Strong alignment between organizational values and financial performance	5	3	10	52	28	98	4.0	Positive
2	Organization fosters adaptability and change management	18	34	6	30	10	98	2.9	Neutral
3	Organizational structure promotes financial performance of company	15	23	4	38	18	98	1.3	Negative

4	**Overall Mean Score**	**2.7**	**Neutral**

*Score criteria: 1.0-2.4 (Negative attitude), 2.5-3.4 (Neutral attitude), and 3.5-5.0 (Positive attitude).

Financial Mechanisms Deployed

Most respondents (60%) highlighted that organizational staff prepare financial statements. However, key challenges in preparing financial statements were also highlighted by most respondents. Sixty (60%) percent of the respondents agreed that financial statements were prepared by a full-time accountant, while 30% by the company owner. Of the 10% that hired accounting staff, 60% were from medium size company. Figure 2 below shows the results from respondents on who prepared accounts and financial statements of the company.

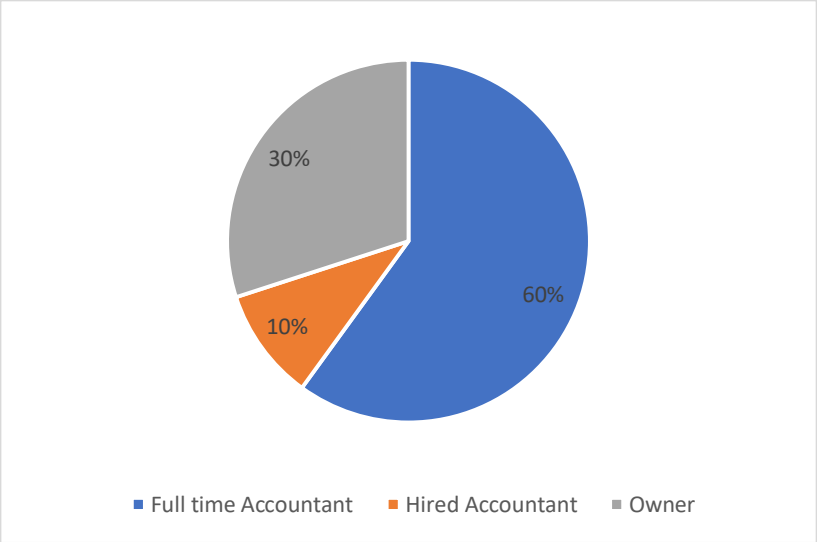

Figure 2. Who Prepares of Financial Statements?

Findings from the study indicate that all financial statements were being used by pharmaceutical wholesale companies for reporting. Most respondents (72%) identified the statement of cash flow as the most used in advising financial performance, followed by the balance sheet (48%). The statement of changes in equity was identified as the least which the companies used (10%). Figure 3 below shows the results on financial statements used to monitor financial performance.

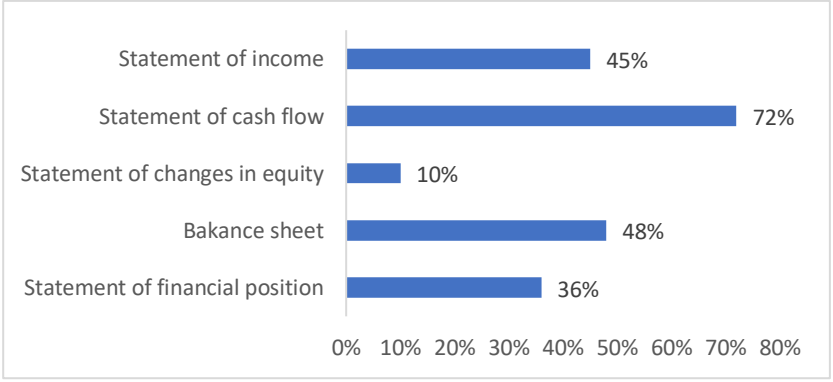

Figure 3. Financial Statements Used to Monitor Financial Performance.

Figure 4 below shows the challenges faced by pharmaceutical companies in preparing financial statements. Majority of the respondents disagreed (85%) that company staff lacked accounting knowledge while only 15% agreed that the company staff lacked accounting knowledge. Of the respondents, 60% of the 35% that strongly disagreed were from companies with more than 10 years' operating.

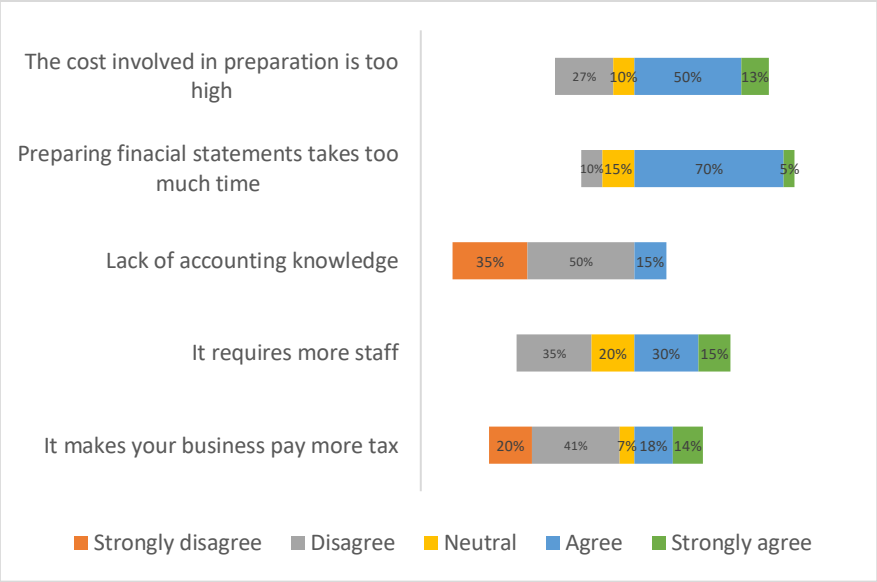

Figure 4. Challenges Faced by Pharmaceutical Companies in Preparing Financial Statements

Key challenges, mentioned by respondents with preparing financial statements include that the cost involved in financial performance was too high (83% agreed). Seventy percent (70%) agreed that preparing financial statements takes too much time while only 10% disagreed.

Forty-five percent (45%) agreed that it required more staff to prepare financial statements, while 35% disagreed. Of the 30% that agreed on requiring more staff to prepare financial statements, 60% are from companies operating 6-10 years, and 20% from companies operating less than 3 years. Majority of the respondents (61%) disagreed that preparing financial statements makes your business pay more tax. Sixty-one percent (61%) disagreed that preparing financial statements makes a business pay more tax. As shown in Table 3 below, the overall attitude on challenges faced in preparing financial statements is neutral, with an overall mean score of

Table 3. Mean Scores for Financial Mechanisms Challenges

S/N	Challenges faced in preparing financial statements	SD	D	N	A	SA	Total score	Mean score	Attitude
1	It makes your business pay more tax	20	40	7	18	14	263	2.7	Neutral

2	It requires more staff	0	34	20	29	15	319	3.3	Neutral
3	Lack of accounting knowledge	34	49	0	15	0	192	2.0	Negative
4	Preparing financial statements takes too much time	0	10	15	69	5	366	3.7	Positive
5	The cost involved in preparation is too high	0	26	10	49	13	343	3.5	Positive
6	**Overall Mean Score**							**3.0**	**Neutral**

Information Technology Systems and Financial Performance

The study found out that utilisation of technology by pharmaceutical wholesale companies was high among the pharmaceutical wholesale companies. The most used gadgets where desktop computers (80%), laptops (92%) and mobile phones (89%).

The study found out that pharmaceutical wholesale companies use information technology (IT) for a wide range of activities to improve financial performance. These wide range of activities include financial transactions and marketing. Seventy-five percent (75%) of the respondents always used IT to perform financial transactions, 52% always used IT for customer ordering, 45% used IT to always give information on products (45%) and marketing products (47%). Only 18% never used IT to order products.

Sixty-four percent (64%) sometimes used IT to with customers. Figure 5 below shows use of IT by pharmaceutical wholesale companies.

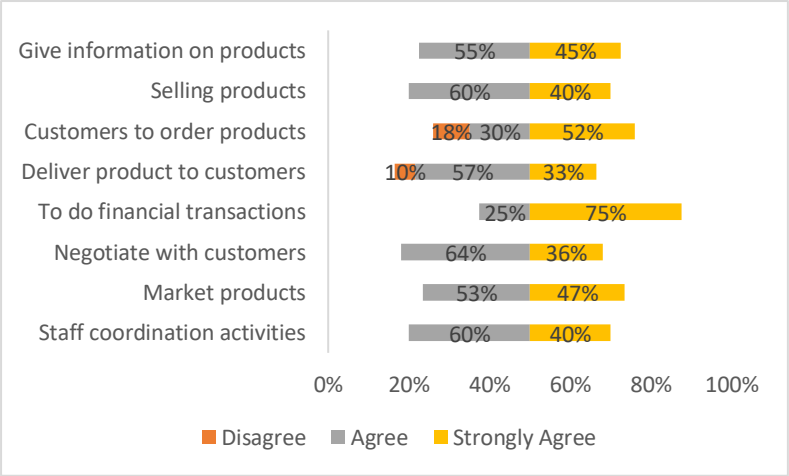

Figure 5. Use of IT by Pharmaceutical Wholesale Companies

As shown in Table 4 below, the overall mean score on uses of IT to influence financial performance is 4.4, which is positive. Respondents perceive IT activities such as staff coordination, marketing, negotiation, financial transactions, customer interactions, and sales as positively contributing to financial performance, as indicated by the consistently high mean scores falling within the positive attitude range.

Table 4. Mean Scores for Information Technology and Financial Performance

S/N	IT and financial performance	D	A	SA	Mean score	Attitude
1	Staff coordination activities	0	59	39	4.4	Positive
2	Market products	0	52	46	4.5	Positive
3	Negotiate with customers	0	63	35	4.4	Positive
4	To do financial transactions	0	25	74	4.8	Positive
5	Deliver product to customers	10	56	32	4.2	Positive
6	Customers to order products	18	29	51	4.3	Positive
7	Selling products	0	59	39	4.4	Positive
8	Give information on products	0	54	44	4.4	Positive
9	**Overall score**				**4.4**	**Positive**

*Score criteria: 1.0-2.4 (Negative attitude), 2.5-3.4 (Neutral attitude), and 3.5-5.0 (Positive attitude).

Marketing Systems and Financial Performance

The results show that retail pharmacies are a major customer of pharmaceutical wholesalers (70%), 67% sell to clinics, 65% sells to hospitals, 53% sells to other pharmaceutical wholesale companies. Individuals constitute 25% of the customer base in this study. Figure 6 below shows the customer base for pharmaceutical wholesale companies

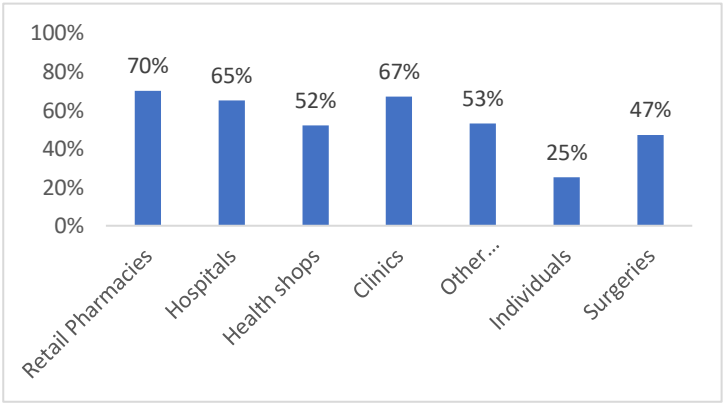

Figure 6. Pharmaceutical Wholesale Companies Customer Base

Majority (83%) of the respondents agreed that marketing improves financial performance of the company. Fifty-five percent (55%) of the respondents agreed that the company uses social media marketing to promote products, while 35% disagree. Majority (74%) agree that the company makes significant investment into marketing. To reach their customers, 65% agreed that they went for outreaches to market products. Figure 7 below shows marketing strategies to improve financial performance.

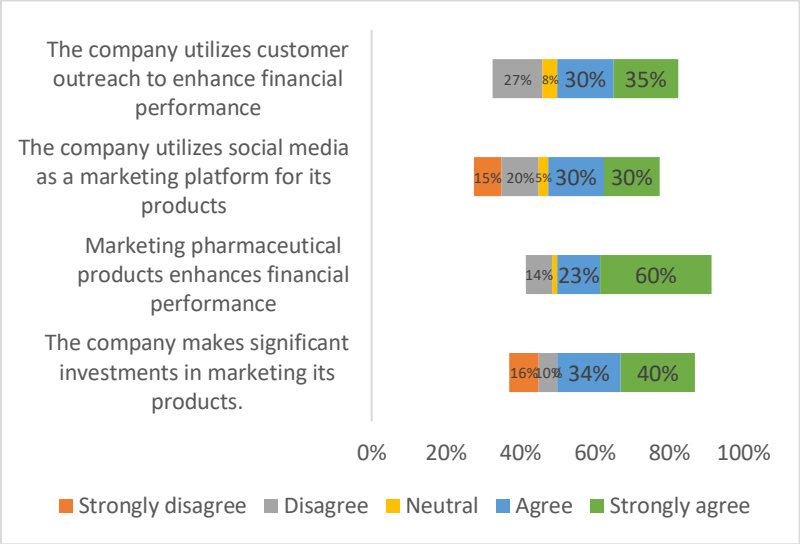

Figure 7. Marketing Strategies to Improve Financial Performance

As shown in Table 5 below, the overall attitude towards the relationship between marketing systems and financial performance is positive, with an overall mean score of 3.8. Respondents perceive marketing investments, marketing pharmaceutical products, and customer outreach as positively influencing financial performance. However, opinions regarding the utilization of social media as a marketing platform are more varied, with a neutral attitude prevailing.

Table 5. Mean Scores for Marketing Strategies to Improve Financial Performance

S/N	Marketing systems and financial performance	Strongly disagree	Disagree	Neutral	Agree	Strongly agree	Mean Score	Attitude
1	The company makes significant investments in marketing its products.	16	10	0	33	39	3.7	Positive
2	Marketing pharmaceutical products enhances profitability	0	14	3	23	59	4.3	Positive
3	The company utilizes social media as a marketing platform for its products	15	20	5	29	29	3.4	Neutral
4	The company utilizes customer outreach to enhance profitability	0	26	8	29	34	3.7	Positive
5	**Overall score**						**3.8**	**Accepted**

*Score criteria: 1.0-2.4 (Negative attitude), 2.5-3.4 (Neutral attitude), and 3.5-5.0 (Positive attitude).

Distribution Systems and Financial Performance

Most of the respondents agreed that companies have distribution systems to move the products to the customer. Seventy percent (70%) of the respondents agreed that pharmaceutical wholesale companies make significant investment in product distribution, while only 15% disagree. Fifty-five percent of those that strongly agreed to have an efficient distribution system were from companies with more than 10 years' operating, while 40% were from companies with 6-10 years' operating.

Sixty-nine (69%) of the respondents agreed that the company has an efficient distribution system, while only 20% disagreed. Majority of the respondents (66%) from the medium size companies agreed that the company has an efficient distribution system.

Majority of respondents, 61% disagreed that the company outsources distribution of pharmaceutical products, while 37% agreed that the company outsources distribution services. Most of the respondents (69%) agreed that that the company has partnerships with other logistics companies, while 28% strongly disagreed that the company has partnerships with other logistics companies. Figure 8 below shows pharmaceutical wholesale companies distribution system and financial performance.

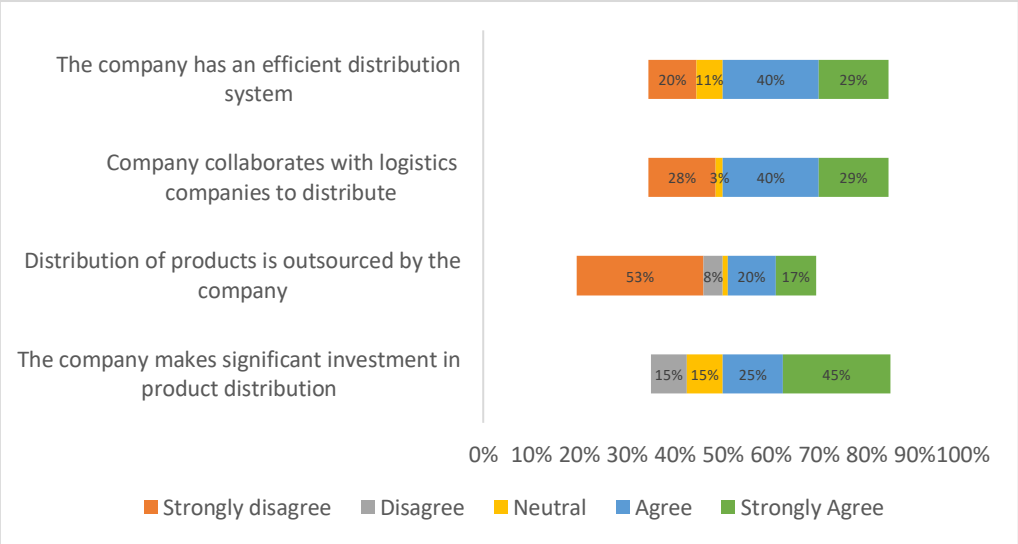

Figure 8. Pharmaceutical Wholesale Distribution Systems and Financial Performance

The overall attitude towards the relationship between distribution system and financial performance is neutral, with an overall mean score of 3.4, as shown in Table 6 below. Respondents perceive significant investment in product distribution and having an efficient distribution system as positively impacting financial performance. However, there is a negative attitude towards outsourcing distribution, while the collaboration with logistics companies for distribution evokes a more neutral attitude overall.

Table 6. Mean Scores for Distribution Systems and Financial Performance

S/N	Distribution system and financial performance	Strongly disagree	Disagree	Neutral	Agree	Strongly Agree	Score	Mean score	Attitude

1	The company makes significant investment in product distribution	0	15	15	25	44	395	4.0	Positive
2	Distribution of products is outsourced by the company	52	8	2	20	17	239	2.4	Negative
3	Company collaborates with logistics companies to distribute	27	0	3	39	28	332	3.4	Neutral
4	The company has an efficient distribution system	20	0	11	39	28	349	3.6	Positive
5	**Overall mean score**							**3.4**	**Neutral**

*Score criteria: 1.0-2.4 (Negative attitude), 2.5-3.4 (Neutral attitude), and 3.5-5.0 (Positive attitude).

Adverse Effects of Poor Financial Performance

Several adverse effects of poor financial performance were cited by respondents. Seventy-five (75%) percent of the respondents mentioned that economic loss is the major adverse effect of poor financial performance while only 40% mentioned bankruptcy. Sixty percent (60%) of the respondents mentioned that bad operations decisions and that poor staff retention (52%) are also adverse effect of poor financial performance. Figure 9 below shows the adverse effects of poor financial management.

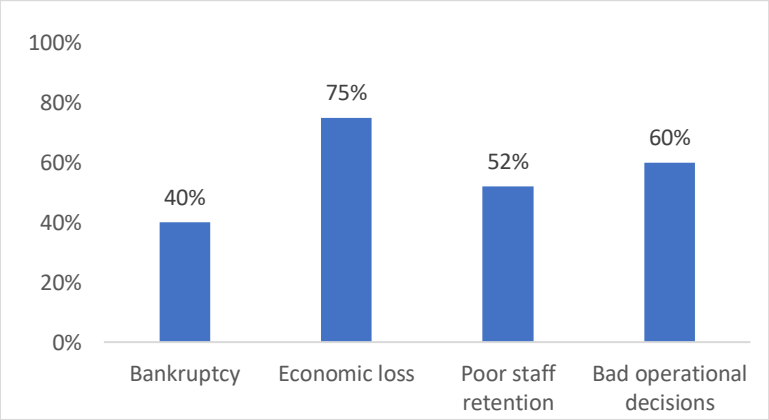

Figure 9. Adverse Effects of Poor Financial Performance

Discussion

The majority, 80% of medium size companies had been operational for more than 10 years. Firm size and the age of the company with financial performance, results from this study agree with the findings from other researchers. Majority of medium-sized companies being operational for more than 10

years reflects their maturity, resilience, and capacity for sustained success. [16] opine that a firm's size is a primary factor in determining its profitability. [17] also asserts that firm's size influence financial performance of a company. Findings from the study provides key insights into the evolving dynamics of the business landscape and the factors contributing to the longevity and viability of medium-sized enterprises. However, [18] found out an inverse relationship between firm age and financial performance in Nigeria.

Of the 50% top management that responded, 70% had post-graduate level education. These findings may suggest that top management with post-graduate level education may bring a wealth of knowledge, expertise, and strategic thinking to the organization, which may positively influence financial performance. This could be through innovation, effective decision-making, strategic planning, and leadership capabilities. To [19] higher academic qualifications influence positively performance. In addition, [20] mention that that resource allocation, internal control systems and management capacity have a positive effect on financial performance.

In this study, respondents were neutral (overall mean score of 2.7) on effect of organizational culture on financial performance. Even though respondents perceived a strong alignment between organizational values and financial performance (mean score 4.0 indicating positive attitude), they also opined that the organizational structure does not promote financial performance of the company (mean score 1.3- negative attitude). Findings from the study differ those by [21], who found out that there is a positive relationship between organizational culture and financial performance. To [22], organizational culture has a key influence on decision-making processes pertaining to financial matters.

In the view of [23] corporate culture entails visionary, ethical, and managerial orientations which organizations use to promote and practice as public commitments toward all stakeholders. In a study that was conducted by [23], corporate values indirectly affect income and operational performance through human values.

According to a study that was conducted by [24], organizational change management processes have a significant contribution to the financial performance of organizations. However, more studies need to be conducted to understand the effect of change management and organizational structure on financial performance.

Findings from the study indicate that all financial statements were being used by pharmaceutical wholesale companies for reporting. These findings agree with other studies. To [25] operationalizing accounting and financial management system impact on financial performance. In this study, most of companies used different accounting methods to monitor financial performance. To [26], small to medium companies prepare financial statements using full-time accounts officers, and sometimes company owners also prepare financial statements. Also, the study found out that some pharmaceutical wholesale companies outsourced services. According to [27], outsourcing enables companies to access world class technical skills while also minimising risk.

As this study found out, [28] mentions that different financial statements, which companies use include cash flow, statement of income and balance sheet among others are used for accounting and affect financial performance. The study found out challenges in financial reporting which was also confirmed in other studies. To [29], capturing financial information takes a lot of time, which corroborates findings from study. There was a mean score of 3.7 on the perception of respondents on financial statements preparation taking too much time, indicating a positive attitude.

In this study, respondents perceived several IT activities as positively influencing financial performance, with an overall mean score of 4.4. According to [30], information technology entails use of computers and hardware to manage business on a wide range of activities where IT is utilised in pharmaceutical companies. [31], views that bigger companies have more IT needs and use more complex technologies. There is need to conduct more studies to analyse the effect of IT systems on financial performance with the mediating effect of business operating environment in Zimbabwe, where economic situation is dynamic.

Respondents in the study perceive marketing systems and financial performance as positive. In the study, respondents identified customer base for pharmaceutical wholesale companies. This corroborates with the [32], which identified the market base for pharmaceutical companies as chain pharmacies, independent pharmacies, hospitals, clinics, nursing homes, and mail-order pharmacies among others. To [33], marketing improves financial performance of an organization.

On distribution system and financial performance, respondents had a neutral attitude with an overall mean score of 3.4 although they perceived significant investment in product distribution and having an efficient distribution system as impacting positively on financial performance. [34] opines that a good distribution system delivers higher profits since products and goods can be distributed. Even though outsourcing distribution services and partnerships to improve distribution were less common among wholesale. [27] asserts that outsourcing logistics leads to improvement in financial performance.

The study found out several adverse effects of poor financial performance. Findings from this study are confirmed by other studies. adverse effects of financial performance such as bankruptcy, economic loss, poor staff retention, and bad operational decisions can have far-reaching consequences, such as legal, financial, operational, and reputational challenges. Addressing these issues requires proactive measures to improve financial health and sustain long-term viability. According to [35], effective budgeting practices positively and significantly influence financial performance of companies.

Conclusion

Based on the major findings from the research results of the study, internal factors such as information systems (overall mean score of 4.4) and marketing systems (overall mean score of 3.8) may influence financial performance of pharmaceutical wholesale companies in Zimbabwe. On the other hand, distribution systems (overall mean score of 3.4), financial mechanisms (overall mean score of 3.0) and organizational culture (overall mean score of 2.7) may not influence financial performance. Information technology activities such as staff coordination, marketing, negotiation, financial transactions, customer interactions, and sales were perceived as positively contributing to financial performance, as indicated by the consistently high mean scores falling within the positive attitude range. Marketing investments, marketing pharmaceutical products, and customer outreach were positively perceived as influencing financial performance. However, opinions regarding the utilization of social media as a marketing platform are more varied, with a neutral attitude prevailing.

On the other hand, on organizational culture, respondents perceived a strong alignment between organizational values and financial performance (mean score 4.0 indicating positive attitude). However, respondents perceived that the organizational structure did not promote financial performance of the company. On distribution systems, respondents perceived that significant investments in distributing products (mean score-4.0) and having an efficient distribution system (mean

score 3.6) positively influence financial performance. Although respondents agreed that accounts staff had requisite knowledge, key challenges identified in preparing financial statements include taking too much time and involving a high cost.

Economic loss, and bad operational decisions were identified as top adverse effects of poor financial performance in this study. With the current evidence in this study, deploying effective marketing systems can lead to improved financial performance of pharmaceutical wholesale companies. Hence the acceptance of the hypothesis statement is to accept H^0, which reads: Deploying effective marketing systems will lead to the improved financial performance of the pharmaceutical wholesale companies.

Acknowledgements

The researcher wishes to express sincere gratitude to everyone who played a role in completing this study on the impact of internal factors on the financial performance of pharmaceutical wholesale companies in Zimbabwe. Special thanks go to the pharmaceutical companies in Zimbabwe for their participation, sharing valuable insights, and data that significantly influenced the study's findings and recommendations. The guidance and mentorship from academic advisors and research supervisors were crucial in refining the research objectives, methodology, and result interpretation. Lastly, my heartfelt thanks are extended to my families, friends, and colleagues for their unwavering support throughout the research. This study's success is attributed to the collective efforts and contributions of all involved.

Conflict of Interest

I, Priscilla Kusena, confirm that there are no conflicts of interest related to the subject matter of this research. I do not have any financial or professional associations that might impact the research outcomes. My participation in this study is motivated purely by academic curiosity and a dedication to enhancing the knowledge base in this field. Maintaining transparency and integrity is crucial, and I have conducted this research with fairness and neutrality. Readers can have confidence that the study's results are unbiased and not influenced by any external factors.

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Intestinal Microbiome and Antimicrobial Resistivity: A Study in Recent Times

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Abstract

The world has recently witnessed a pandemic and is now challenged by continuous environmental changes. Human health is in constant jeopardy with the rise in bacterial, fungal, and viral infections. Antibiotics are the most widely used medication for the treatment of any infection. The urban population does not always maintain a healthy lifestyle due to the fast-paced nature of life. West Bengal the eastern state of India is no exception to this directive. Rampant use of antibiotics and their frequent consumption has widely increased over the years. This is posing a serious threat to the healthy microbiome of the human intestine. It is resulting in a decline of the healthy microbiota and the development of antibiotic resistance. The study aims to understand the effect of antibiotic consumption in the post-COVID scenario on the gut microbiome of the West Bengal population. The population includes both rural and urban as it takes into account the different lifestyles.

Keywords: *Antibiotics, Antimicrobial Resistance, Antibiotic Use in India, Gut Microbiome.*

Introduction

The COVID-19 pandemic struck the world and caused great havoc. Many people died; a trail of recurrent infections was left behind in the survivors. Climate change is also posing a serious threat to human health. There is always a fluctuation of temperatures and seasonal changes are ideal causes of viral, and bacterial infections. People also suffer from various kinds of fungal infections. Human health is always at stake. Antibiotics are mostly used to treat any kind of infection [1, 2]. Generally, the most prescribed antibiotics fall under the range of broad spectrum as these work on a wide range of disease-causing bacteria (gram-positive and gram-negative) [3].

We also see that there is a difference in lifestyle between healthy and urban populations and this also plays a crucial role. Life moves at a fast pace in urban areas as compared to rural areas. The urban population does not always have the chance to follow a healthy diet. However, they have easy access to a good healthcare system. On the other hand, the rural population follows a healthy diet, their life is slow-paced but they do not have easy access to a good healthcare system.

Gut microbiota plays a fundamental role in the development of both local and systemic immunity [4]. The human gut is full of diverse bacteria, and many harbor resistance against a broad range of antibiotics [1, 6]. This includes

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pathogenic species featured in the CDC's Antibiotic Resistance Threats Report [1, 2], such as vancomycin-resistant *Enterococci* and carbapenem-resistant Enterobacteriaceae [1]. The different phyla comprising the gut microbiota are depicted in Figure 1 [20]. The gut microbiome is under constant threat from antibiotic use and unhealthy lifestyles. Over-the-counter buying of antibiotics without proper prescription at pharmacy shops is very common in India. This is easily accessible to the urban population. This results in unregulated sales of antibiotics. It is also observed that people generally do not always complete the entire course of antibiotics. They stop the medication in between as soon as there are visible signs of recovery. These two factors are leading to antibiotic abuse [5].

Antibiotic medicines are now impacting the gastrointestinal system and disrupting the gut microbiome [3, 5]. Generally, the early symptoms of an unhealthy gut during antibiotic consumption are irritable bowel syndrome and diarrhea [3, 4]. Antibiotics can result in several negative consequences on the gut microbiota, from reduced diversity of species, alteration in metabolic activity, and the selection of antibiotic-resistant organisms, resulting in downstream effects such as antibiotic-associated diarrhea and recurring C difficile infections [9]. There is also evidence that early exposure to antibiotics can impact gastrointestinal, immunological, and neurocognitive systems. This is problematic due to the increased use of antibiotics, which suggests a future increase in the prevalence of acute conditions. To address this challenge, continuing research on the composition and function of the gut microbiota is necessary [9].

With due course of time, this leads to the development of multidrug-resistant organisms in the gut microbiome and thus begins the antimicrobial resistance [3, 4].

The antimicrobial resistance makes the disease-causing parasites flourish even in the presence of the medication which at one point had impacted their growth [8]. This leads to more complications in recovery and in some extreme cases the disease-causing pathogen can be resistant to the medications that are presently available [8].

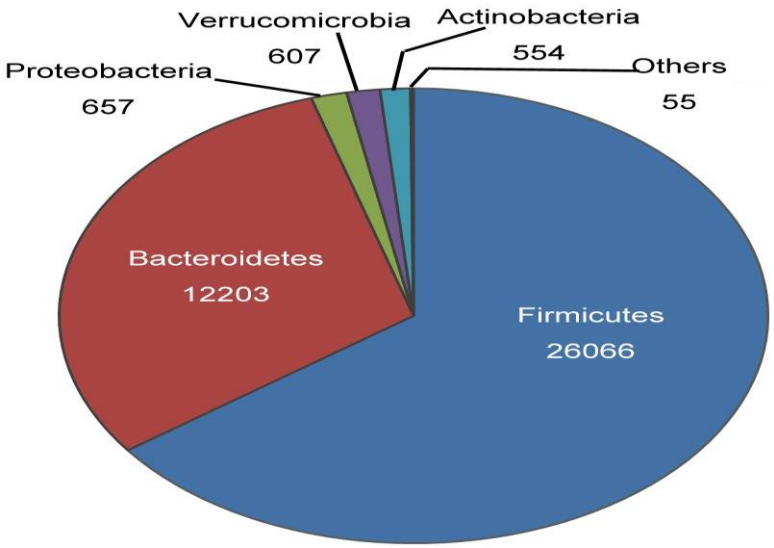

Figure 1. Gut Microbial Composition. The pie chart shows the distribution of gut bacteria obtained by searching RDP browser. Others are: Spirochaetes, Fusobacteria, Deferribacteres, Cyanobacteria, Planctomycetes, Lentisphaerae, TM7 and Tenericutes. Of the thirteen phyla, the Firmicutes and Bacteroidetes occupy 65% and 30% of the pie, respectively, while the rest eleven phyla take up 5%.

Factors Affecting Gut Health

COVID-19 pandemic: The world was gripped by the COVID-19 pandemic and it caused massive havoc. The not-so-advanced healthcare system of India was exposed to the lack of oxygen and essential drugs required for the treatment of COVID-19 [12]. Additionally, during the pandemic period, there was a drastic decline in seeking non-COVID-19 disease-related healthcare services [12]. There were different analyses conducted and all of them revealed a strong relationship between the increase in antibiotic consumption and COVID-19 cases. The utilization of hospital antibiotics, measured in terms of DDD, exhibited a 26% increase in 2021 when compared with 2019 [13]. Despite the ineffectiveness of antibiotics in treating COVID-19, they were prescribed to individuals with suspected or confirmed cases of COVID-19 for several reasons. These reasons include the challenges in excluding bacterial coinfection during initial presentation and the potential occurrence of secondary bacterial infections throughout the disease [14,15]. The empirical use of antibiotics for patients with COVID-19 raises concerns about their overuse and the subsequent harm associated with AMR [16]. Azithromycin has been frequently prescribed in the treatment of COVID-19 globally [17]. The COVID-19 pandemic renewed attention to the need to tackle antibiotic misuse and AMR. Although less than 10% of hospitalized and community-based patients with COVID-19 worldwide are diagnosed with a secondary bacterial infection requiring antibiotics, an estimated 75% of patients receive antibiotic prescriptions [18].

Climate change: Climate change is affecting the health directly causing more sickness and death. It is directly contributing to humanitarian emergencies from heatwaves, wildfires, floods, tropical storms, and hurricanes and they are increasing in scale, frequency, and intensity. Temperature and precipitation changes enhance the spread of vector-borne diseases [19]. India's inadequate health systems make our population particularly vulnerable to the impact of climate risks on health. Although we commonly say that climate change affects human health, it remains challenging to accurately estimate the scale and impact of many climate-sensitive health risks. However, scientific advances progressively allow us to attribute an increase in morbidity and mortality to global warming, and more accurately determine the risks and scale of these health threats [19]. In more indirect ways, it affects nutrition, reduces working hours, and increases climate-induced stress [19].

Lifestyle: As stated earlier, the lifestyle difference between healthy and urban populations also plays a crucial role. The fast-paced urban lifestyle becomes limiting in following a healthy diet. However, the urban population has easy access to a good healthcare system. On the contrary, the rural population follows a healthy diet, their life is slow-paced but they do not have easy access to a good healthcare system. Lifestyle and food habits are also contributing factors to the health of the gut microbiome [1, 4, 10]. The use of probiotics instead of antibiotic therapy to address certain health conditions in humans may alleviate these antibiotic-mediated selective pressures [10].

Diet: It is now widely recognized that diet and other environmental factors play a role in impacting the composition and metabolic activity of the human gut microbiota, which in turn impacts health. Molecular technologies have greatly advanced our understanding of the complexity and diversity of the gut microbial communities within and between individuals. Diet, particularly macronutrients, has a major role in shaping the composition and activity of these complex populations [21].

The maintenance of a diverse and thriving population of beneficial gut bacteria helps to keep harmful bacteria at bay by competing for nutrients and sites of colonization. The physical and mental well-being of any individual is dependent on the food we eat, the environment we live in, and other socio-economic factors [28]. Dietary means, particularly the use of a range of fibers, maybe the best way of maintaining a healthy gut microbiota population [21]. The importance of proper nutrition has already been highlighted during COVID-19 [28]. The general principle is to eat a balanced diet containing seasonal fruits and green vegetables as well as take nutritional supplements as advised by a nutritionist. Proper nutrition includes protein supplements especially plant and seafood proteins, macro and microelements-rich diet, and regular intake of leafy vegetables as a source of vitamins and mineral supplements. Vitamins show immunomodulatory and antioxidative responses, they modulate the expression of genes in immune cells and also help in the differentiation and maturity of immune cells [29]. Good nutritive food is always vital and helps in building immunity [30]. A good immune system easily can fight against infection and decline stressful conditions in human beings [3].

Microbes colonize the human gut during or shortly after birth. The complexities and variability of adult gut microbial populations have become increasingly evident in recent years [21]. The variability may relate to the influence of numerous factors, including diet and host genetics [21]. The composition and activity of gut bacteria can vary according to (and possibly a result of) life events, including puberty, ovarian cycle, pregnancy, and menopause [22]. The impact of non-dietary lifestyle factors on the gut microbiota is also being recognized in present times. The most impactful factors are smoking, lack of exercise, stress, and obesity. Smoking can significantly impact the large bowel (and potentially the microbiota) as they are risk factors for Colorectal Cancer [24].

Stress: Another lifestyle factor, stress, has an impact on colonic motor activity via the gut-brain axis which can alter gut microbiota profiles, including lower numbers of potentially beneficial Lactobacillus [23]. The COVID-19 pandemic has caused anxiety and stress to all beings and this results in turn into sleep disturbances, so it's a vicious cycle as stress and sleep disturbances are complementary to each other [30]. To get good sleep it has been advised that people should consume food containing or promoting the synthesis of serotonin and melatonin at dinner [30]. The diet should be inclusive of varieties of plant species along with roots, leaves, fruits, and seeds like almonds, bananas, cherries, and oats which contain melatonin and/or serotonin or tryptophan. Milk and milk products are the main sources of tryptophan, which is the sleep-inducing amino acid [30]. The sedentary lifestyle of the urban population has increased the incidence of Obesity which is associated with excess energy intake. Exercise plays an important influence on any shifts in microbial populations that are associated with obesity. Geographical location and traveling to different places also influence the gut microbiome. Antibiotics are the most commonly used method of treatment for any bacterial, viral, and fungal infection. The use of antibiotics has increased significantly over some time. They play a crucial role in tackling infections however, their inappropriate use led to the development of multi-drug resistant organisms resulting in antimicrobial resistance or AMR. As a consequence, the most commonly used antibiotics now lose their effectiveness in treating the infection resulting in prolonged hospitalization, a rise in healthcare expenses, and loss of life (in severe cases).

Antibiotic consumption and antibiotic resistance: In India, it is very common to buy antibiotics from pharmacy shops without a

proper prescription. This over-the-counter buy results in unregulated sales of antibiotics. The urban population has easy access to this as compared to the rural population. It is also quite common for patients to not complete the entire course of antibiotics. They tend to stop intake of medicine as soon as recovery signs are visible. These are all various forms of antibiotic abuse. Antimicrobial resistance is posing a serious threat in India and across the world [3, 4. 8, 10]. Globally, India tops the list of countries with the highest antibiotic consumption, and highest AMR. Inappropriate use of antibiotics is one of the central drivers of AMR, and this misuse or overuse of drugs remains a significant problem in India. Lack of effective regulations, and/or failure to implement the regulations is one of the main reasons behind the inappropriate use of antibiotics. The results conducted from past research across countries revealed that very often, clinicians prescribe antibiotics when they are not required, or they prescribe the wrong antibiotics to patients. Often there are circumstances where pharmacy staff are not fully qualified to sell these medicines, or they sell them without prescriptions. All these cumulative factors lead to AMR if patients consume the wrong drug or dosage and for the wrong duration [25].

India being a densely populated country has a high prevalence of communicable diseases [7, 8]. Along with this, a majority of the population has restrictive access to basic healthcare and it is also very challenging to spread awareness about prevention techniques [7]. These are also some of the factors that are accelerating antibiotic resistance.

The spread of antibiotic resistance needs to be stopped. It is the cumulative responsibility of healthcare professionals and patients to be aware of antimicrobial resistance, reduce the overuse of antibiotics, follow a healthy lifestyle and proper diet, and complete the full course of antibiotics [7].

Importance of Stool: A stool sample is most widely used for understanding the gut microbiota; it is not just a waste material. The organs responsible for stool formation and the process of stool formation are depicted in Figure 2 [27]. The stool test can help understand any underlying gastrointestinal infection. Few stool tests are easily used in the primary diagnosis of disorders such as gastrointestinal infections, malabsorption syndromes, and inflammatory bowel diseases. Routine stool tests can prevent unnecessary laboratory investigations. There are various investigations performed in stool analysis and they are microscopic examination, chemical, immunologic, and microbiologic tests. Stool samples can be examined for leukocytes, occult blood, fat, sugars (reducing substances), pH, pancreatic enzymes, alpha-1 antitrypsin, calprotectin, and infectious causes (bacteria, viruses, and parasites). Stool samples are also macroscopically checked in terms of color, consistency, quantity, shape, odor, and mucus [26]. There are numerous associations between gut microbiota and human health, it is particularly important to analyze the relationship between changes in gut microbiota and disease occurrence, progression, and prognosis [11]. A stool test can detect parasitic infections, bacterial overgrowth, signs of cancer, or pathogenic bacteria like Clostridium difficile, and E. coli. The samples that are immediately frozen after collection have been widely regarded as the gold standard for gut microbiota profiling [11].

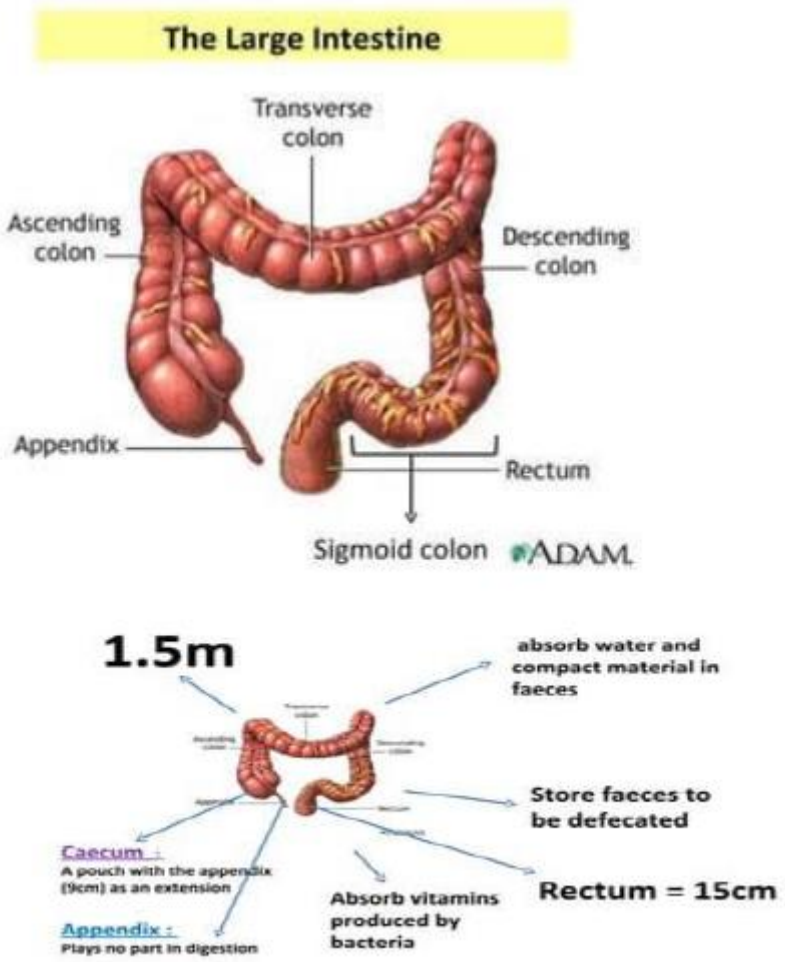

Figure 2: Stool Formation in Human Body

Discussion

Climate change has an impact on overall human health quality. Gut microbiota is a mirror of how the health of humans is. It plays a fundamental role in the development of both local and systemic immunity. The gut microbiome is home to different species of bacteria, some of which are naturally resistant to a broad range of antibiotics. The diet and lifestyle have an intense influence on the gut health. Food items like probiotics help in the growth of good bacteria which in turn increases the immune system. Antibiotics are the most widely used mode of treatment for any kind of bacterial, viral, and fungal infections. Broad-spectrum antibiotics are mostly used as it encompasses a lot of infections. Over-the-counter buying of antibiotics without a medical prescription is very common in India. The urban population has easy access to good healthcare, whereas, the rural population has limited access to good healthcare. It is often observed that people do not complete the entire course of antibiotics; it is stopped midway as soon as there are signs of recovery. Diarrhoea and Irritable Bowel Syndrome are some of the common symptoms related to frequent antibiotic consumption. Unregulated sales of antibiotics, frequent consumption, and incomplete dosage are different forms of antibiotic abuse which is leading to antibiotic resistivity. India is grappling with the threat of antimicrobial resistivity and it is spreading very rapidly. Antimicrobial resistivity leads to prolongation of illness and hospitalization. Healthcare professionals and patients are equally

responsible for spreading awareness about antimicrobial resistance and healthier ways of consuming antibiotics.

Conclusion

The world is being continuously challenged with climate changes and health problems. The lifestyle is also changing in the fast-paced life. Antibiotic consumption has significantly increased; antibiotic abuse is on the rise. All these point towards antimicrobial resistance. Understanding more about antibiotic resistance and its effects is the need of the hour. This will pave the path to understanding how effective the presently available antibiotics in the market remain to the disease-causing microbes and whether there is a requirement for new antimicrobial drugs.

Conflict of Interest

I hereby declare that there is no conflict of interest.

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A Cross Sectional Study in Indian Adult Population to Assess the Internet Addiction and its Effect on the Quality of Sleep

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Abstract

In contemporary society, the internet has become an integral aspect of daily life, alongside a concerning rise in internet addiction characterized by an overwhelming compulsion to engage with online activities. This phenomenon is particularly prevalent among the youth population in India, leading to various physical, mental, and emotional challenges. Despite its widespread impact, internet addiction has yet to be officially recognized as a disorder in diagnostic manuals like the DSM. A comprehensive meta-analysis spanning 80 studies across 31 countries revealed a global prevalence of internet addiction at 6%. In the Indian context, a study sponsored by the Indian Council of Medical Research surveyed 2,755 adults aged 18-65, identifying a prevalence rate of approximately 1.3%. Examining a sample of 303 adult participants in India, it was found that 33.3% exhibited signs of internet addiction, with 1.7% classified as severely addicted, 10.2% as moderately addicted, and 20.8% as mildly addicted. Notably, the majority of severely addicted individuals were in the 26-35 age group, while addiction rates were higher among males compared to females [1, 2]. Furthermore, analysis revealed a correlation between internet addiction and poor sleep quality, affecting 22.6% of addicted individuals, particularly males aged 18-25 and 26-35. These findings underscore the urgent need for further research and interventions to address the growing issue of internet addiction and its associated health impacts.

Keywords: *b-PSQI, Compulsive Disorder, Internet Addiction Disorder (IAD), Prevalence, Sleep Quality.*

Introduction

As the internet advanced and became a part of the normal routine of human activities in the past two-three decades [3], reliance and dependency of people also has grown on the internet. Now several online social platforms are available for people of all ages like WhatsApp, Facebook, and similar others alluring people to spend around 6 hours every day in the US as per the Pew Research. This was Dr. Kimberly Young (1996) who made internet addiction famous by publishing multiple pages and creating Internet Addiction Tool (IAT) which is being used worldwide by several mental health experts. The prevalence ranges of internet addiction varied from 1.5-8.2% [4] and 6% to 18.5% [5] where, latter was based on multiple studies using IAT. Hypothetically, internet addiction depends upon the (over) time spent on the internet [6, 7] and could be due to other indistinctive reasons like individual and/or behavioral problems [8].

The prevalence rates of internet addiction among adolescent populations exhibit considerable variability, ranging from 0.8% to 26.7% across multiple studies [7, 9-12]. Similarly, in adult samples from various countries outside India, prevalence rates range from 1.2% to 22.8% [13-17] indicating notable disparities.

Furthermore, gender differences are evident in the susceptibility to internet addiction, with males exhibiting a higher propensity compared to females [18-20]. This observation

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underscores the importance of considering gender-specific factors in understanding and addressing internet addiction behaviors. A meta-analysis encompassing empirical studies conducted between 1996 and 2012, involving a total of 89,281 participants globally, revealed a prevalence of internet addiction at 6% [95% CI 5.1-6.9] [21].

In the Indian context, limited studies have examined internet addiction prevalence, with findings indicating a prevalence of 1.3% in the general population [22]. However, compared to Western and Eastern countries, research on internet addiction in India is relatively scarce, with a predominant focus on adolescent populations.

The disparity in prevalence rates may be attributed primarily to variations in assessment tools utilized across studies, rather than differences in age groups. Additionally, discrepancies in the populations studied, such as internet users versus the general population, contribute to the observed differences.

Commonly associated outcomes among individuals with internet addiction include anxiety, depression, and sleep disturbances [23-25], often accompanied by comorbid conditions like muscle pain, obesity, and cardiovascular problems.

Challenges in determining the prevalence of internet addiction in the Indian population include the need for broader representation across regions, including rural areas, and addressing illiterate populations.

The development and utilization of new assessment tools, such as the Chen Internet Addiction Scale (CIAS) and its revisions, offer alternative approaches to measure internet addiction, with tailored tools for the Indian population being recommended to mitigate response manipulation based on social strata.

Acknowledging internet gaming disorder in the DSM-V underscores the significance of addressing internet addiction, with various therapeutic interventions being explored. Serotonin-reuptake inhibitors (SSRIs), physical exercise, and psychotherapy, including Motivational Interviewing and Multilevel counseling, are among the treatment modalities utilized, with psychotherapy being the preferred approach by clinicians [26-31].

Methods

Survey research has consistently been favored for its ability to collect information not readily accessible through other means [32-34]. In this study, two types of questionnaires were employed. The first set comprised internationally validated instruments, including the Internet Addiction Test (Young, 1999) and the brief Pittsburgh Sleep Quality Index (PSQI) to assess the sleep quality of such addicted individuals.

Ethical considerations were paramount throughout the study, with approval obtained from the ethical committee to ensure research integrity. The research protocol was formulated through collaborative discussions involving a psychiatrist, multiple researchers, acquaintances, and the research supervisor.

The study employed a cross-sectional design, utilizing close-ended, self-administered questionnaires distributed to the Indian public aged 18 and above, as well as experts in the field. Data collection was facilitated through Google Forms, with questionnaire links disseminated via various platforms such as LinkedIn, WhatsApp, emails, and word of mouth through personal networks. Participants from the general public were provided with an option to voluntarily consent to participate, and anonymity of responses was maintained.

Analysis of data collected from the general public focused on establishing the prevalence of internet addiction among Indian adults and its association with poor sleep quality in affected individuals.

Summary of the Study Design

Data was gathered from 303 participants more than and equal to 18 years of age who consented voluntarily to share the requested information about the use of the internet and associated experiences which could have affected their mental, physical, and emotional patterns.

Inclusion criteria for participants were.

1. Adult Indian >= 18 years.
2. Literate and use the internet.
3. All genders.
4. Consent voluntarily to participate in the study.

Exclusion Criteria:

1. Illiterate candidate.
2. Age < 18 years.

Recruitment methods:

1. Local networking including friends, family, relatives, & colleagues.
2. Via phone and e-mail.
3. Social Networking websites (WhatsApp, LinkedIn etc.)

Study Duration

November 2022 to Jun 2023.

Ethical Consideration

While the study's non-interventional nature didn't necessitate ethical approval, seeking approval from the Ethics Committee was undertaken to reassure volunteers that their information would remain confidential, solely utilized for data analysis within the confines of this research.

Sample Size

The sample size was determined using a 95% confidence interval (CI) and a 5% margin of error, resulting in a calculated requirement of 271 adult volunteers from various states of India. These individuals were invited to participate in the survey by accessing the questionnaire through Google Forms. By June 2023, a total of 303 responses had been received. It is noted that the questionnaires utilized in this study are internationally validated and accessible in the public domain, requiring no formal permissions for reproduction, translation, display, or distribution for academic purposes.

Formula used: $$\frac{\frac{z^2 \times p(1-p)}{e^2}}{1+\left(\frac{z^2 \times p(1-p)}{e^2 N}\right)}$$

Where, N = population size; e = Margin of error (percentage in decimal form); z = z-score. The z-score is the number of standard deviations a given proportion is away from the mean. The right z-score considering 95% CI would be 1.96.

Study Design

The study questionnaire had section for voluntary consent of potential study participants and questions from the Young's Internet Addiction Tool (IAT) [Table 1] and brief Pittsburgh Sleep Quality Index (PSQI) [Table 2].

The Internet Addiction Tool (IAT) [35] developed by Young in 1998 consisted of 20 statements, each rated on a 5-point Likert scale, with scores ranging from 0 to 100. A score of 80 or higher indicated severe addiction, while scores falling between 50 and 79 suggested problematic internet use (moderate addiction), and scores equal to or below 49 indicated controlled internet usage. Respondents were asked to select the most appropriate response from a drop-down menu, with options including Not Applicable (0), Occasionally (2), Rarely (1), Frequently (3), Often (4), and Always (5).

Table 1. The Internet Addiction Tool (IAT)

S. No.	Questions	S. No.	Questions

1	How often do you find that you stay online longer than you intended?	11	How often do you find yourself anticipating when you will go online again?
2	How often do you neglect household chores to spend more time online?	12	How often do you fear that life without the Internet would be boring, empty, and joyless?
3	How often do you prefer the excitement of the Internet to intimacy with your partner?	13	How often do you snap, yell, or act annoyed if someone bothers you while you are online?
4	How often do you form new relationships with fellow online users?	14	How often do you lose sleep due to being online?
5	How often do others in your life complain to you about the amount of time you spend online?	15	How often do you feel preoccupied with the Internet when off-line, or fantasize about being online?
6	How often do your grades or schoolwork suffer because of the amount of time you spend online?	16	How often do you find yourself saying "just a few more minutes" when online?
7	How often do you check your email before something else that you need to do?	17	How often do you try to cut down the amount of time you spend online and fail?
8	How often does your job performance or productivity suffer because of the Internet?	18	How often do you try to hide how long you've been online?
9	How often do you become defensive or secretive when anyone asks you what you do online?	19	How often do you choose to spend more time online over going out with others?
10	How often do you block out disturbing thoughts about your life with soothing thoughts of the Internet?	20	How often do you feel depressed, moody, or nervous when you are off-line, which goes away once you are back online?

The brief version of Pittsburgh's Sleep Quality Index (PSQI) to assess the sleep quality and disturbances over the past one month. This questionnaire had 5 components with certain questions and specified scores quantifying the sleep latency (C1), sleep duration (C2), sleep efficiency (C3), sleep disturbances (C4) and daytime dysfunction

(C5) which when summed together, overall sleep quality is assessed. Every component is scored from 0 to 3 where 0 is no difficulty at all while 3 stands for severe difficulty. These component scores are further summed to obtain a global score where any score more than 4 is indicative of poor sleep quality and should be looked into or such individuals should seek an expert's advice. Higher scores indicate worse sleep quality. These subjective questions pertain to the usual sleep habits of any individual during the past month only. The brief version of PSQI improved its efficiency and applicability and yielded a favorable sensitivity of 75.82% and specificity of 76.99% to measure different (poor) sleep patterns thus establishing it as a reliable and measurable screening tool [36].

Table 2. Brief Pittsburgh Sleep Quality Index (PSQI)

1. During the past month, what time have you usually gone to bed at night?	2. During the past month, how long (in minutes) has it usually taken you to fall asleep each night?	3. During the past month, what time have you usually gotten up in the morning?	4. During the past month, how many hours of actual sleep did you get at night? *(This may be different than the number of hours you spent in bed.)*	
5. During the past month, how often have you had trouble sleeping because you…	Not during the past month	Less than once a week	Once or twice a week	Three or more times a week
a. Cannot get to sleep within 30 minutes				
b. Wake up in the middle of the night or early morning				
c. Cannot breathe comfortably				
d. Cough or snore loudly				
e. Feel too hot				
f. Have bad dreams				
g. Have pain				
6. During the past month, how often have you had trouble staying awake while driving, eating meals, or engaging in social activity?				

	No problem at all	Only a very slight problem	Somewhat of a problem	A very big problem
7. During the past month, how much of a problem has it been for you to keep up enough enthusiasm to get things done?				

Data Collection and Analyses

Responses to the questionnaire were gathered online via Google Forms. Subsequently, the data was inputted into Microsoft Excel 365 for analysis. Various Excel formulae were employed to conduct analyses, and the results were presented through tables, graphs, and figures. The collected data underwent review and moderation to ensure accurate placement and ease of further calculation. Excel facilitated the segregation of data, detailed description, and creation of multiple pivot tables, charts, and tables to support the content and outcomes. Means, percentages, and other derived information were easily obtained using Excel. Each collected piece of information, including responses to the Internet Addiction Test (IAT) and the Pittsburgh Sleep Quality Index (PSQI), was reviewed, and explained separately, while establishing relationships among them.

Results

Demographics

Out of the total 303 responses received, 181 (59.7%) were male, 120 (39.6%) were female, and the remaining 2 (0.7%) did not disclose their gender [Figure 1].

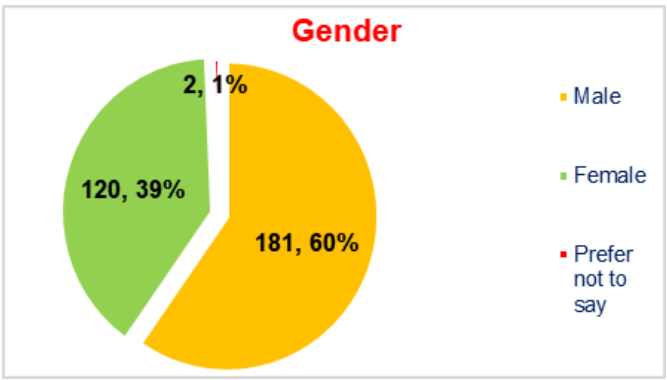

Figure 1. Gender Distribution

These participants were then categorized into different age groups [Figure 2] to facilitate analysis. Specifically, 135 participants fell into the 18-25 years age bracket, 92 were in the 26-35 years age group, and 69 were aged 36-45 years. Additionally, 6 participants were between 46-60 years old, while 1 participant was over 60 years old. The two individuals who did not disclose their gender were distributed in the 26-35 year and 36-45 years age groups, with one person in each group.

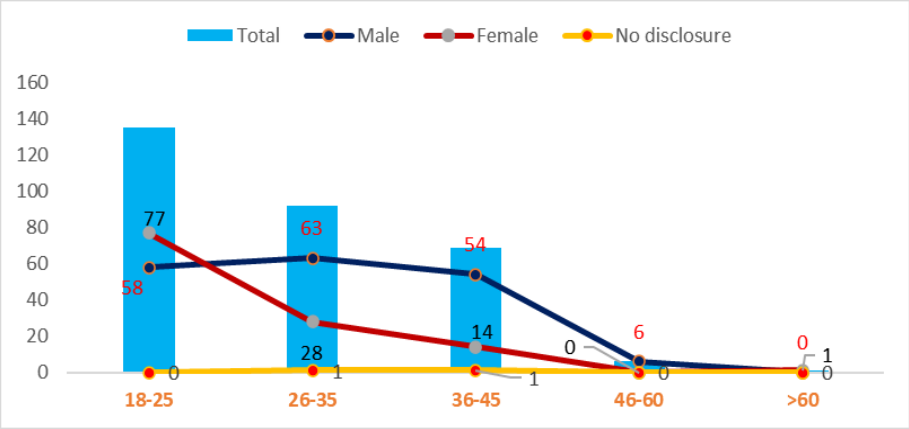

Figure 2. Age Group with Gender Distribution

Given the focus of the thesis on internet addiction, the duration of internet usage [Table 3] holds significance. On average, participants began using the internet at 18 years old, with an average duration of use of 10 years. The maximum duration observed was 20 years, categorized into four intervals of 0-5, 5-10, 10-15, and 16-20 years for analysis, with usage decreasing as age increased.

Table 3. Comparison between Age Group and Internet Use-Age

Internet Use-Age			**18-25 years**		**26-35 years**		**36-45 years**		**46-60 years**		**>60 years**	
Year Range	Total	Total %	Total	Total %	Total	Total %	Total	Total %	Total	Total %	Total	Total %
0 - 5	37	12.2%	32	86.5%	3	8.1%	2	5.4%	0	0.0%	0	0.0%
6 – 10	142	46.9%	83	58.5%	35	24.6%	21	14.8%	2	1.4%	1	0.7%
11 - 15	107	35.3%	20	18.7%	45	42.1%	39	36.4%	3	2.8%	0	0.0%
16 - 20	17	5.6%	0	0.0%	9	52.9%	7	41.2%	1	5.9%	0	0.0%

The majority of participants (72.3%) reported using the internet for both work and study, while 11.9% and 15.8% used it solely for work or study, respectively [Figure 3].

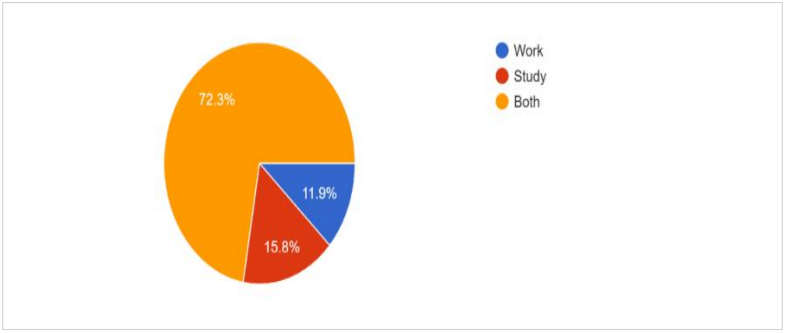

Figure 3. Internet Usage Distribution

Regarding professions [Figure 4], the largest shares were among students/working students (50.2%) and private/corporate employees (40.6%).

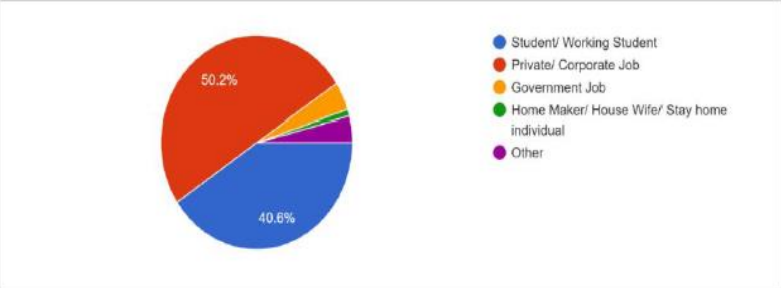

Figure 4. Profession-Wise Distribution

Additional demographic parameters assessed included marital status [Figure 5], concomitant substance use [Figure 6], and existing health issues [Figure 7].

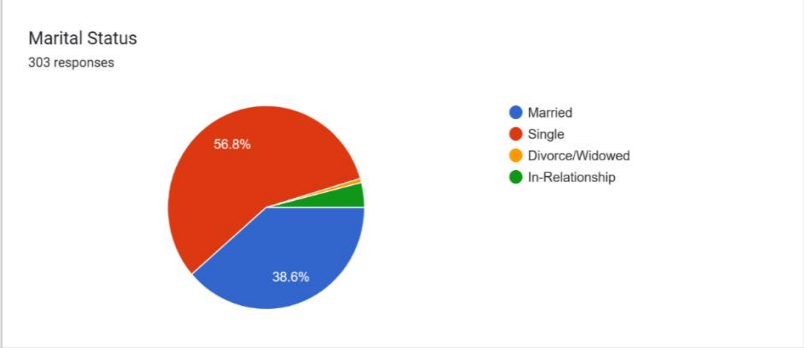

Figure 5. Marital Status Distribution

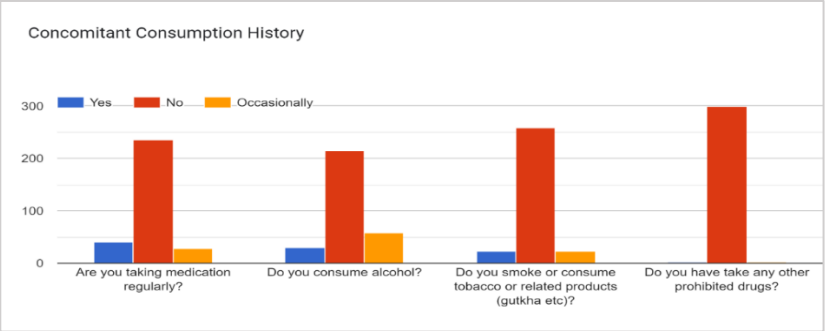

Figure 6. Concomitant Consumption Distribution

Four individuals (1.3%) reported psychiatric or mental health issues [Figure 7], which were excluded from the final analysis. Other health issues did not appear to significantly impact internet addiction or vice versa.

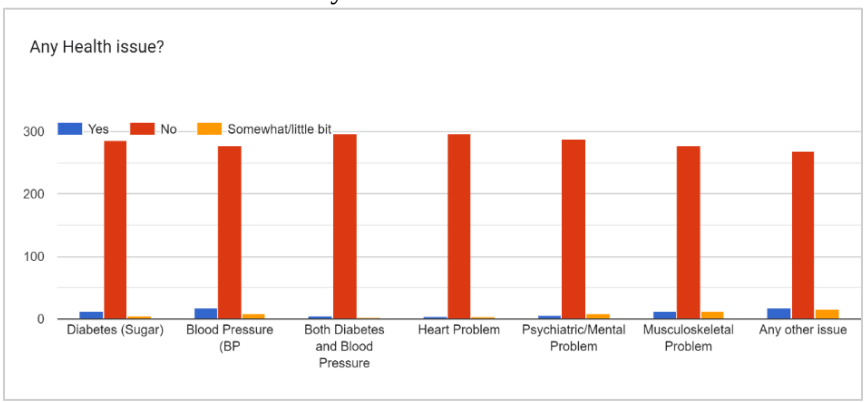

Figure 7. Medical History-Wise Distribution

Prevalence of the Internet Addiction using Internet Addiction Test (IAT)

Out of the total 303 participants, 103 individuals (34%) were identified as being addicted to the internet. Addiction was observed across three age groups: 18-25 years, 26-35 years, and 36-45 years. The prevalence of addiction was highest in the 18-25 years age group (13.5%), followed by the 26-35 years age group (12.2%), and then the 36-45 years age group (8.3%). These age groups were further analyzed based on gender to better understand addiction patterns [Table 4].

A breakdown by gender revealed a higher prevalence of internet addiction among males (65%) compared to females (34%), a trend consistent with findings from previous research. Notably, in the youngest age group, there was a slight numerical predominance of females.

Table 4. Internet Addiction Status - Overall

IAD-Overall										
Overall			**18-25**			**26-35**			**36-45**		
TOTAL Addicted	103	34.0 %	TOTAL Addicted	41	*39. 8%	TOTAL Addicted	37	*35. 9%	TOTAL Addicted	25	*24. 3%
Male	67	65.0 %	Male	20	48.8 %	Male	29	78.4 %	Male	18	72.0 %
Female	35	34.0 %	Female	21	51.2 %	Female	8	21.6 %	Female	6	24.0 %
Gender Unknown	1	1.0 %	Gender Unknown	0	0.0 %	Gender Unknown	0	0.0 %	Gender Unknown	1	4.0 %

Approximately 70% of participants reported spending more time on the internet than necessary. Additionally, nearly half of the participants expressed a preference for checking their emails before engaging in other activities. Around 44%-45% of participants exhibited symptoms of internet overuse, such as neglecting household chores and experiencing feelings of loneliness and boredom. Participants aged over 60 years were not found to be addicted and were therefore excluded from further analysis.

Among the 103 addicted participants, the severity of internet addiction was classified as mild (21.1%) [Table 7, Figure 10], moderate (10.6%) [Table 6, Figure 9], and severe (2.3%) [Table 5, Figure 8].

Table 5. Internet Addiction Status – SEVERE

IAD-Severe										
Overall (of 103)			**18-25**			**26-35**			**36-45**		
TOTAL Addicted	7	6.8%	TOTAL Addicted	1	14.3%	TOTAL Addicted	5	71.4%	TOTAL Addicted	1	14.3%
Male	4	57.1%	Male	0	0.0%	Male	3	60.0%	Male	1	100.0%

Female	3	42.9%	Female	1	100.0%	Female	2	40.0%	Female	0	0.0%
Gender Unknown	0	0.0%	Gender Unknown	0	0.0%	Gender Unknown	0	0.0%	Gender Unknown	0	0.0%

Table 6. Internet Addiction Status – MODERATE

IAD-Moderate										
Overall (of 103)			**18-25**			**26-35**			**36-45**		
TOTAL Addicted	32	31.1 %	TOTAL Addicted	16	50. 0%	TOTAL Addicted	9	28. 1%	TOTAL Addicted	7	21.9%
Male	23	71.9 %	Male	9	56. 3%	Male	8	88. 9%	Male	6	85.7%
Female	9	28.1 %	Female	7	43. 8%	Female	1	11. 1%	Female	1	14.3%
Gender Unknown	0	0.0 %	Gender Unknown	0	0.0 %	Gender Unknown	0	0.0 %	Gender Unknown	0	0.0%

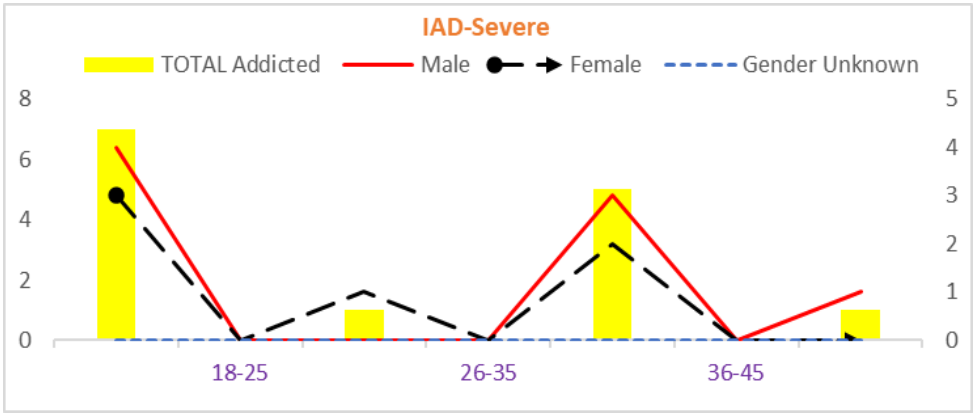

Figure 8. Internet Addiction Status - SEVERE

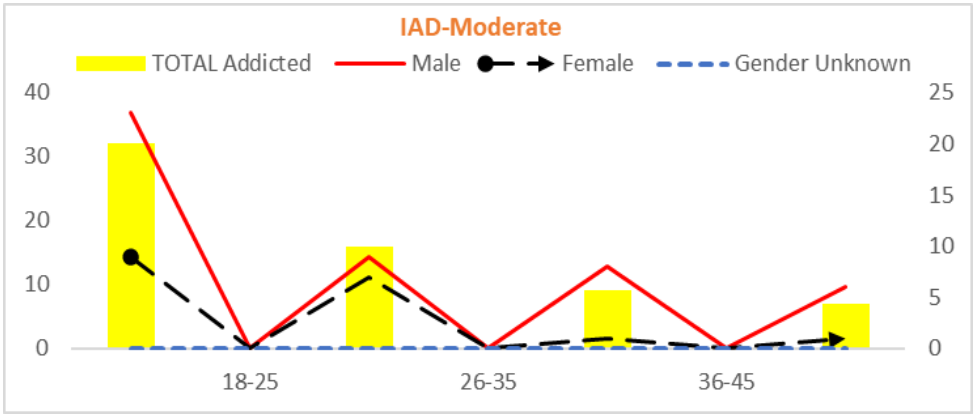

Figure 9. Internet Addiction Status - MODERATE

Table 7. Internet Addiction Status - MILD

IAD-Mild											
Overall (of 103)			**18-25**			**26-35**			**36-45**		
TOTAL Addicted	64	62.1%	TOTAL Addicted	24	37.5%	TOTAL Addicted	23	35.9%	TOTAL Addicted	17	26.6%
Male	40	62.5%	Male	11	45.8%	Male	18	78.3%	Male	11	64.7%
Female	23	35.9%	Female	13	54.2%	Female	5	21.7%	Female	5	29.4%
Gender Unknown	1	1.6%	Gender Unknown	0	0.0%	Gender Unknown	0	0.0%	Gender Unknown	1	5.9%

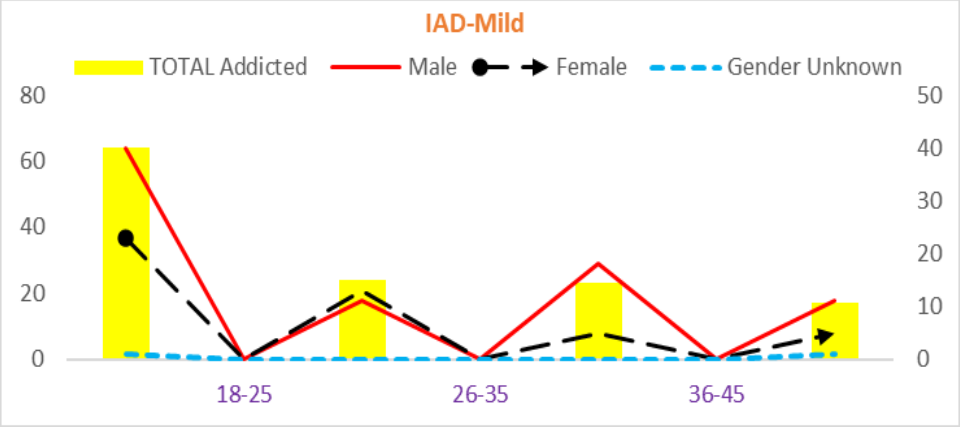

Figure 10. Internet Addiction Status - MILD

All seven individuals classified as severely addicted to the internet exhibited mental and sleep-related problems. The age group with the highest prevalence of severe addiction was 26-35 years, accounting for five individuals (71.4%), followed by one individual each from the 18-25 years and 36-45 years age groups. These participants demonstrated a propensity to spend prolonged periods online compared to what would be expected. Additionally, the majority of moderately addicted participants (28 out of 32, or 87.5%) reported excessive internet use outside of their regular hours, with a higher representation from the 18-25 years age group. None of the participants aged over 45 years were found to be moderately addicted and were thus excluded from further analysis. Furthermore, a significant proportion of both severely and moderately addicted individuals (35 out of 39, or 89.7%) reported using the internet for work, study, or both, suggesting a potential confounding factor regarding the extended hours of internet usage. Despite this, these individuals are deemed either fully addicted or predisposed to addiction, warranting expert intervention. The data indicates a correlation between internet addiction and excessive internet usage. The remaining 62.1% of the addicted population (21.1% of the total 303 respondents) were categorized as mildly addicted. Among the 64 mildly addicted individuals, 24 (37.2%) reported using the internet beyond normal hours and exhibited symptoms of sleep disturbances.

Issues with the Sleep Quality Using Brief Pittsburgh's Sleep Quality Index (b-PSQI)

Out of 303, 144 (47.5%) participants scored more than 4 on b-PSQI (overall C) scale i.e., presented symptoms of poor or disrupted sleep quality. Quality could be sum of sleep latency (C1, 75, 52.1%), reduced sleep efficiency (C3, 50, 34.7%) and disturbance with the sleep (C4, 71, 49.3%). The total number of males (92, 63.9%) were higher overall (including all age groups) than females (52, 36.1%) [Figure 11] however, age group of 18-25 years had more females than males with complains of sleep issues i.e., 30 (females) vs 27 (male) in 'overall' sleep quality issues [Table 8, Figure 12]. 11 (36.7%) female participants in this age group confirmed not getting sleep for over 5.5 hours whereas 13 (43.3%) experienced trouble sleeping sound due to any of following reasons, pain, cough, breathing problems, or bad dreams. Males, on the other hand, were dominant in all other age groups presenting issues with their overall sleep quality with disruption in the sleep and took relatively longer to sleep after going to the bed. Only 6 (4.2%) of the total with sleep issues belonged to the age of >45 years. hence, not being assessed. C1, C3 and C4 are described later in this section.

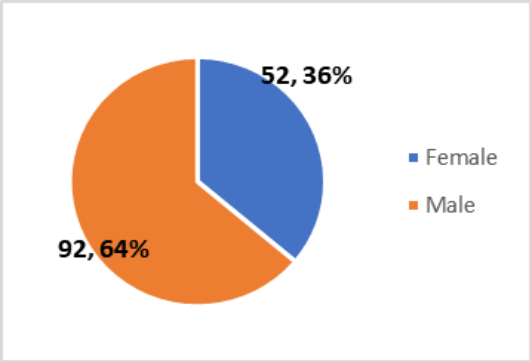

Figure 11. Gender Distribution

Table 8. PSQI (Overall C Score) - Age & Gender Wise Distribution

Overall Sleep Quality (C Score >4) with reference to AGE and GENDER					
Gender	**18-25**	**26-35**	**36-45**	**>45**	**Grand Total**
Female	30 (52.6%)	12 (25.0%)	9 (27.3%)	1 (16.7%)	52 (36.1%)
Male	27 (47.4%)	36 (75.0%)	24 (72.7%)	5 (83.3%)	92 (63.9%)
Grand Total	57	48	33	6	144

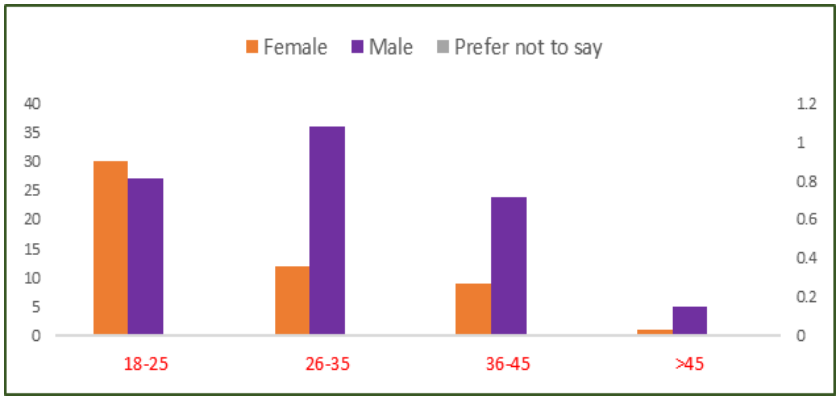

Figure 12. Overall C Score - Age and Gender Wise Distribution

Sleep Disturbance (C4) [**Table 9**] can be defined if the participant experienced discomfort during the sleep which could be due to cough, breathing problem, pain, bad dream, feeling too hot and/or person woke up in the middle of the night or early morning. Responses to questions 5(b) to 5(g) were scored as below:

Table 9. C4 Score Determination

Responses to Q 5(b)-5(g)	**Response Score**	**Sum of scores 5(b)-5(g)**	**C4 Score**
Not during the past month	0	0	0
Less than once a week	1	≥1≤6	1
Once or twice a week	2	>1≤12	2
Three or more times a week	3	>12	3

Here's the age and gender wise distribution of participants with difficulty in sleep [**Table 10**]. Number of participants in age group 26-35 years were higher than any other groups. In all age groups but 18-25 years females were found more affected with the sleep deprivation. Overall, number of males were higher than females. More participants were found in the age group, 26-35 years though almost equal to the youngest group.

Table 10. Sleep Disturbance - Age and Gender Wise Distribution

Sleep Disturbance (C4 Score >=2) with reference to AGE and GENDER					
Gender	18-25	26-35	36-45	>45	Grand Total

Female	13 (48.1%)	6 (12.5%)	3 (9.1%)	0 (.0%)	22 (15.3%)
Male	14 (24.6%)	22 (45.8%)	13 (39.4%)	0 (.0%)	49 (34.0%)
Grand Total	27	28	16	0	71

Sleep Efficiency (C3) is the percentage of time a person sleeps [Table 11]. This can be obtained by dividing the total number of hours asleep by total number of hours in bed. Scores ≥2 translated to <75% of the sleep efficiency. The distribution of the scores would be as below table:

Table 11. C3 Score Determination

Range %age of C3	**C3 Score**
>85%	0
75-84%	1
65-74%	2
<65%	3

Here's the age and gender wise distribution of participants with less sleep efficiency [**Table 12**]. Number of participants were found to be same in both the age groups 18-25 and 26-35 years. In all age groups but 18-25 years females were found more affected with the sleep deprivation. Overall, number of males were higher than females.

Table 12. Sleep Efficiency Issues - Age and Gender Wise Distribution

Sleep Efficiency (C3 Score >=2) with reference to AGE and GENDER					
Gender	**18-25**	**26-35**	**36-45**	**>45**	**Grand Total**
Female	11 (64.7%)	5 (10.4%)	5 (15.2%)	0 (.0%)	**21 (14.6%)**
Male	6 (10.5%)	12 (25.0%)	10 (30.3%)	1 (16.7%)	**29 (20.1%)**
Grand Total	**17**	**17**	**15**	**1**	**50**

Sleep Latency (C1) is the time taken by an individual to 'actually' sleep after laying on the bed [Table 13]. To calculate the total C1 score, scores from question 5a were added to the original C1 to obtain the final score. The distribution of the scores were as below:

Table 13. C1 Score Determination

Component scoring per response provided to Q#2	**Total SUM (after addiction of score from Q# 5a)**	**Total C1 Score**
<15 min = 0	0	0
16-30 min = 1	1-2	1
31-60 min = 2	3-4	2
>60 min =3	5-6	3

C1 score ≥2 means the participants took more than 30 minutes to sleep. Here's the age and gender wise distribution of participants with less sleeping hours [Table 14]. The number of participants in the age group 18-25 years was higher than any other group. In all age groups but 18-25 years females were found more affected with the sleep deprivation. Overall, number of males were higher than females.

Table 14. Sleep Latency Issues - Age and Gender Wise Distribution

Sleep Latency (C1>=2) with reference to AGE and GENDER					
Gender	**18-25**	**26-35**	**36-45**	**>45**	**Grand Total**
Female	17 (56.7%)	7 (14.6%)	6 (18.2%)	0 (.0%)	**30 (20.8%)**
Male	13 (22.8%)	16 (33.3%)	13 (39.4%)	3 (50.0%)	**45 (31.3%)**
Grand Total	**30**	**23**	**19**	**3**	**75**

Relationship between Internet Addiction and Sleep Problems

Of these 144 subjects, 7 (4.9%) had severe internet addiction (IAT) while 24 (16.6%) and 40 (27.7%) participants were moderately and mildly addicted to the internet, respectively, and had sleep quality issues [Figure 13]. This data included 4 people who had medical history of mental problems like psychiatric issues or depression so to avoid any influence on the outcome, these were removed. After removing these four individuals the total number of individuals both addicted to the internet and who had sleep issues was reduced to 67 from 71 [Table 15].

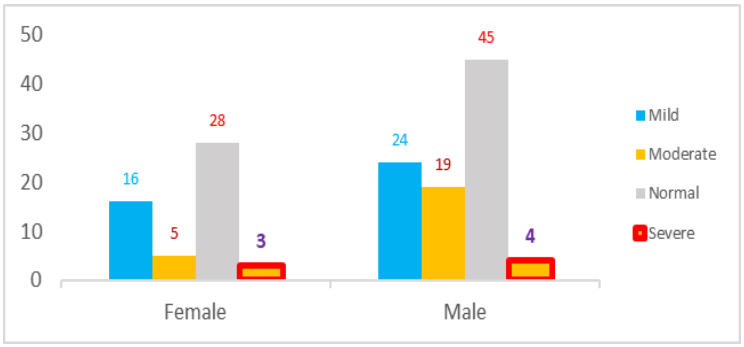

Figure 13: Comparison between IAD with PSQI>4

Table 15. Relationship between the Internet Addiction and Sleep Quality

Overall C Score / IAT Outcome	5	6	7	8	9	10	11	12	13	14	Grand Total
Mild	6	8	8	9	5	2	1				39
Moderate	1	7	8	1	2		2	1	1		23
Severe				1			1		1	2	5
Grand Total	**7**	**15**	**16**	**#**	**7**	**2**	**4**	**1**	**2**	**2**	**67**

5 (7.5%) were severely addicted and had sleep issues. Females were higher than males in this category i.e., 3:2 and had severe sleep problems too with their C Score ≥11. Males (82.6%) were more in number than females (17.4%) in the moderate category comprised of 23 (34.3%) participants. Here too, 6 individuals experienced severe sleep quality issues (C score ≥9). 58.2% participants (41% Females and 59% Males) had mild addiction to the internet and experienced comparatively less sleep disruption. 8 individuals complained of moderate to severe sleep issues with a C score of ≥8 [**Table 16**].

Table 16. Relationship Between the Internet Addiction and Sleep Quality (Gender wise Distribution)

	Gender	Female								Male									Grand Total
	C-Score	5	6	7	8	9	10	11	14	5	6	7	8	9	10	11	12	13	
IAT Outcome	Mild	2	4	4	2	2	1	1		4	4	4	7	3	1				39
	Moderate		1	2				1		1	6	6	1	2		1	1	1	23
	Severe							1	2				1					1	5
	Grand Total	2	5	6	2	2	1	3	2	5	10	10	9	5	1	1	1	2	67

Interestingly the distribution of the participants was equal between the two age groups, 18-25 [Table 17] and 26-35 years [Table 18] where male and female distribution

was 50% i.e., 13 each in the former age group whereas in the latter group, males (20,76.9%) were more than females (6, 23.1%). Number of individuals with both severe internet addiction and sleep quality issues were found in the age group 26-35 years which again proved that this age group was prominent on addiction and sleep issues front. Here, both males and females were equal in number i.e., 2 each but different C score severity. 1 female person with severe IAD and high C Score was from 18-25 years' age group.

The number of moderately addicted and with higher C-Score were higher in the age group 18-25 years (9) followed by 8 in 26-35 years and 6 in 36-45 years [Table 19] age group where number of males was higher in all these groups. None of the participants with >45 years of age presented both the symptoms, hence, were not included in the analyses.

Table 17. Relationship Among IAD, C-Score and Gender in Participants of 18-25 Years

	IAT OUTCOME	**Mild**	**Mild**	**Moderate**	**Moderate**	**Severe**	**Grand Total**
	Gender / **Overall Sleep Quality C Score**	**Female**	**Male**	**Female**	**Male**	**Female**	
18-25 Years	5	1	1				2
	6	4	1	1	3		9
	7	2	1	1	3		7
	8		3				3
	9	2	1				3
	11			1		1	2
	Grand Total	**9**	**7**	**3**	**6**	**1**	**26**

Table 18. Relationship Among IAD, C-Score and Gender in Participants of 26-35 Years

	IAT OUTCOME	**Mild**	**Mild**	**Moderate**	**Severe**	**Severe**	**Grand Total**
	Gender / **Overall Sleep Quality C Score**	**Female**	**Male**	**Male**	**Female**	**Male**	
26-35 Years	5	1	2	1			**4**
	6		2	3			**5**
	7	2	2	2			**6**
	8	1	4	1		1	**7**

	9			1			**1**
	13					1	**1**
	14				2		**2**
	Grand Total	**4**	**10**	**8**	**2**	**2**	**26**

Table 19. Relationship Among IAD, C-Score and Gender in Participants of 36-45 Years

	IAT OUTCOME	**Mild**	**Mild**	**Moderate**	**Moderate**	**Grand Total**
	Gender / **Overall Sleep Quality C Score**	**Female**	**Male**	**Female**	**Male**	
36-45 Years	5		1			1
	6		1			1
	7		1	1	1	3
	8	1				1
	9		2		1	3
	10	1	1			2
	11	1			1	2
	12				1	1
	13				1	1
	Grand Total	**3**	**6**	**1**	**5**	**15**

3 (42.9%) participants were consuming alcohol and /or tobacco in both severe and moderate category which may also affect the sleep cycle unless these people were addicted to that which is very subjective. 5 individuals (4 in moderate and 1 in severe category) had confirmed some musculoskeletal problems which may with rare chances affect the sleep quality and cause internet addiction due to idle nature (subjective, may or may not happen) and could be a confounding factor. Marital and professional status didn't seem to affect the addiction or sleep quality of participants; however, their extended hours on internet could be because of their job profile or personal requirements. The other factors like health issues barring the psychiatric problem participants didn't support any impact or plausible cause to the sleep disruption in the internet addicted individuals.

Discussion

In total, 32.7% of Indian adults were identified as internet addicted, with an average

internet usage duration of 15.5 years. The highest prevalence of internet addiction was observed among individuals aged 26-35 years (14.2%), followed by those aged 18-25 years (10.2%). Notably, a majority (71.4%) of severely addicted individuals belonged to the 26-35 years age group. Males exhibited a higher addiction rate (57.1% vs. 42.9%) and susceptibility to internet addiction (71.9% vs. 28.1%) compared to females.

According to previous literature, internet addiction prevalence among the Indian adult population ranged from 1.3% [22] to 6% globally [21]. The findings of this study align closely with the reported Indian percentage, indicating 1.7% severely addicted individuals, although severity mapping was not specified in the referenced figures. Other studies conducted in various states in India provided a broad range of mild and moderate internet addiction prevalence, ranging from 24% to 35% for mild addiction and approximately 7-24% for moderate addiction [23, 24, 37]. The data collected for this thesis also falls within this range, with 20.8% of participants exhibiting mild internet addiction and 10.2% confirmed as moderately addicted.

After removing the four participants with historical mental issues, the total number of addicted participants would be 99 with 63 (63.6%) mildly, 31 (31.3%) moderately and 5 (5.1%) were severely addicted to the internet. Of these 99, 67 (67.7%) individuals confirmed having 'overall' sleep quality issues which could be trouble getting sleep (sleep latency), relatively less sleeping hours (sleep efficiency) and disturbed sleep due to bad dreams or pain or breathing problems or cough/snore problems i.e., people with C-Score > 4. 100% of the severely 'internet' addicted individuals had sleeping issues with overall C score ranged between 8-14 meaning, sleep is affected by the overuse of the internet. Even for the participants with previous mental problems but severe IAT score had poor quality of sleep (c score = 8). 23 (74.2%) of moderately addicted participants had c-scores ranging from 5 to 13. Mildly (internet) addicted participants also showed symptoms of sleep issues where 39 (61.9%) were mildly addicted and had c-scores between 5-11. The analyses confirmed that as severity of addiction to the internet increases so as the worsening of the overall quality of sleep [27, 38-43].

Overall males (44, 65.7%) were 47.7% more in number than females (23, 34.3%) who were both addicted to the internet and had trouble with sleep affecting their overall quality of sleep. The percentage of individuals both addicted and have disrupted quality of sleep per severity (severe to mild) was 7.5%, 34.3% and 58.2%, respectively with 67 (22.1%) as total. Interestingly, more severe cases could be observed from the age group, 26-35 years while more mild and moderate individuals with sleep issues belonged to 18-25 years. Concomitant medication and previous medical history were also reviewed, and the observation was that these couldn't affect either internet addiction or sleep quality of the individuals. Marital (38.8%) and professional status didn't seem to affect the addiction or sleep quality of participants; however, their extended hours on internet could be because of their job profile or personal requirements. Overall, these factors don't seem to affect or contribute to internet addiction and/or sleep quality; however, this can't be totally ruled out as these could be potential confounding factors which require further study.

The data established the direct relationship between internet addiction and poor sleep quality and suggested that such patients should be treated and/or managed properly using various suitable means depending upon the addiction level.

Next Steps

Extensive epidemiological research on internet addiction is imperative, employing

stringent criteria to mitigate confounding factors. This research should encompass individuals of all ages, backgrounds, and socioeconomic statuses, utilizing various data collection methods such as interviews, face-to-face interactions, and remote surveys where appropriate. Collected data must undergo thorough review and cleaning to ensure accuracy prior to final analysis and conclusions.

There is a pressing need for localized studies, conducted regularly at smaller scales such as schools, regions, or states, ideally on a biennial or triennial basis. This data should be shared with an independent entity for statistical analysis, with resultant outcomes guiding necessary interventions to mitigate the consequences of internet addiction.

Research efforts should prioritize investigating all potential pathological manifestations stemming from internet addiction. Encouraging participation from a diverse array of clinicians, psychologists, psychiatrists, and mental health counsellors is crucial. Their input can inform tailored treatment and therapy approaches across various demographic categories.

Conclusion

Internet addiction is a verifiable phenomenon, as evidenced by the provided metrics. Males exhibit a heightened susceptibility to internet addiction and its associated sleep disturbances. The data indicates that young and middle-aged Indian adults face an elevated risk of internet addiction and consequent sleep issues, including sleep apnea and disruptions caused by factors like pain, nightmares, or respiratory issues. The more time spent on non-productive or unnecessary internet use correlates directly with increased risk of addiction, which in turn contributes to poor sleep quality and a host of related problems. Early detection of such signs and symptoms is crucial, with prompt advice from mental health professionals strongly recommended. Recognizing internet addiction as a silent yet significant psychopathological condition, initiatives such as seminars, public discussions, and educational platforms should be established to support the younger generation and practitioners in addressing this societal concern.

Conflict of Interest

There is not conflict of interest.

Acknowledgement

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Effect of Insurance Funds on Human Development Index in Nigeria

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Abstract

The main objective of this study was to evaluate the effect of insurance funds on human development index in Nigeria between 2012 and 2022. The design adopted for this study was ex-post-factor; data used for analysis were elicited from Central Bank Statistical Bulletin, World Bank Developmental Indicators Data base and National Insurance Commission Annual Reports. To achieve this objective, a model was formulated based on empirical and theoretical reviews. The model used human development index in Nigeria as the dependent variable, while life insurance funds, pension funds and deposit administration funds were the independent variables in the model. This study employed the Fully Modified Least Squares (FMOLS) Model to analyze data.The findings elicited from this study revealed that life insurance funds and pension funds recorded significant positive effect on human development index, while deposit administration funds had a significant negative effect on human development index in Nigeria. From the inferential result, the researcher concluded that insurance funds have significant effect on human development index in Nigeria. From the foregoing, the researcher recommended that the National Insurance Commission, in conjunction with the government should efficiently work together to ensure that the premium collected, and the income generated by the industry through pension funds and life insurance are diversified into economic and productive investment, in order to boost human development in Nigeria.

Keywords: *Deposit Administration Funds, Human Development Index, Insurance Funds, Life Insurance, National Insurance Commission, Pension Funds.*

Introduction

The world we live in is full of uncertainties and risks [1]. Individuals, families, businesses, properties, and assets are exposed to different types and levels of risks. These includes risk of losses of life, health, assets, property, etc. while it is not always possible to prevent unwanted events from occurring, financial world has developed products that protect individuals and businesses against such losses, by compensating them with financial resources. Insurance is a financial product that reduces or eliminates the cost of loss, or effects of loss caused by different types of risks. Apart from protecting individuals and businesses from any kind of potential risks, the insurance sector contributes significantly to human development index of the nation, by providing stability to the functioning of businesses and generating long-term financial resources for citizens and industrial projects. Among other things, the insurance sector also encourages the virtue of savings among individuals and generates employment among the populace [2]. Moreover, Insurance provides financial support and reduces uncertainties in business and human life. It provides safety and security against particular events. There is always a fear of sudden loss, which insurance provides cover against. Also, Insurance facilitates the spreading of risk, from the insured to the insured, which is the basic principle of insurance.

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Insurance also represents a promise of future compensation relating to specific losses, in exchange for periodic payments. Insurance is similar to banks and capital markets, as they solve the need of business units and private households in financial intermediation. The only way out is to reposition organizations and businesses to meet with the demand of the period, create awareness about the industry, training and retraining of staff, minimization of the wastages and maximization of gains in the interest of the economy [3]. Moreover [4] asserted that managing risk is an important function for business organizations dealing with money, which includes banks and insurance firms. Hence, in doing this, the insurance industry enhances national development through effective wealth creation, protection and consideration of funds lent. However, for any insurance contract to be valid there must exist an insurable interest and utmost good faith, which requires both parties to the insurance contract to make full disclosure of all material facts, before indemnity on a financial loss, or the happening of the event insured against, can be claimed. In view of this, [4], in his studies concluded that the importance of insurance to any nation's economy cannot be undermined. He said no country can experience a meaningful development without the presence of a formidable insurance industry. This makes insurance business in any nation indispensable, irrespective of its weak contribution to the Gross Domestic Product (GDP) or its level of awareness among the populace, as it is vital to the well-being of and smooth functioning of a modern economy [1].

From the foregoing, insurance services have come to be recognized by both individuals and corporate bodies to be an effective tool for the transfer of risks, which are vital for economic growth and human development. These services enable people to carry out their economic activities, unmindful of the adverse effect of the risk.

Statement of Problem

The gap between insurance funds and the Human Development Index (HDI) in Nigeria poses significant challenges to the country's socio-economic development. Despite the existence of insurance mechanisms, there is a lack of alignment between these financial instruments and the improvement of human well-being, as measured by the HDI. This misalignment raises concerns regarding access to insurance, the effectiveness of risk mitigation, and its overall impact on the quality of life for Nigerians. A significant portion of Nigeria's population lacks access to insurance services, particularly in rural and underserved areas. This limited accessibility deprives a substantial portion of the population of the protective shield that insurance can provide against unforeseen events, including health emergencies, property damage, and loss of livelihoods. As a result, the country's HDI is adversely affected, with a high prevalence of vulnerabilities and disparities in well-being. Also, the insurance industry in Nigeria often focuses on lucrative markets, such as urban centers and high-net-worth individuals. This has led to the neglect of critical sectors such as agriculture, which is the backbone of the nation's economy. Without adequate insurance coverage for farmers and agricultural activities, Nigeria's vulnerability to crop failures, extreme weather events, and economic shocks intensifies, thereby undermining progress in the HDI. In the same vein, Nigeria's insurance penetration rate remains significantly lower than the global average. This low insurance penetration translates into a lack of preparedness among individuals and communities to cope with unexpected setbacks, whether in terms of health, education, or economic stability. Inadequate insurance coverage is a stumbling block in the nation's efforts to improve human development outcomes. Finally, many Nigerians hold skeptical views about insurance, often due to negative perceptions of the industry and a lack

of trust in insurers. This skepticism can deter individuals from purchasing insurance policies, even when it could significantly mitigate risks to their well-being. Addressing these perception and trust issues is vital for improving insurance uptake and, consequently, the nation's HDI.

The relationship between insurance funds and human development is a critical aspect of a nation's economic and social well-being. In Nigeria, a country grappling with developmental challenges, understanding the issues that hinder the alignment of insurance funds with the Human Development Index (HDI) is of paramount importance. This article seeks to investigate and address the underlying issues that hinder the synergy between insurance funds and the enhancement of Nigeria's Human Development Index.

Objectives of the Study

Generally, the objective of this study is to examine the effect of insurance funds on human development in Nigeria. Other specific objectives are to:

1. Examine the influence of life insurance funds on human development index in Nigeria.
2. Ascertain the influence of pension funds on human development index in Nigeria.
3. Evaluate the influence of deposit administration fund on human development index in Nigeria.

Hypotheses of the Study

The following null hypotheses have been developed with a view to achieving the research objectives:

$H0_1$: There is no significant influence of life insurance funds on human development index in Nigeria.

$H0_2$: Pension funds has no significant influence on human development index in Nigeria.

$H0_3$: There is no significant influence of deposit administration fund on human development index in Nigeria.

Conceptual Review

Insurance

Insurance is a means of protection from financial loss. It is a form of risk management, primarily used to hedge against the risk of a contingent or uncertain loss. An entity which provides insurance is known as an insurer, insurance company, insurance carrier or underwriter. A person or entity who buys insurance is known as an insured or policyholder. The insurance transaction involves the insured assuming a generated and known relatively small loss in the form of payment to the insurer, in exchange for the insurer’s promise to compensate the insured in the event of a covered loss [2]. The loss may or may not be financial, but it must be reducible to financial terms, and usually involves something in which the insured has an insurable interest, established by ownership, possession or pre-existing relationship. In practice, the insured receives a contract, called the insurance policy, which details the conditions and circumstances under which the insurer will compensate the insured. The amount charged by the insurance policy is called the premium. If the insured experiences a loss, which is potentially covered by the insurance policy, the insured submits a claim to the insurer for processing by a claim adjuster. However, the insurer may hedge its own risk by taking out reinsurance, whereby another insurance company agrees to carry some of the risk, especially if the risk is too large for the primary insurer to carry.

Life Insurance

Life insurance is a financial contract between an individual (the policyholder) and an insurance company. In exchange for regular premium payments, the insurance company provides a payout (the death benefit) to the policyholder's beneficiaries upon the

policyholder's death. Life insurance serves several key purposes:

1. Financial Security: Life insurance offers a financial safety net to the policyholder's dependents and loved ones in the event of the policyholder's death. This ensures that beneficiaries can maintain their standard of living and meet financial obligations.
2. Estate Planning: It can be used as a tool for estate planning, helping to cover estate taxes and other financial responsibilities after one's passing.
3. Investment and Savings: Certain life insurance policies, such as whole life or endowment policies, have a savings or investment component, allowing policyholders to accumulate cash value over time.
4. Loan Collateral: Life insurance policies with cash value can be used as collateral for loans or withdrawals to address financial needs during the policyholder's lifetime.

In Nigeria, life insurance plays a crucial role in providing financial protection and security to families, ensuring that they can continue to meet their financial needs even in the absence of the primary breadwinner. However, insurance penetration in Nigeria is relatively low, and affordability remains a challenge for many citizens, particularly those in lower-income brackets.

Human Development Index (HDI)

The Human Development Index (HDI) is a composite measurement developed by the United Nations to assess the overall development of countries. It takes into account three key dimensions of human well-being:

1. Life Expectancy: This dimension reflects the average life expectancy at birth. It indicates the overall health and healthcare access in a country.
2. Education: Education is measured through a combination of indicators, including expected years of schooling for children and average years of schooling for adults. It reflects the population's access to and attainment of education.
3. Per Capita Income: This dimension assesses the average income of a country's citizens. It is often used as a proxy for the standard of living and economic well-being.

Nigeria has made progress in improving life expectancy over the years, but challenges related to healthcare access and quality persist, impacting this component of HDI. Nigeria faces challenges related to educational access and quality, particularly in rural areas. These challenges can affect educational attainment and, subsequently, the education component of HDI. In terms of per capita income; income inequality is a notable issue in Nigeria, with disparities between urban and rural areas and different income groups. This impacts the per capita income component of HDI. Life insurance in Nigeria serves as a mechanism for providing financial security and protection to families, contributing to individual and household well-being. On the other hand, the Human Development Index assesses a country's overall development by considering life expectancy, education, and per capita income. In Nigeria, addressing challenges related to healthcare access, education, and income inequality is essential for improving the country's HDI and, by extension, the well-being of its citizens.

Pension in Nigeria

Pension is the amount paid by government or company to an employee after working for some specific period of time, considered too old or ill to work or have reached the statutory age of retirement [5]. In this direction, it is safe to refer it as the monthly sum paid to a retired officer until death because the officer has worked with the organization paying the sum. It was in this perception that [6] asserts that pension is the method whereby a person pays into pension scheme a proportion of his/her earnings during his working life.

A greater importance has been given to pension and gratuity by employers because of the belief that if employees' future needs are guaranteed and confidence restored in the contributory pension scheme, they would be more motivated to contribute positively to organization's output. According to [7], pension consists of lump sum payment paid to an employee upon his disengagement from active service. Study maintains that pension plans may be contributory or not; fixed or variable benefits; group or individual; insured or trustee; private or public, and single or multi-employer. [8] and [9] stated that there are four main classifications of pensions in Nigeria. This suggests that there are Retiring Pension which is usually granted to a worker who retire after completing a fixed period of quality service. Consequently, pension can be defined as a fixed regular sum paid to a person, following retirement on having attained the retirement age or decided to disengage from service before his/her retirement date or health grounds [10]. Therefore, this goes to suggest that pension creates an impression in retirees that there is life after active service.

The Role of Insurance in Nigeria Economy

Insurance keeps assets and life under guarantee. Insurance plays a great role both in developed and developing countries' economies. Insurance provides safety and security: Insurance always provides financial support and decreases dangers in economic and social life. For example, we can say that in the case of life insurance financial assistance guarantee to the family of the insured on his death: Insurance makes financial resources: As economic category insurance, which is part of the financial system, is the foundation and utilization process of the targeted finance funds established to eliminate the damage from the sudden accidents and emergency, to provide financial support to the citizens in the accidents connected with their private lives [11-13] Insurance always protects people from loss, from danger. Many people know that danger can occur all the time. For this reason, a person who wants to ensure his property, pays some insurance premium to the insurance company. So, his property is guaranteed by the insurance company. Whenever a loss occurs, it is compensated out of funds of the insurer. With this process, insurance spreads risk in life. In addition to eliminating risk for the individual through transfer, the insurance device reduces the aggregate amount of risk in the economy by substituting certain costs for uncertain losses [14-16].

Theoretical Framework

Few financial propositions supporting insurance activities in an economy include the growth theory and the theory of financial intermediation. This study is however anchored on the theory of financial intermediation.

The Growth Theory

1. The growth theory was propounded by R. U. Herrod and E. Domar in 1955. The theory states that demand does not automatically equal supply, nor does saving automatically equal investment. The growth theory states that well developed financial intermediation can promote human development index through marginal productivity of capital efficiency in channeling savings to environment, saving rate and technological innovations.

   The channel to growth model tries to link the financial intermediation function of insurance companies to economic growth. According to [17], this theory is relevant to the study of when life insurance reserves can be used as approximation of the investment function. They used technical reserves of both life and non-life insurance companies as proxy for their investment function, and the expected effect on human development index was positive. Life and non-life insurance as a financial intermediation

activity, contributes to economic growth, through accumulation of productive capital within an economy, and the improvement of the efficiency of investment. From the growth theory, it was discovered that the insurance sector fosters human development index in the following ways.

i) Providing broader insurance coverage directly to firms, as well as improving their financial soundness.

ii) Fostering entrepreneurial attitudes, encouraging investment, innovation, market dynamism and competition.

2. iii) Promoting sensible risk management by households and firms and contributing to sustainable and responsible development.
3. **Empirical Review**

   It has been realized that very few studies have been done on insurance and economic growth. Significant of such studies are those of [18] examined the relationship between human development index and insurance sector growth. The study employed fixed effect model and cointegration analysis to determine the short-run and run relationship between economic growth and insurance sector growth and development in Nigeria. The result reveals that insurance sector growth and development positively and significantly affect economic growth. The study recommended that National Insurance Commission (NAICOM), in collaboration with the Federal Government should enforce laws on insurance practice in Nigeria.

In a similar study, [19] conducted a study on the impact of insurance contributions on human development index in Nigeria. The study used dynamic factor model to analyze the functional relationship between the volume of insurance contributions and economic growth in Nigeria. The results showed that insurance contributes greatly to economic growth in Nigeria. The study recommended that the National Insurance Commission should efficiently work together to ensure that the premium collected, and the income generated by the industry, are diversified into economic and productive investment. [20] investigated the effect of life insurance on human development index and what conditions affect the insurance growth nexus. The study adopted secondary data using multiple regression statistical tools. The findings confirmed the positive impact of the development of the life insurance market on economic growth.

In the same vein, [21] studied the relationship between insurance and economic growth, a theoretical and empirical analysis. They applied a cross country panel analysis using annual insurance premium data from 29 European countries over 1992 to 2004. It was revealed that there is weak evidence for a growth-supporting role of life insurance to bank and stock sector.

Dwelling on the same subject matter, [22] study explored the relationship between Nigeria's insurance industry and economic growth from 2001 to 2017. This study used descriptive stats and multiple regression for analysis. Insurance investment, premium, and claims positively impacted GDP. The insurance sector has greatly aided Nigeria's economic advancement. Mandatory insurance policies recommended for individuals and businesses. Encourages investment, protects investors, promotes steady growth. Regulators should enforce transparent fund management by insurers. Insurers should diversify investments to boost returns and pay claims.

In a similar study, [23] analyzed insurance receivables' impact on Nigerian economic growth from 2008-2017. This study used panel data analysis to investigate the correlation between insurance industry indicators (life premium, non-life premium, and insurance investment) and economic growth. The study showed that life premium and human

development index related positively yet insignificantly, and non-life premium related negatively but insignificantly with economic growth. Insurance investment had no effect on economic growth. Nigerian insurance industry has little impact on economy. Policy makers should tackle insurance industry challenges from government and public. With policies and awareness, the industry can achieve its potential.

In another study, [24] studied the effect of inflation on insurance penetration in Nigeria from 1985 to 2016. Study used regression analysis and found inflation has a small positive impact on insurance penetration in Nigeria. The study recommends measures to reduce inflation in Nigeria, which will increase insurance penetration in the industry.

In the same vein, [25] linked insurance and human development index in Nigeria from 1996 to 2015. This study used OLS estimation. Insurance in Nigeria boosts economic growth. The government should boost the insurance industry with economic policies. Enforce insurances, enhance industry reputation with education campaigns.

Similarly, [26] employed Autoregressive Distributed Lag (ARDL) Method to examine the effect of life and non-life insurance on human development index in Nigeria. Evidence is found in the results of the analysis of an existence of a long-run relationship between premium for both life and non-life insurance and economic growth. Thus, the study concluded that life and non-life insurance complement each other to positively affect economic growth.

In another study, [27] examined the effect of portfolio investment of insurance on the gross domestic product of Nigeria. A strong relationship was established between relevant variables in the study. [28] used multiple regression method of analysis to examine the impact of insurance on human development index in Macedonia with data for the period of 1995 to 2010. The three indices of independent variable used are Life insurance, non-life insurance and total penetration. The findings of the empirical analysis show that though, while the effect of life insurance is negative on the economy, there is a positive and significant effect of insurance development on economic development.

Methods

Research Design

This researcher would adopt the *ex-post facto* research design because secondary data is required.

Econometric Model Specification

This research adapted the econometric model previously used by [29] who empirically examined the effect of life and non-life insurance on human development in Nigeria between 2004 and 2013. The model of this study expanded the model used by [29] to accommodate other insurance funds such as pension fund and deposit administration fund. Thus, the model for this research is specified as follows:

$$HDI = f(LIF, PEF, DAF) \qquad \text{Model (3.1)}$$

Where:
HDI = Human Development Index.
LIF = Life Insurance Fund.
PEF = Pension Fund.
DAF = Deposit Administration Fund.

From the above specified model, the econometric model for this research would be specified thus:

$$HDI = \beta 0 + \beta 1LIF + \beta 2PEF + \beta 3DAF + \mu \qquad \text{Model (3.2)}$$

Where
μ - Stochastic variable.
f - Functional notation.

Method of Data Analysis

For the purpose of arriving at empirical results for this study, appropriate analysis was carried out involving descriptive and inferential statistics. The relevant statistics are mean,

standard deviation, minimum, maximum, range and number of observations. The inferential statistics are derivatives of regression analysis and would include R^2, adjusted R^2, t- statistics (t-stat.), Durbin-Watson (D-W) statistics, P-value and F-ratio. P-value is a margin to be used for acceptance or rejection of hypothesis and D-W statistics for testing for the presence of 1st order autocorrelation. Decisions were made based on 5% level of significance.

Results

Unit Root Test

Table 1. Unit Root Test Result (Summary)

Variables	**Levels**					**1st Differences**					**Order of Integration**
	ADF	**Critical Values**				**ADF**	**Critical Values**				
	t-stat	**@ 1%**	**@ 5%**	**@ 10%**	**p-value**	**t-stat**	**@ 1%**	**@ 5%**	**@ 10%**	**p-value**	
HDI	0.638736	4.420595	3.259808	2.771129	0.8138	5.145625	4.582648	3.320969	2.801384	0.0052	**I(1)**
LIF	0.945873	4.420595	3.259808	2.771129	0.9900	3.870052	4.420595	3.259808	2.771129	0.0212	**I(1)**
PEF	0.070070	4.297073	3.212696	2.747676	0.9281	3.750821	4.582648	3.320969	2.801384	0.0285	**I(1)**
DAF	0.462306	4.297073	3.212696	2.747676	0.8610	3.469247	4.582648	3.320969	2.801384	0.0412	**I(1)**

Source: Researcher's Computation (2023)

Table 1 showed the unit root test result on all the variables, and it indicated that they are non-stationary in the same order. This is proven by comparing the values presented carefully in the statistical test of Augmented Dickey Fuller (ADF) at 1 percent, 5 percent and 10 percent level of significance. From the test result, the variables showed difference at once and at first difference, the variables are stationary. This means that the variables were in the same order integrated I(1). As such, the appropriate estimation technique to employ for inference the Fully Modified Least Squares (FMOLS) (Pesaran, et al. 2001).

Descriptive Statistics

Table 2. Descriptive Statistics

	HDI	LIF	PEF	DAF
Mean	0.512273	579.8864	548.6982	108.9427
Median	0.514000	481.1440	558.9600	124.4970
Maximum	0.546000	1254.450	908.0900	221.7500

Minimum	0.483000	121.7568	265.4900	17.78853
Std. Dev.	0.018336	394.4974	171.5561	72.46664
Skewness	0.285398	0.477505	0.388409	0.233246
Kurtosis	2.323329	1.822033	3.220500	1.756436
Jarque-Bera	0.359192	1.054007	0.298864	0.808530
Probability	0.835608	0.590371	0.861197	0.667467
Sum	5.635000	6378.750	6035.680	1198.370
Sum Sq. Dev.	0.003362	1556282.	294315.1	52514.14
Observations	11	11	11	11

Source: Researcher's Computation (2023)

The descriptive statistics presented in Table 2 show that LIF has the highest mean value of N5.79 billion, followed by PEF which has N5.48 billion, while DAF and HDI have N1.088 billion and 0.51 respectively. Note that the Mean describes the average value for each data series in the model. From the analysis, LIF has the highest Standard Deviation as it recorded approximately 394.5, implying that it is the most volatile variable in the model as it has the highest percentage of dispersion from the mean, while HDI recorded the lowest standard deviation with a figure of approximately 0.02. The Table further reveals that all the variables are skewed to the right. Kurtosis measures the peakness or flatness of the distribution of a series. The kurtosis of a normal distribution is 3. If it exceeds 3, it means that the distribution is peaked or leptokurtic relative to the normal. Conversely, if it is less than 3, it shows that the distribution is flat or platykurtic relative to the normal. Table 2 further reveals that PEF with a Kurtosis value of 3.22 is peaked or leptokurtic. While the other variables with Kurtosis values less than 3 are flat or platykurtic.

Jarque-Bera (JB) tests whether the series is normally distributed or not. The test statistics measure the difference of the skewness and kurtosis of the series with those from a normal distribution. In JB statistic, the null hypothesis which states that the distribution is normal is rejected at 5% level of significance. From the results of the analysis presented in Table 3 above, all the variables had Probability values of greater than 0.05, as such, we conclude that all the variables a normally distributed. The number of observations of 11 depicts the duration or scope of this study, being 11 years. Although these skewness and kurtosis indicate departure from normality, such points are not strong enough to discredit the goodness of the dataset for the analysis in view.

Inferential Result

Table 3. Co-integration Regression Results

Dependent Variable: HDI		
Method: Fully Modified Least Squares (FMOLS)		

Date: 08/15/23 Time: 01:27				
Sample (adjusted): 2013 2022				
Included observations: 10 after adjustments				
Cointegrating equation deterministics: C				
Long-run covariance estimate (Bartlett kernel, Newey-West fixed bandwidth				
= 3.0000)				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
LIF	3.98E-05	6.75E-06	5.899852	0.0011
PEF	4.44E-05	1.61E-05	2.749790	0.0333
DAF	-9.52E-05	3.39E-05	-2.807412	0.0309
C	0.475826	0.006050	78.64846	0.0000
R-squared	0.910276	Mean dependent var		0.515200
Adjusted R-squared	0.865414	S.D. dependent var		0.016396
S.E. of regression	0.006015	Sum squared resid		0.000217
Long-run variance	1.12E-05			

Source: Researcher's Computation (2023)

The Fully Modified Least Squares (FMOLS) result as shown in Table 3 above suggests that LIF and PEF have positive effect on the explained variable. While DAF had a negative effect on HDI. The result further reveals that a unit increase in LIF would bring about a 3.98 unit increase in Human Development Index, while a unit increase in PEF would bring about a 4.44 unit increase in Human Development Index. Also, a unit increase in DAF would bring about a unit decrease in the Human Development Index.

A keen observation of the result showed that the R-squared and Adjusted R-squared was

approximately 0.91 and 0.86 respectively. This means that the explanatory variables accounted for about 91% variations in the explained variable. Put differently, about 91% variation in Human Development Index was explained by the independent variables, while the remaining 8% may be attributed to variables not captured in the model (stochastic variables).

Diagnostic Test

Variance Inflation Factors

Table 4. Variance Inflation Factors

Variance Inflation Factors			
Date: 08/15/23 Time: 01:29			
Sample: 2012 2022			
Included observations: 10			
	Coefficient	Uncentered	Centered
Variable	Variance	VIF	VIF
LIF	4.55E-11	21.31409	5.390787
PEF	2.61E-10	82.38789	4.802335
DAF	1.15E-09	18.69546	4.735134
C	3.66E-05	32.71976	NA

Source: Researcher's Computation (2023)

Variance inflation factor (VIF) detects multicollinearity in regression analysis. It is a rule of thumb that if the VIF factor falls within the 1 and 5, this means the variables are moderately correlated, hence free from the problem of multicollinearity. From Table 4 above, the VIF values of all the variables fall within the 1-5 region, showed that that the variables in the model are free from the problem of multicollinearity.

Test for Auto-Correlation

Table 5. Auto-Correlation

Date: 08/15/23 Time: 01:30						
Sample: 2012 2022						
Included observations: 10						
Autocorrelation	Partial Correlation		AC	PAC	Q-Stat	Prob*
. |** . |	. |** . |	1	0.225	0.225	0.6732	0.412
. *| . |	. *| . |	2	-0.123	-0.183	0.9012	0.637

. ***| . |	. ***| . |	3	-0.408	-0.364	3.7531	0.289
. ***| . |	. ***| . |	4	-0.435	-0.355	7.5447	0.110
. | . |	. | . |	5	-0.044	-0.026	7.5918	0.180
. |* . |	. *| . |	6	0.163	-0.068	8.3901	0.211
. |* . |	. **| . |	7	0.146	-0.207	9.2383	0.236
. | . |	. **| . |	8	-0.023	-0.286	9.2695	0.320
. | . |	. | . |	9	0.000	-0.009	9.2695	0.413
*Probabilities may not be valid for this equation specification.						

Source: Researcher's Computation (2023)

This test is carried out to further test for auto correlation. The result of Correlogram Q-Statistic in Table 5 suggests that the variables are free from auto correlation.

The correlogram Q- Stat. table indicates that all p-values were >5% hence the conclusion that the model was free from auto correlation.

Hypotheses Testing

The researcher tested six hypotheses which were earlier stated in null form. The purpose of this section is to draw inferences following the results obtained from data analysis and hypotheses testing.

Decision Rule: The researcher used critical values like p-value as the basis for acceptance and rejecting of null hypotheses. Where the critical p-value computed is less than 5% significance level, the variable was taken as being significant, hence it was rejected.

Table 6. Test of Hypothesis One

$H0_1$: There is no significant influence of life insurance funds on human development index in Nigeria

Variables	Coefficient	t-Statistic	P-value
LIF	3.98	5.899	0.0011

Source: Researcher's Computation (2023)

The test of hypothesis ($H0_1$) revealed that the p-value of LIF is less than 0.05 significance level, with a probability value of 0.0011. The researcher therefore rejects the null hypothesis. This result shows that life insurance fund has significant influence on human development index in Nigeria.

Table 7. Test of hypothesis two

$H0_2$: Pension funds has no significant influence on human development index in Nigeria.

Variables	Coefficient	t-Statistic	P-value
PEF	4.44	2.749	0.0333

Source: Researcher's Computation (2023)

The test of hypothesis ($H0_2$) revealed that the p-value of PEF is less than 0.05 significance level, with a probability value of 0.0333. The researcher therefore rejects the null hypothesis.

This result indicates that pension funds have significant influence on human development index in Nigeria.

Table 8. Test of Hypothesis Three

$H0_3$: There is no significant influence of deposit administration fund on human development index in Nigeria

Variables	Coefficient	t-Statistic	P-value
DAF	-9.52	-2.807	0.0309

Source: Researcher's Computation (2023)

The test of hypothesis ($H0_3$) revealed that the p-value of DAF is less than 0.05 significance level, with a probability value of 0.0309. The null hypothesis which states that there is no significant influence of deposit administration fund on human development index in Nigeria is rejected.

Discussion of Findings

A keen observation of the result showed that the R-squared and Adjusted R-squared was approximately 0.91 and 0.86 respectively. This means that the explanatory variables accounted for about 91% variations in the explained variable. Put differently, about 91% variation in Human Development Index was explained by the independent variables, while the remaining 8% may be attributed to variables not captured in the model (stochastic variables). The findings are summarized below:

1. Life insurance funds had a significant and positive effect on human development index in Nigeria. This finding is in agreement with the study of [29]. This positive effect could be attributed to the fact that life insurance funds contribute to the wellbeing of the citizens and could also provide funds for the populace to enjoy the necessary physiological needs of an average Nigerian which are the components of human development index in Nigeria.
2. From the findings, pension fund also recorded a significant positive effect on human development index in Nigeria. The same explanation for this positive effect can be deduced from that of life insurance funds in i above. In the same vein, this finding is also in consonance with the study of [27].
3. Lastly, deposit administration fund recorded a significant negative effect on human development index in Nigeria.

Conclusion

This study investigated the effect of insurance funds on human development index in Nigeria. The study used life insurance funds, pension funds and deposit administration funds as independent variables, to test their effect on the dependent variable being human development index. The results of Fully Modified Ordinary Least Squares revealed that life insurance fund and pension fund had significant positive effect on human development index in Nigeria, while deposit administration fund had a significant negative effect on human development index in Nigeria. National insurance commission (NAICOM) should ensure that the insurance industry is stable robust in discharging its functions in the Nigerian economy through adequate regulations and reforms which will lead to the stability of this sector and by extension tantamount to the improvement in the standard of living of the populace which is a measure of human development index. From the foregoing, this study concludes that insurance funds had significant effect on human development index in Nigeria within the period of review.

Recommendations

Based on the results discussed in the foregoing paragraphs, government, National

insurance commission and policymakers in Nigeria should consider the following recommendations to increase and improve human development index into Nigeria.

1. Since life insurance funds had a significant positive effect of human development index in Nigeria, efficient policies on the amount of premium to be paid on life insurance contract should be enacted by National Insurance Commission, as higher premium discourages potential insurance investors from efficiently participating in the industry.
2. In the same vein, pension funds had a significant positive effect on human development index in Nigeria, the National Insurance Commission, in conjunction with the government should efficiently work together to ensure that the premium collected, and the income generated by the industry through pension funds, are diversify into economic and productive investment, in order to boost human development in Nigeria.
3. From the results, deposit administration had a negative effect on human development index in Nigeria, the National Insurance Commission (NAICOM), in collaboration with the Federal Government should formulate and enforce laws on insurance practice in Nigeria such that deposit administration fees charged are moderate and affordable so as not to discourage potential policy buyers from shying away from investing in the insurance industry in Nigeria.

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Conflict of Interest

The author reports that there is no conflict of interest whatsoever in this research paper.

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Assessment of the Internet Addiction Disorder and its Association with Anxiety and Depression in Young Indian Adults: A Cross Sectional Study

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Abstract

The phenomenon of involuntary engagement with internet devices, accompanied by a sense of emptiness in their absence, characterizes internet addiction disorder. A comprehensive meta-analysis spanning 80 studies worldwide from 1996 to 2012, involving 89,281 participants across 31 countries, revealed a 6% prevalence of this disorder among young individuals globally. A separate study funded by the Indian Council of Medical Research (ICMR) investigated 2,755 participants aged 18-65 in India, finding a prevalence rate of 1.3% for internet addiction. Notably, this disorder has not yet been recognized as Internet Addiction Disorder (IAD) in the Diagnostic and Statistical Manual of Mental Disorders (DSM). Numerous studies have examined the prevalence of internet addiction in the Indian population. This current study aimed to assess the prevalence, impact, and available treatment options for internet addiction among Indian adults. Utilizing a cross-sectional, close-ended online survey questionnaire distributed among the general public and experts, a total of 303 responses were collected. The findings revealed that 33.3% of Indian adults were addicted to the internet, with varying degrees of severity: severely (1.7%), moderately (10.2%), and mildly (20.8%) addicted. Notably, most severely addicted individuals (80%) fell within the 26-35 years age range. Male participants exhibited a higher prevalence of internet addiction compared to females (57.1% vs. 42.9%), with males also displaying a greater propensity for addiction (71.9% vs. 28.1%). Further analysis indicated that 11.2% of addicted individuals experienced symptoms of anxiety and/or depression, with males affected at a rate 50% higher than females.

Keywords: *Anxiety, Compulsive Disorder, Depression, Internet Addiction Disorder (IAD), Mental Health Issues.*

Introduction

With advancement in technology, especially the internet in the last 15-20 years [1] dependency of people on internet even for their daily chores has increased a lot. Slowly the world would be in grip of several online platforms like WhatsApp, Facebook, Orkut (obsoleted) and similar others where people devote approximately 6 hours per day in the US (Pew Research). Internet use can be differentiated as 'healthy' and 'pathological' use [2]. The term 'Internet Addiction Disorder' was first coined by Dr. Ivan Goldberg (1995), satirically which later was researched upon by Dr. Kimberly Young (1996) followed by a research article on pathological use of the internet leading to 'internet addiction' in 1998. Across the USA and EU region, prevalence rates of this addiction varied between 1.5-8.2% [3], few other reports following IAT suggested this range from 6-18.5% [4]. The addiction defining criteria majorly depends upon the time invested on the internet [5, 6] while other indistinctive criteria defined are individual/behavioral problems [7].

The prevalence rates in adolescent populations varies between 0.8% -26.7% [6, 8-

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11]. Similar variation was observed in adult samples where prevalence rates ranged from 1.2% -22.8% [11-17] from studies done is several countries outside India. The difference could be seen in the genders where males were comparatively addicted and more prone to the internet addiction than females [18-20]. The meta-analysis of empirical reports from studies done on 89,281 samples from 1996-2012 showed 6% of internet addiction globally [95% CI; 5.1-6.9] [21].

In Indian context, studies have shown the prevalence of internet addiction to be 1.3% in the general population [22] though the number of studies done have been quite less compared to other western and eastern countries and adolescent population has always been the focus.

Reasons for dissimilarity between the prevalence rates could be attributed more to different assessment tools than the age group but also the variety of the population studied (internet users than the general population). The major associated outcomes highlighted in almost all addicted individuals have been anxiety, depression, and sleep problems [23-25]. These symptoms were sometimes accompanied by other dependent or comorbid conditions like muscle pain, obesity, cardiovascular problems etc. [26-30].

Other limitations to identify the prevalence of internet addiction in Indian population would be to cover the wide range of population across all regions including the rural part and illiterate population.

A few new scoring tools have also been prepared and are being used across the globe apart from IAT. Chen Internet Addiction Scale (CIAS), original and revised (CIAS-R) has been the second most preferred tool [31]. Similar assessment tools for Indian population knowing the social strata would have been the better approach to avoid manipulation of the responses.

As this problem has been realized and supported by recognition and inclusion of internet gaming disorder in the DSM V, several therapy areas have also been devised and executed to satisfaction in most of the cases. Several studies have suggested using different therapies for certain groups of affected individuals. Serotonin-reuptake inhibitors (SSRIs) have been one of the leading treatment methods to help circumvent the anxiety and depression caused due to internet addiction [32, 33], physical exercise & sport therapy has also gained some significance lately either individually [34] or in combination [35]. But the most preferred treatment by clinicians is psychotherapy including Motivational Interviewing, Multilevel counselling, community engagement therapy etc. [36-40].

Methods

Survey research has always been a preferred method to gather information not available from other sources [41- 43]. Two kinds of questionnaires were used for this survey. The first set of survey consists of internationally validated questionnaires, Internet Addiction Test (Young, 1999) to assess the prevalence of addiction to the internet in the population and the second was the brief Patient Health Questionnaire-4 (PHQ-4) to assess the anxiety and depression in the addiction population. Though the study was an anonymous survey but to ensure the ethics and integrity of the research, ethical committee approval was also sought. The concept was translated into the protocol after discussion with a psychiatrist, multiple researchers, friends, and my research guide.

This was a cross sectional, close ended, self-administered questionnaires, sent to the public (Indian ≥18years) to gather data on their experience with the internet and associated mental issues. The data collection was done using Google Forms. The link to the questionnaire was shared with the general public using various platforms like LinkedIn, WhatsApp, Emails, Words of Mouth though

friends and family. All participants were given an option to consent voluntarily to complete the questionnaires and data was gathered anonymously. The data collected from general public was analyzed to establish the prevalence of the internet addiction in Indian adult and its relationship with mental health issues i.e., anxiety and/or depression.

Summary of the Study Design

Data was gathered from interested 303 India participants (≥18 years) who voluntary consented to provide requested information regarding their involvement with the internet and experiences, if any, regarding the influence of this on their mental, physical, and emotional health.

Inclusion criteria for participants were,

1. They must be >= 18 years in age. There wasn't any upper cap on the age group as the intention was to cover the adult population across all age groups.
2. They should be literate and can use internet and related devices.
3. They can be from all genders. Participants can choose not to declare their age too.
4. They should be able to read and understand the voluntary consent form.
5. They should have either a smart phone or computer to complete the form online.

Exclusion Criteria

1. Illiterate participants
2. Age < 18 years
3. Participants with no internet access
4. Participants who don't want to consent for this study.

Recruitment Methods

1. Word of mouth/ verbal advertising.
2. Networking (friends, family, relatives, colleagues).
3. Mail pals (phone and mail contacts).
4. Social Network (WhatsApp, messaging, LinkedIn).

Study Duration

The survey started in early November 2022 and lasted until June 2023.

Ethical Consideration

Though ethical approval was not required due to non-interventional nature of the study; however, EC approval was sought to assure the volunteers that their information shall not be divulged and shared with anyone and used only for the data analysis of this study.

Sample Size

The sample size was calculated based on the 95% confidence interval (CI) and 5% margin of error and the result obtained was 271 adult volunteers from different states of India who were shared with the survey questionnaire in the form of Google Forms, link provided. By June 2023, 303 responses were obtained. These questionnaires are globally validated and available in public domain and no permission is required to reproduce, translate, display, or distribute for academic purposes.

Formula used: $\frac{\frac{z^2 \times p(1-p)}{e^2}}{1+\left(\frac{z^2 \times p(1-p)}{e^2 N}\right)}$.

Where, N = population size; e = Margin of error (percentage in decimal form); z = z-score. The z-score is the number of standard deviations a given proportion is away from the mean. The right z-score considering 95% CI would be 1.96.

Study Design

The questionnaire was started with the Introduction of the study and voluntary consent of the participants followed by 20 questions from the Internet Addiction Test (IAT) tool [Table 1] and 4 questions from the brief Patients Health Questionnaire (PHQ-4) [Table 2].

The Internet Addiction Tool (IAT) [44]s had 20 items or statements based on 5-point Likert scale with score ranging from 0 to 100

where, a score 80 and above qualified the person as severely addicted while a score between 50-79 indicated problematic use of internet i.e., moderately addicted, and any score less than or equal to 49 confirmed the controlled use of the internet. The users were asked to respond to these questions by selecting the most appropriate option from the drop-down. The options were Not Applicable (0), Occasionally (2), Rarely (1), Frequently (3), Often (4) and Always (5).

Table 1. Internet Addiction Tool Questionnaire

S.No.	Questions	S.No.	Questions
1	How often do you find that you stay online longer than you intended?	11	How often do you find yourself anticipating when you will go online again?
2	How often do you neglect household chores to spend more time online?	12	How often do you fear that life without the Internet would be boring, empty, and joyless?
3	How often do you prefer the excitement of the Internet to intimacy with your partner?	13	How often do you snap, yell, or act annoyed if someone bothers you while you are online?
4	How often do you form new relationships with fellow online users?	14	How often do you lose sleep due to being online?
5	How often do others in your life complain to you about the amount of time you spend online?	15	How often do you feel preoccupied with the Internet when off-line, or fantasize about being online?
6	How often do your grades or schoolwork suffer because of the amount of time you spend online?	16	How often do you find yourself saying "just a few more minutes" when online?
7	How often do you check your email before something else that you need to do?	17	How often do you try to cut down the amount of time you spend online and fail?
8	How often does your job performance or productivity suffer because of the Internet?	18	How often do you try to hide how long you've been online?

9	How often do you become defensive or secretive when anyone asks you what you do online?	19	How often do you choose to spend more time online over going out with others?
10	How often do you block out disturbing thoughts about your life with soothing thoughts of the Internet?	20	How often do you feel depressed, moody, or nervous when you are off-line, which goes away once you are back online?

The brief Patients Health Questionnaire-4 (PHQ-4) developed and validated by Kroenke, Spitzer, Williams, & Löwe in 2009 [45] where response to first two questions help assess anxiety (GAD-2) and the other two the depression (PHQ-2) levels in an individual. This is based on the 4-point Likert type scale where scores are rated as normal (0-2), mild (3-5), moderate (6-8) and severe (9-12). Total score of ≥3 for the first 2 questions suggests anxiety while a score of ≥3 for the last two questions suggests depression. Total score is determined by adding together the scores of each of the 4 items. The total PHQ–4 score complements the subscale scores as an overall measure of symptom burden, as well as functional impairment and disability. Its first two items are from the 'Generalized Anxiety Disorder–7 scale' (GAD–7) for anxiety level while the last two items are drawn from the 'Patient Health Questionnaire-9' (PHQ-9) to assess the depression level of an individual. This ultra-brief version serves as a good measure of assessment of underlying anxiety and depressive disorder.

Table 2. Brief Patient Health Questionnaire-4

Over the last two weeks, how often have you been bothered by the following problems?	**Not at all**	**Several days**	**More than half the days**	**Nearly every day**
Feeling nervous, anxious or on edge	0	1	2	3
Not being able to stop or control worrying	0	1	2	3
Feeling down, depressed, or hopeless	0	1	2	3
Little interest or pleasure in doing things	0	1	2	3
Total	**0**	**4**	**8**	**12**

Data Collection and Analyses

Questionnaire responses were collected via online mode using Google Forms. Data was entered in Microsoft Excel 365 and analyses were done using various excel formulae and presented in the form of tables, graphs, and figures. The data thus obtained was reviewed and moderated a bit to ensure they are placed in the right place and easy for further calculation. With excel it was easy to segregate, describe in length and create multiple small pivot tables/tables or charts to support the content/outcome. Means, percentage and derivative information/data was easily derived using excel. The data was reviewed and explained for every collected information i.e., for every questionnaire, IAT and PHQ-4 separately while establishing the relationships between them.

Results

Demographics

Out of total 303 responses [Figure 1] received, 181 (59.7%) were male, 120 (39.6%) were females and rest 2 (0.7%) didn't reveal their gender.

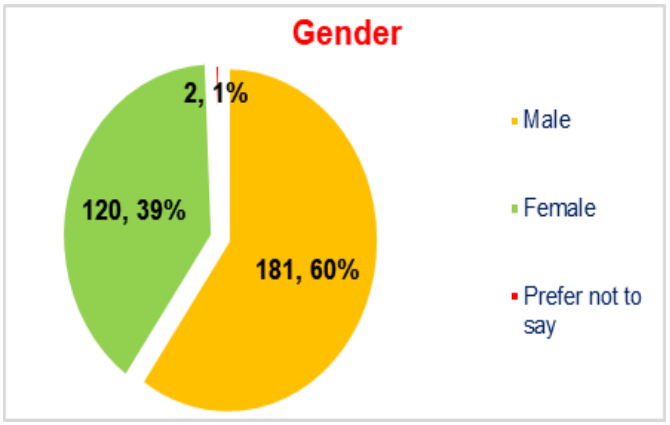

Figure 1. Gender Distribution

These participants were further distributed in various age groups [Figure 2] for easy distinguishment of age groups addicted or more prone to internet addiction. A total of 135 participants were from 18-25 years, 92 belonged to the 26-35 years' age group while 69 were from the age group 36-45 years. 6 and 1 participants were from age groups 46-60 and >60 years, respectively. 2 people who didn't reveal their gender, each belonged to the 26-35 year and 36-45 year' age group.

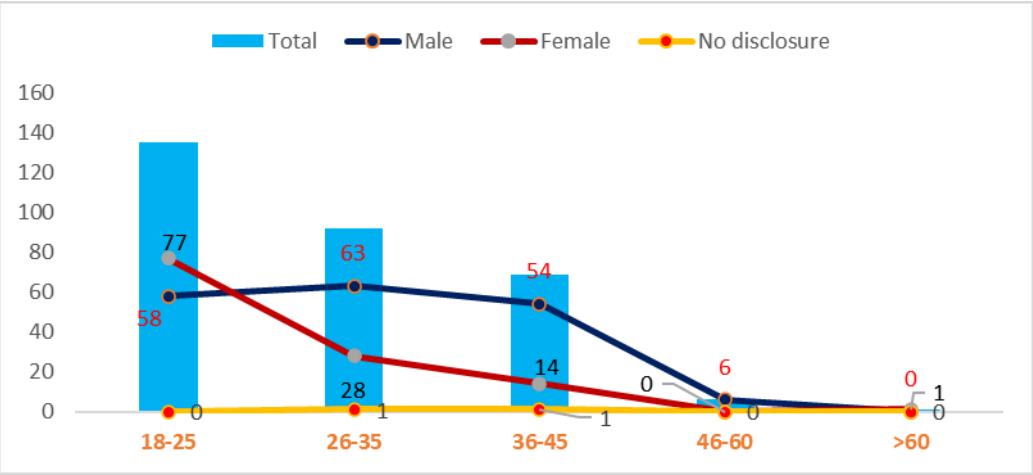

Figure 2. Age Group with Gender Distribution

Since this thesis is all about internet addiction, internet use-age, meaning for how long people are using the internet would be of significance. The average age [Table 3] of using the using the internet was 18 years while the average duration of use of the internet was 10 years. Since the maximum duration of the internet use was 20 years hence, it was distributed in four duration categories with an interval of 5 years i.e., 0-5, 5-10, 10-15 and 16-20 years which was further assessed per the age range as below:

Table 3. Comparison between Age Group and Internet Use-Age

Internet Use-Age			**18-25 years**		**26-35 years**		**36-45 years**		**46-60 years**		**>60 years**	
Year Range	**Total**	**Total %**	**Total**	**Total %**	**Total**	**Total %**	**Total**	**Total %**	**Total**	**Total %**	**Total**	**Total %**
0 - 5	37	12.2%	**32**	**86.5%**	3	8.1%	2	5.4%	0	0.0 %	0	0.0%
6 – 10	**142**	**46.9 %**	**83**	**58.5%**	35	24.6%	21	14.8%	2	1.4 %	1	0.7%
11 - 15	107	35.3%	20	18.7%	**45**	**42.1%**	**39**	**36.4%**	3	2.8 %	0	0.0%
16 - 20	17	5.6%	0	0.0%	9	52.9%	**7**	**41.2%**	1	5.9 %	0	0.0%

With increased age the use of internet decreased and most of the participants were found using the internet between 6-15 years and most of them belonged to 18-25 years and 26-35 years followed by some percentage from 36-45 years. 72.3% of the participants used the internet for both study and work with 11.9% and 15.8% used it for work and study, respectively [Figure 3].

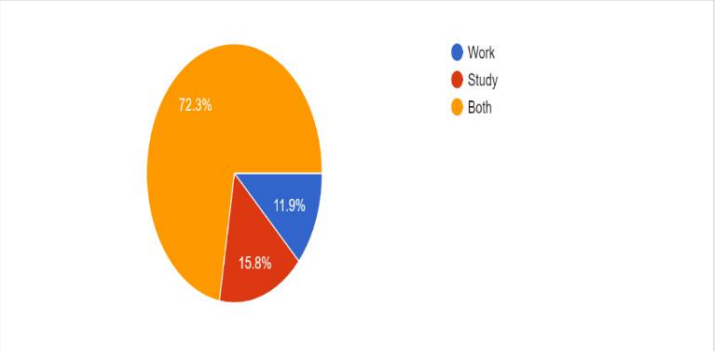

Figure 3. Internet Usage Distribution

The major share of profession was distributed between Student/working students (50.2%) and Private/Corporate employees (40.6%) [Figure 4].

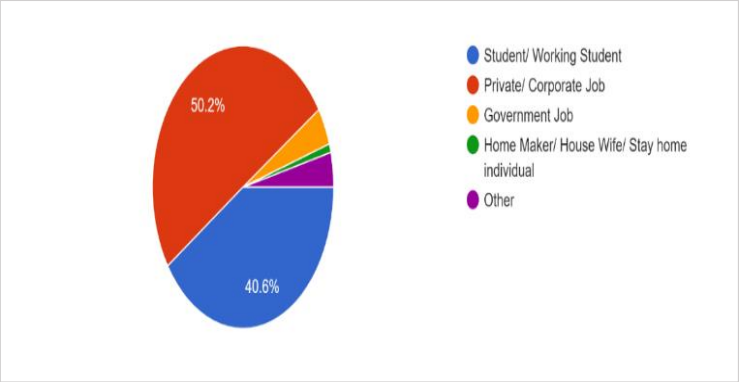

Figure 4. Profession-Wise Distribution

Other demographic parameters assessed were marital status [Figure 5], concomitant consumption history [Figure 6] and any existing health issues which can skew the results.

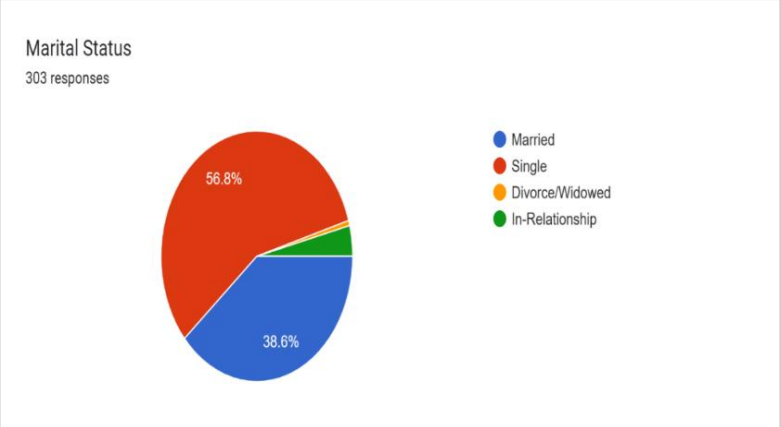

Figure 5. Marital Status Distribution

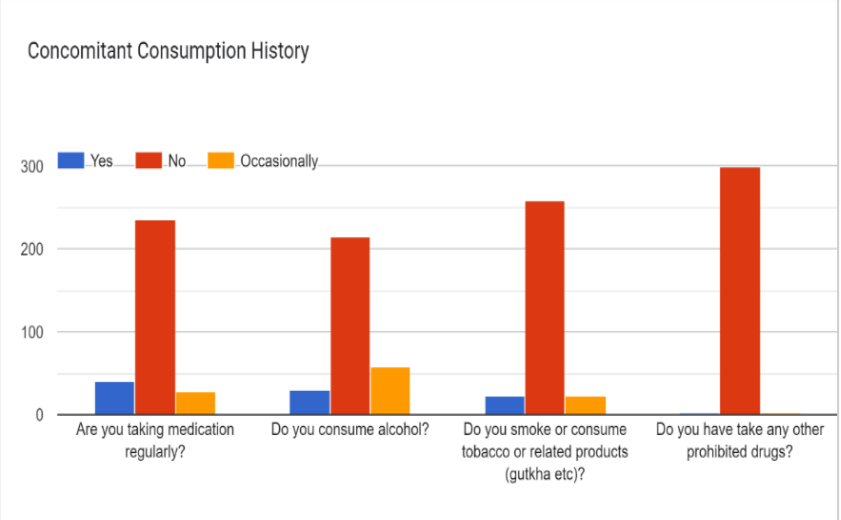

Figure 6. Concomitant Consumption Distribution

Four (4, 1.3%) individuals confirmed psychiatric/Mental issues [**Figure 7**] which were not included in the final analysis of the data. Rest health issues didn't seem to interfere with internet addiction or other way round.

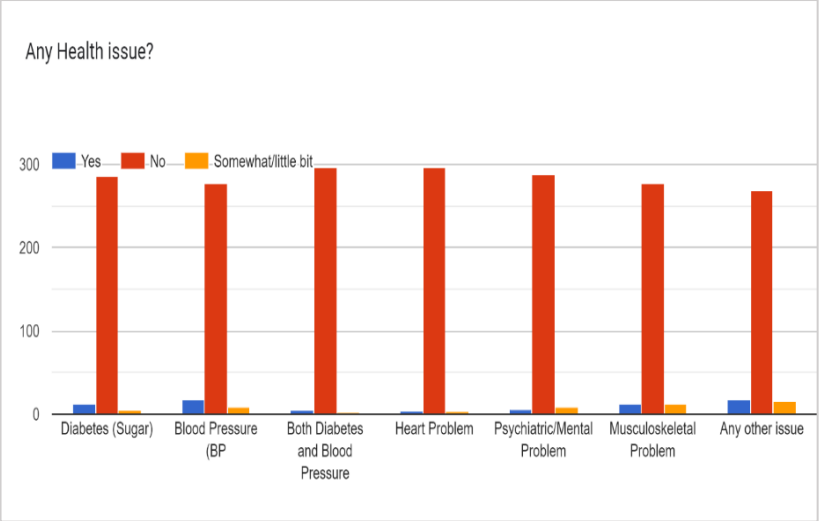

Figure 7. Medical History-Wise Distribution

Prevalence of the Internet Addiction using Internet Addiction Test (IAT)

Out of 303 participants, 103 (34%) were found addicted to the internet. Only three age groups, 18-25, 26-35 and 36-45 years showed some level of addiction. Addiction level was highest in 18-25 years (13.5%) followed by 26-35 years (12.2%) and lastly 36-45 years (8.3%). These age groups were further sub-divided into genders and addiction levels to understand it better. Following table [**Table 4**] provides an overall interpretation of the addiction where internet addiction was found higher in males (67, 65%) than females (35, 34%) which has been observed by several researchers worldwide and details and references have already been provided in the above sections. One person (1%) out of two who didn't reveal their gender was found addicted.

Internet addiction was found higher in males, and they were found more prone to the addiction than females. One exception, though, was observed in the youngest age group where females were higher in number by 1. The percentage* under the age-group in the below table was calculated using 103 as the denominator hence could be different from as stated above.

Table 4. Internet Addiction Status - Overall

IAD-Overall										
Overall			**18-25**			**26-35**			**36-45**		
TOTAL Addicted	103	34.0%	TOTAL Addicted	41	*39.8%	TOTAL Addicted	37	*35.9%	TOTAL Addicted	25	*24.3%
Male	67	65.0%	Male	20	48.8%	Male	29	78.4%	Male	18	72.0%
Female	35	34.0%	Female	21	51.2%	Female	8	21.6%	Female	6	24.0%

Gender Unknown	1	1.0 %	Gender Unknown	0	0.0%	Gender Unknown	0	0.0 %	Gender Unknown	1	4.0%

212 (69.97%) confirmed spending more time (Q1 above) over the internet than required. Approximately 151 (49.53%) study participants would like to review their emails before any other thing. 44% -45% participants presented the symptoms of overuse of the internet for example, intentionally overseeing their work, neglecting, or ignoring their household chores over internet, and feeling lonely, joyless, and bored. No participants over 60 years were found addicted, hence removed from the analysis.

These 103 (34%) addicted participants were further broken down to understand the severity level of internet addiction into Mild (64, 21.1%) [Table 7, Figure 10], Moderate (32, 10.6%) [Table 6, Figure 9] and Severe (7, 2.3%) [Table 5, Figure 8].

Table 5. Internet Addiction Status – SEVERE

IAD-Severe										
Overall (of 103)			**18-25**			**26-35**			**36-45**		
TOTAL Addicted	7	6.8%	TOTAL Addicted	1	14.3 %	TOTAL Addicted	5	71.4%	TOTAL Addicted	1	14.3 %
Male	4	57.1%	Male	0	0.0%	Male	3	60.0%	Male	1	100.0 %
Female	3	42.9%	Female	1	100. 0%	Female	2	40.0%	Female	0	0.0%
Gender Unknown	0	0.0%	Gender Unknown	0	0.0%	Gender Unknown	0	0.0%	Gender Unknown	0	0.0%

Table 6. Internet Addiction Status - MODERATE

IAD-Moderate										
Overall (of 103)			**18-25**			**26-35**			**36-45**		
TOTAL Addicted	32	31.1%	TOTAL Addicted	16	50.0%	TOTAL Addicted	9	28.1%	TOTAL Addicted	7	21.9%
Male	23	71.9%	Male	9	56.3%	Male	8	88.9%	Male	6	85.7%
Female	9	28.1%	Female	7	43.8%	Female	1	11.1%	Female	1	14.3%
Gender Unknown	0	0.0%	Gender Unknown	0	0.0%	Gender Unknown	0	0.0%	Gender Unknown	0	0.0%

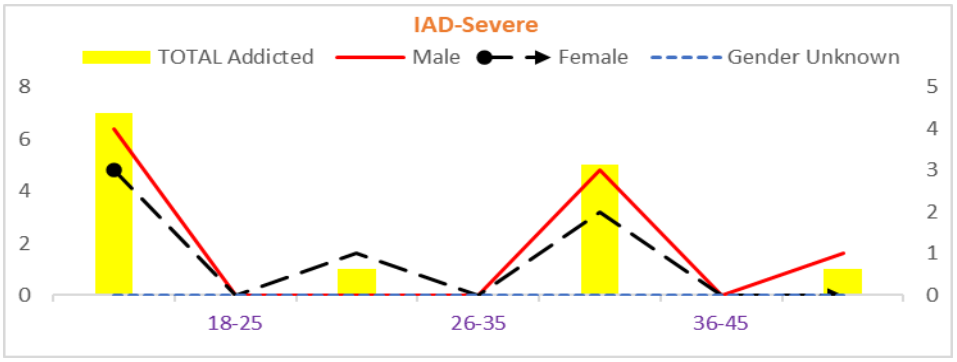

Figure 8. Internet Addiction Status - SEVERE

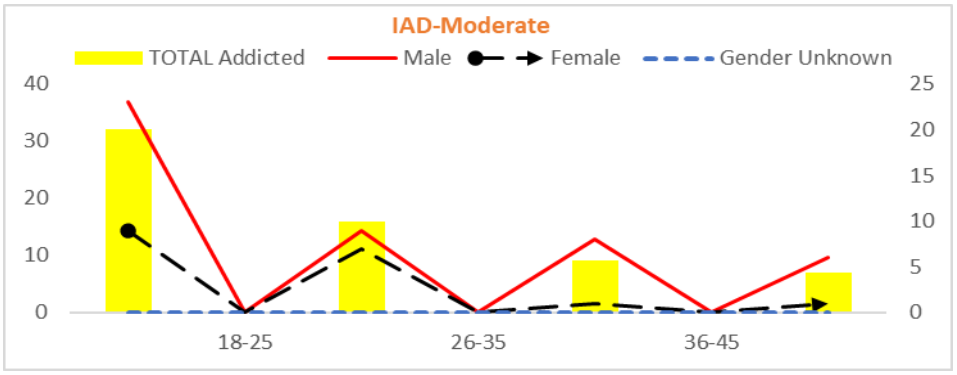

Figure 9. Internet Addiction Status - MODERATE

Table 7. Internet Addiction Status - MILD

IAD-Mild											
Overall (of 103)			**18-25**			**26-35**			**36-45**		
TOTAL Addicted	64	62.1%	TOTAL Addicted	24	37.5%	TOTAL Addicted	23	35.9%	TOTAL Addicted	17	26.6%
Male	40	62.5%	Male	11	45.8%	Male	18	78.3%	Male	11	64.7%
Female	23	35.9%	Female	13	54.2%	Female	5	21.7%	Female	5	29.4%
Gender Unknown	1	1.6%	Gender Unknown	0	0.0%	Gender Unknown	0	0.0%	Gender Unknown	1	5.9%

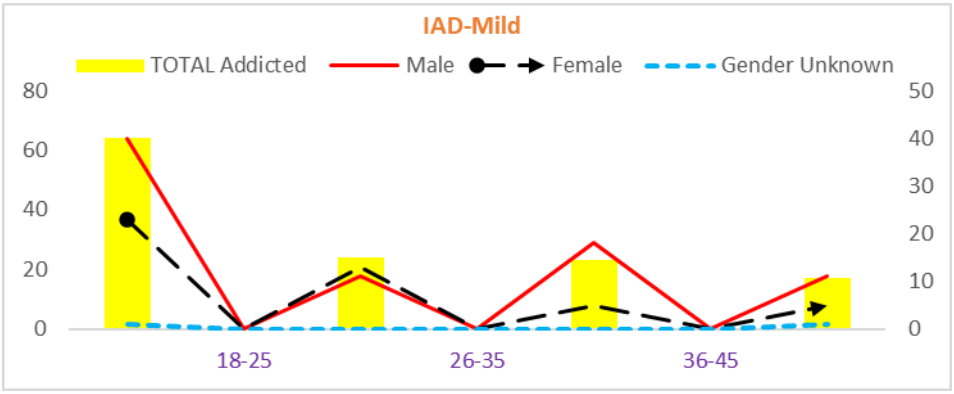

Figure 10. Internet Addiction Status - MILD

All 7 severely addicted individuals were suffering from mental (anxiety and/or depression) problems. People in the age group 26-35 years were mostly severely addicted to the internet (5, 71.4%) followed by 1 in each of 18-25 years and 36-45 years age groups. All these participants showed a tendency to stay online for extended hours than expected. 28 (87.5%) of these moderately addicted participants found overusing the internet outside their normal hours. Again, participants in the age group 18-25 years were higher in number than in the other two groups. None from over 45 years were found moderately addicted, hence, not considered for further analysis. 35 (89.7%) of these severely and moderately addicted individuals were using internet either for work or study or both so there could be chance that the extension of hours be due to the necessity hence, this could be a confounding factor; however, for analyses perspective and by some means these people are either completely addicted or prone to addiction and may require an expert intervention. The metrics support the correlation between internet addiction and overuse of the internet. The rest of the 62.1% of the addicted population (21.1% of total 303) was recorded as mildly addicted. Of these 64 mildly addicted individuals, 24 (37.2%) used internet overtime and these presented symptoms of sleep issues too.

Mental problems using brief Patient Health Questionnaire (PHQ-4)

Out of 303, 131 (43.2%) participants scored to qualify for PHQ-4 i.e., presented symptoms of some kind of anxiety and depression where, total number of males (70, 23.1%) were higher than females (61, 20.1%). Of 131 [Figure 11], 81 (26.73%) had Mild PHQ-4 (≥3-<6 score), 34 (11.22%) presented Moderate symptoms with a score between 6 and 8 (both inclusive) while 16 (5.28%) had PHQ-4 score between 9 and 12 (both inclusive) and termed as severely affected. Interestingly, females (10, 62.50%) were higher than males (6, 37.50%) under 'severe' category while in 'moderate' category the male-female ratio was 0.78 i.e., 15 (44.12%) were males and 19 (55.88%) were females. It was observed that the individuals in the age group of 18-25 (66, 21.8%) presented mental problems comparatively more than other two groups, 26-35 (46, 15.2%) and 36-45 (19, 6.3%) years. No participants in age >45 years presented any such symptoms hence, not being assessed [Table 8].

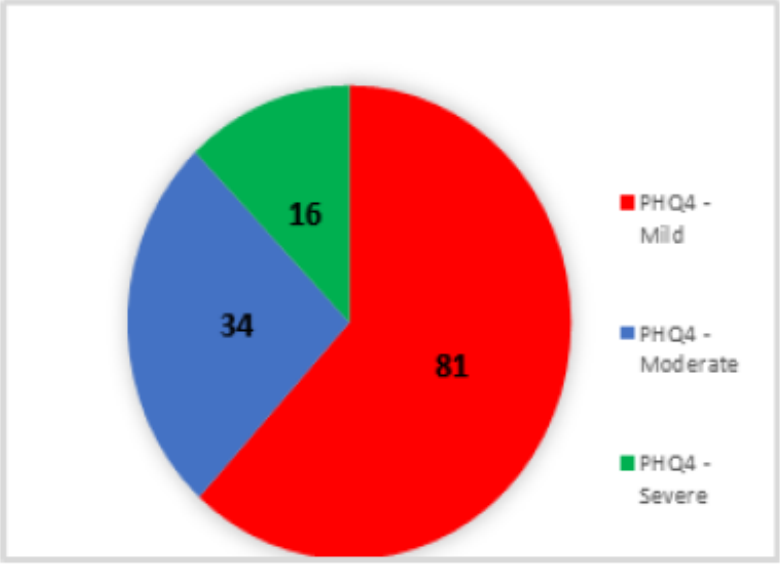

Figure 11. PHQ-4 Distribution

Table 8. PHQ-4 - Age & Gender Wise Distribution

Age Group	**18-25**						**26-35**						**36-45**					
Parameter	**Total**		**MALE**		**FEMALE**		**Total**		**Male**		**Female**		**Total**		**Male**		**Female**	
PHQ4 - Mild	13.53%	41	18	43.90%	23	56.10%	9.90%	30	23	76.67%	7	23.33%	3.30%	10	8	80.00%	2	20.00%
PHQ4 - Moderate	5.61%	17	6	35.29%	11	64.71%	3.30%	10	5	50.00%	5	50.00%	2.31%	7	4	57.14%	3	42.86%
PHQ4 - Severe	2.64%	8	1	12.50%	7	87.50%	1.98%	6	3	50.00%	3	50.00%	0.66%	2	2	100.00%	0	0.00%

Out of 131, 74 (56.5%) confirmed having either anxiety (13, 4.29%) or depression (20, 6.60%) or both (41, 13.53%). Overall, more females were found suffering with anxiety (M: F=6:7) and both (M: F=17:24) whereas depression was found more in males (13, 65%) than females (7, 35%). The most suffering group here [Table 9] too was 18-25 years (34, 51.5%) where, females dominated the males in total in the ratio of 12:22 (48% vs 53.7%). Again, number of males was higher than females in participants in the age group of 26-35 (M: F=15:12) and 36-45 (M: F=9:4) years as was in IAT and PHQ-4 analyses. Again, since no observation pertinent to anxiety and depression was observed in people >45 years hence, they are not the part of the analysis.

Table 9. Anxiety and Depression Distribution - Age & Gender Wise

	18-25						**26-35**						**36-45**					
Parameter	**Total**		**MALE**		**FEMALE**		**Total**		**Male**		**Female**		**Total**		**Male**		**Female**	
Anxiety	1.65%	5	1	20.00%	4	80.00%	1.98%	6	3	50.00%	3	50.00%	0.66%	2	2	100.00%	0	0.00%
Depression	2.31%	7	6	85.71%	1	14.29%	3.30%	10	6	60.00%	4	40.00%	0.99%	3	1	33.33%	2	66.67%
Both A and D	7.26%	22	5	22.73%	17	77.27%	3.63%	11	6	54.55%	5	45.45%	2.64%	8	6	75.00%	2	25.00%

Below table [Table 10] illustrates the relationship between the b-PHQ-4 and Anxiety and Depression.

Table 10. Correlation Between PHQ-4 and Anxiety & Depression

	Anxiety		**Both**		**Depression**		**Grand Total**
PHQ 4 Outcome	**Female**	**Male**	**Female**	**Male**	**Female**	**Male**	
Mild	5	5			4	10	24

	(20.8%)	(20.8%)			(16.7%)	(41.7%)	
Moderate	2 (5.9%)	1 (2.9%)	14 (41.2%)	11 (32.4%)	3 (8.8%)	3 (8.8%)	34
Severe			**10 (62.5%)**	**6 (37.5%)**			**16**
Grand Total	**7**	**6**	**24**	**17**	**7**	**13**	**74**

Relationship between Internet Addiction and Mental Problems

The following table [Table 11] illustrates unequivocally the relationship between internet addiction and mental problems. This is to note that the participants with medical history of mental problems were excluded from this analysis.

Table 11. Relationship between Internet Addiction and Anxiety/Depression

	Anxiety (A)		**Both (A & D)**			**Depression (D)**	**Grand Total**
IAT Outcome	**Female**	**Male**	**Prefer not to say**	**Female**	**Male**	**Male**	
Mild	1 (6.3%)	2 (12.5%)	1 (6.3%)	4 (25%)	3 (18.8%)	5 (31.3%)	16
Moderate	1 (7.1%)	2 (14.3%)		2 (14.3%)	6 (42.9%)	3 (21.4%)	14
Severe				3 (75%)	1 (25%)		4
Grand Total	**2**	**4**	**1**	**9**	**10**	**8**	**34**

57.14% of the seven severely addicted individuals had both anxiety and depression. In the age group of 18-25 years, only female participants had both anxiety and depression, and were severely addicted to the internet too. Overall, number of males were higher in all addicted and affected age groups i.e., 18-25, 26-35 and 36-45 years. The following table [Table 12] where, A=Anxiety and D=Depression, is a group of small tables illustrating the age and gender wise distribution of the population.

Table 12. Relationship b/w Internet Addiction and Anxiety and disorder-Age wise Distribution

18-25 Years							**26-35 Years**							**36-45 Years**				
Gender	**Female**	**Male**			**Total**		**Female**			**Male**			**Total**	**Female**		**Male**		**Total**
IAT Outcome	**Both**	**A**	**Both**	**D**			**A**	**Both**	**D**	**A**	**Both**	**D**		**Both**	**D**	**A**	**Both**	

Mild	4		1	2	7		1		1	2		1	5		2	1	1		4
Moderate	1	1	3	1	6		1	1			1	2	5				1	2	3
Severe	2				2			1			1		2						
Grand Total	**7**	**1**	**4**	**3**	**15**		**2**	**2**	**1**	**2**	**2**	**3**	**12**		**2**	**1**	**2**	**2**	**7**

Discussion

Overall, 32.7% of Indian adults were found to be internet addicted. The average number of years these individuals were using the internet was 15.5 years. More people addicted to the internet belonged to the age group of 26-35 (43, 14.2%) followed by 18-25 years where 31 (10.2%) participants were found addicted. However, 71.4% of severely addicted participants belonged to the 26-35 years age group. Males were highly addicted (57.1% vs 42.9%) and were highly prone (71.9% vs 28.1%) to the internet addiction too, compared to female participants. Per literature review, the range of internet addiction in Indian adult population was 1.3% [22] while globally it was 6% [21]. Result from this data is also around the stated Indian percentage i.e., 1.7% severely addicted individual though the above figures don't state the severity mapping of the internet addiction. Other studies done in few sates in India did provide some high-level range of mild and moderately (internet) addicted population i.e., mildly addicted population ranged from 24% to 35% while approximately 7-24% of the Indian population were found moderately addicted to the internet [23, 24, 46]. The data gathered for this thesis also supports this range where 20.8% of the participants were mildly addicted to the internet whereas 10.2% were confirmed addicted to the internet moderately.

Of 103 internet addicted individuals, 38 (36.8% and 12.5% of 303) confirmed affected with anxiety and/or depression. Removing the 4 with medical history of mental problems, 34 (11.2%) individuals are both addicted to the internet and presented the symptoms of anxiety and/or depression as well. 64.7% of these were males (22), 50% more than the females (11). One individual didn't reveal the gender. This being a very small number, not included in the calculation, did not affect the outcome. 75% of total severely addicted participants were females (3) and they had both anxiety and depression. Two of these girls belonged to the age group of 26-35 years while one to 18-25 years. Similarly, 1 male with severe internet addiction had both anxiety and depression and was of 28 years. So, in 'severely' addicted category, 26-35 years and females were dominant. While in both moderately and mildly addicted categories, males (78.6% in moderate and 62.5% in mild) were higher in number than females and with people in the age group of 18-25 (6/14 in moderate and 8/16 in mild) years dominating over other groups. Surprisingly, the 36-45 years age group had the second largest number of participants (6) in the mildly addicted category.

It was established that the mental problem is directly proportional to the internet addiction i.e., 80% of the severely addicted individuals had anxiety and/or depression followed by 45.2% of moderately addicted participants presented symptoms of mental problems. This proves the prevalence of anxiety and/or depression in people with internet addiction [28, 29, 32, 47, 48]. Males have been highly prone to both addiction and mental problems.

Almost all these participants were devoid of any other illness or addicted to any prohibited drugs or narcotics. 17% were students (all single) while others were either working or both working and studying. 42.8% of non-

student participants were married and were in private jobs which could be a confounding factor as these people may use the internet for more duration than expected because of work too. Overall, these factors don't seem to affect or contribute to internet addiction and/or mental problems, however, this can't be totally ruled out.

Next Steps

Large scale epidemiological research is needed with robust criteria to rule out confounding factors. This should include people from all ages, background, economic and social strata. The data gathering via interviews, face to face interactions and where necessary remotely should be done. The collected must be reviewed and cleaned to make it close to perfect before final analyses and conclusion. There's a need to have studies conducted at smaller levels like schools, regions, talukas, or states at a regular interval like every two or three years and this data should be shared with an autonomous facility to perform statistical analysis and share the outcome followed by required measures to curb or alleviate the consequences of internet addiction.

The research should be focussed on all possible pathological manifestations caused by internet addiction. Clinicians, psychologists, psychiatrists, or mental counsellors should be encouraged to participate in large number. Data collection from such experts is significant as this could pave the way for next course of treatment/therapy varying based on multiple categories.

Conclusion

Internet Addiction is REAL, and its prevalence has been proved by the metrics provided. Adult males are highly prone to this addiction and associated mental problems. The data suggests that the young and middle-aged Indian adults are at higher risk to the internet addiction and anxiety and/or depression. More (non-productive or not required) time devoted to the internet is directly proportional to the internet addiction which in turn commensurate with the Anxiety and Depression. Such signs and symptoms should be diagnosed early and appropriate advice from mental experts is encouraged. Knowing internet addiction is a silent but psychopathological; seminars, public discussions, educational forums should be established to help the younger generation and younger practitioners too to help the society.

Conflict of Interest

There is not conflict of interest.

Acknowledgement

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Adaptive Study Design Methodology vs. Standard Randomized Clinical Trial in Different Therapeutic Area: A Review

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Abstract

The aim of this review is to explore the learning outcome and understanding how the adaptive study design helps in current scenario of drug development in various therapeutic areas compared to traditional randomized clinical trials with respect to Dose Finding, identification of Maximum tolerated dose (MTD), fewer subjects, short duration, increases success rate of study objective, yields better knowledge of treatment effect like better estimates of sub-group effects or dose-response relationship. One of the major advantage of this study design is that potential changes are approved prior hand by regulatory authorities and ethics committee, hence there is no need to submit the protocol amendment and also logistics for the change in treatment is also planned upfront and researchers are given full flexibility to respond towards unexpected events and there are several options proposed upfront to introduce any new doses, amend endpoints. The conclusion is that the use of Adaptive designs appears to be increasing in certain diseases and in some of the diseases it is still underutilised. FDA and other regulators, researchers are still exploring how and the extent to which they may be incorporated into the evaluation of experimental therapies bearing in mind that focus will be mainly in feasibility, validity, flexibility, integrity and efficiency. As the new regulatory guideline are already established, future investigations of adaptive designs could examine ongoing dynamics in trials and based on this project, there are some suggestions to be given to the researchers to include the adaptive design or methodology to be indicated in the study title which certainly helps to retrieve the data easily.

Keywords*: Adaptive Design, Adaptive Dose- Finding, Randomized Clinical Trial, Standard Clinical Trials.*

Introduction

Drug Development Cost has substantially increased in the past few decades however this has neither not translated to increase in the number of approved drugs nor in the greater success rates in clinical trials. Clinical trials have typically been conducted in three steps. [1]: The trial is planned; it is carried out in accordance with the plan; Once the data is prepared, it is evaluated in accordance with a predetermined analysis plan. This procedure is simple, but it is obviously rigid because it does not allow for adjustments that could be wanted or required over the course of the trial. An option is provided by adaptive designs (ADs). Assumption-busting strategies have been referred to as "planning to be flexible" [2], "driving with one's eyes open" [3], or "taking out insurance" [4]. According to the BioMed Tracker, upon review of the results from 4,275 clinical trials during the period of 2003 to 2010, the overall success rate for trial drug approval or intervention was only 9% (3).There are many factors influencing in the low success rate, among which increasing complexity of bringing potential experimental therapiesto trial is one of the important factor. A novel approach

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to overcome this challenge is accomplished by modifying trial design features during the trial which is termed Adaptive study design. The decision will be made by the researchers based on the data collected throughout the trial.

The defining characteristic of all ADs is that results from interim data analyses are used to modify the ongoing trial, without undermining its integrity or validity [5]. Preserving integrity and validity is crucial. In an AD, data are repeatedly examined. Thus, we need to make sure they are collected, analysed and stored correctly and in accordance with good clinical practice at every stage. Integrity means ensuring that trial data and processes have not been compromised, e.g. minimising information leakage at the interim analyses [6]. Validity implies there is an assurance that the trial answers the original research questions appropriately, e.g. by using methods that provide accurate estimates of treatment effects [7].

Adaptive study design unlike traditional designs, is proposed to be more flexible and accumulate data to alter the ongoing research trials without undermining the integrity and validity of the trial whereas the traditional designs does not permit modifications during the course of enrolment and follow-up phase, and where the efficacy and safety are understood only after the trial is completed [8]. This results in enhancing clinical research by cutting on the time and the cost factor which is most warranted in conducting clinical trials for a pharmaceutical development. Also to be noted that both the traditional and adaptive trial designs have important differences, like the differences in the planning and conduct of these studies, so too are the reasons and interpretation of bias[9]. Major Regulatory agencies such as US FDA began encouraging the use of adaptive design methods and also European Medicines Agency (EMA) have identified the validity of adaptive trial designs and provided guidance on how researchers and Pharmaceuticals should consider their regulatory considerations during the presubmission (i.e., planning/learning phase) and confirmatory phases[10]. This study design is defined as ‘planning to be flexible’ ‘driving with one’s eyes open’ or ‘taking out insurance’against assumptions.

A recent review of trials registered on ClinicalTrials.gov showed a large increase in thenumber of adaptive design trials completed since 2006: there were only 10 registered adaptivetrials before 2006, but 133 registered from 2006 to 2013 however as per the basic data search through publications, there are no data published yet on the adaptive study designs in recent years. Hence, this literature review is prepared by organizing adaptive trials data after 2013 for which data posted in Clinical Trials.gov is utilised. The list of the Randomizedclinical trials conducted from year 2013-2018 in which analysis of the number of adaptive trialsincluding drug and device in all the phases of clinical trials in different indications were studied.

Methodology

A comprehensive Feasibility study was conducted to choose the appropriate literature search engine to extract the data on the list of adaptive study design conducted between year 2013 – 2019. The list of sources included in the literature search are PubMed, Cochrane search, Clinical Study Data request website and Clinical Trials.gov.

Table 1. Types of Adaptive Designs and its Definitions. Source: PubMed (nih.gov)

Type of adaptive design	**Definition**
Adaptive dose-finding	These clinical trials usually occur in early-phase research for dose identification in future studies. These studies allocate patients to multiple different treatment doses and patient responses are assessed at interim analyses. Trial design is thenadapted to allocate more patients to the treatment doses of interest, reducing allocation of patients to doses that appear non-informative.
Adaptive randomization	A study design in which accumulating results are observed and the randomization scheme is adjusted so that patients enrolled later in the trial have a higher probability of being randomised to the treatment arm that was more effective among earlier patients in the trial.
Seamless Phase II/III	A study design that combines the objectives of the Phase II investigational stage with the Phase III efficacy or confirmatory stage into a single study protocol moving from one stage to the second stage without stopping the patient enrolment process.
Biomarker adaptive	This method allows adaptations to trial design based on interim analysis of the treatment responses of biomarkers, such as genomicmarkers. This design can be used to select patient populations for subsequent trials, identify the natural course of a disease, achieve early detection of a disease and/or help in developing personalized medicine.
Sample size re-estimation	A study design using a flexible sample size adjustment or re-estimation based on interim analysis of accumulating data.
Multiple adaptive	This refers to a trial that incorporates multiple adaptive designs into a single study.

Adaptive treatment-switching	A study design allowing the investigator to switch a patient's treatment from an initial assignment to an alternative treatment dueto apparent lack of efficacy, disease progression or safety issues associated with the initial treatment.

Table 1 describes the phrases derived from the common forms of adaptive study designs: Adaptive dose-finding, adaptive randomization, adaptive treatment switching, Biomarker adaptive, adaptive seamless, sample size re-estimation and Multiple Adaptive.

The results informed the choice of databases for the main review was restricted to ClinicalTrials.gov database where it was found that search criteria were user friendly, better flexibility, improved filtering records, data completeness and searching options[11]. Even unpublished data was able to retrieve based on the therapeutic area with the crux of the information. The search was restricted to dates between 01/01/2013 and 31/12/2018.

Strategy Used for Data Sources and Search

Adaptive design related search in terms of Indications and different phases was an iterative process with the chosen terms from the feasibility study on the sources such as Clinical study Data request.com, Cochrane, PubMed search engines and scoping exercise using Clinical Trials.gov. The search terms were applied to trials meeting the inclusion criteria using the Boolean OR operator. There are certain limitations due to time constraints to perform the quality check by the second reviewer.

Eligibility Criteria

The below are the eligibility list taken for the review:

1. Interventional Clinical Trials including Device Trials
2. Early Phase, Phase II, III & Phase IV
3. Therapeutic Indication
4. Time Period Between 01/01/2013 to 31/12/2018
5. Trial documents posted in English in Clinical Trials.gov

Data Synthesis and Analysis

The following information was collected from the included trials and recorded on an Excelspreadsheet:

1. List of Interventional Clinical Trials conducted during 2013- 2018 as per the ClinicalTrial Registry
2. Number of Adaptive trials among those clinical trials during 2013-2018 as per the Clinical Trial Registry.
3. Number of standard trials in leading Therapeutic area during 2013-2018
4. Number of Adaptive trials in leading Therapeutic area during 2013-2018
5. List of Interventional standard Early Phase, Phase II, Phase III and Phase IV studiesduring 2013-2018
6. List of Adaptive Early Phase, Phase II, Phase III and Phase IV studies during 2013-2018

Main Outcome Measures

1. Number of Adaptive Clinical trials Vs Standard Clinical Trials in Leading TherapeuticArea
2. Number of Adaptive Clinical Trials in Early Phase and Phase II – I

Results and Discussion

Interventional Clinical Trials including drug and device clinical trials from Phase I – IV conducted only in Humans during the period of 2013-2018 were selected for literature review which aimed to understand the number of adaptive study methodology being used in

clinical trial phases and reported in various diseases. Among the systematic review, it was found that 1557 studies with adaptive designs were used during the above indicated period and for this project, sample size of 18 disease condition were selected based on the disease prevalence criteria and its impact in the pharmaceutical development. Based on the analysis, it is identified that 1012 adaptive clinical trial designs were used during the clinical trial implementation.

Table 2. Results on the Comparison of Standard Randomized Clinical Trials VsAdaptive Study Designs. Substantial Variability has been Observed in the Posted Trial Designs and Especially in the Terminology Described in the Title of the Clinical Trial. Source: Clinical Trials.gov

Indication	**Number of Standard Randomized**	**Adaptive study designs**
Endocrine System Diseases	9012	64
Eye Diseases	3930	28
Arthritis	3276	21
Carcinoma	7991	61
Depression (Includes Depressive Disorders and	2855	80
Digestive System Diseases (Includes Gastrointestinal	13298	77
Epilepsy (Includes Epileptics)	593	19
Heart Disease *(Includes Cardiac, Coronary, and*	8373	69
Hypertension	3120	27
Immune system diseases	11240	126
Kidney Diseases	3760	29
Liver Diseases	4088	35
Lung Diseases *(Includes Pulmonary Diseases)*	8204	61
Lymphoma	2504	16
Respiratory Tract diseases	11664	86
Skin Diseases	7549	35
Urologic disease	5265	39
Vascular Diseases Including Disorders	12356	86
Virus Diseases	4740	53

From the review, Table 2 elaborates that researchers/Pharmaceutical sponsor used adaptive designs prominently in Immune system diseases with the number of trials conducted 126, following which the Respiratory and vascular diseases with the number of registered trials of 86 which is also schematically represented in Figure 2.

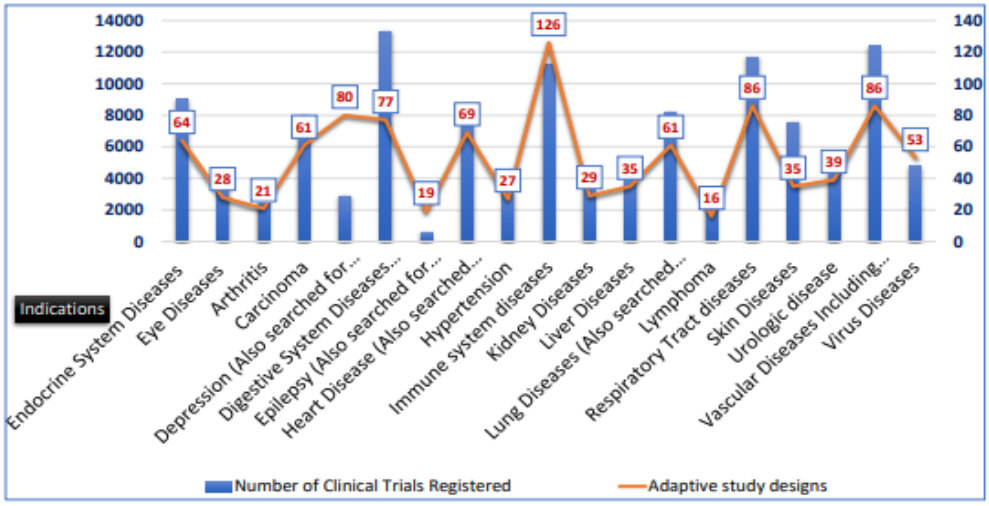

Figure 1. Number of Adaptive Study Designs from the Standard Randomized Clinical Trials in the Selected Disease Condition. Source: PubMed (nih.gov)

Table 3 summarizes the list of adaptive study designs extracted from the selected disease condition listed in the below table and upon analysis,the types of adaptive designs used in each trial were listed. The trials were selected to understand the different types of adaptive study design employed , its significance and the brief description are tabulated.

Table 3. Types of Adaptive Study Design, Description & its Significance. Source: Clinical Trials.gov

CLINICAL TRIALS.GOV IDENTIFIER	THERAPEUTIC AREA	TITLE	DESCRIPTION	TYPES OF ADAPTIVE DESIGNS
NCT00674635	Immune System Diseases	Phase II Study Evaluating the Safety and Efficacy of GSK315234A in Patients With Rheumatoid Arthritis	This is a randomized, double-blinded, placebocontrolled adaptive, dose finding study to investigate the safety, tolerability, PK, PD and efficacy of single and repeat intravenous infusions of GSK315243A in patients with active rheumatoid arthritis. The study	ADAPTIVE DOSE FINDING STUDY

			is divided into 2 parts: Part A is an adaptive, dose finding phase which will provide safety, tolerability, PK and PD on single intravenous infusions. Part B is a repeat dose phase which will provide safety, tolerability, PK, PD and efficacy following repeat intravenous infusions of a selected dose level.	
NCT01555710	Small Cell Lung Cancer	Study of Palifosfamide-tris in Combination With Carboplatin and Etoposide in Chemotherapy Naïve Patients With ExtensiveStage Small Cell Lung Cancer (The MATISSE Study	This is a multinational, multicenter, randomized controlled, open-label, adaptive study to evaluate the efficacy of PaCE chemotherapy in chemotherapy naive subjects with extensive-stage SCLC. Eligible subjects will be stratified according to age, gender, and Eastern Cooperative Oncology Group (ECOG) performance status, and randomized in a 1:1 ratio to receive either PaCE or CE chemotherapy. The study design uses	ADAPTIVE GROUP SEQUENTIAL APPROACH

			an adaptive group sequential approach with sample size re-estimation at the interim analysis	
NCT00502775	Immune System Diseases	An Adaptive Phase II Study to Evaluate the Efficacy, Pharmacodynamics, Safety and Tolerability of GSK2586184	This is an adaptive, dose ranging, Phase II study to investigate the relationship between repeat doses of GSK2586184 and the pharmacodynamic effect and clinical efficacy in patients with active systemic lupus erythematosus (SLE). This study will also investigate the safety and tolerability of repeat doses of GSK2586184	ADAPTIVE DOSE RANGING
NCT03447990	Heart Diseases	Study Evaluating the Safety, Tolerability and Preliminary Pharmacokinetics and Pharmacodynamics of MYK-491	This is a a two part study. The first part is a randomized, crossover, double-blind, placebo-controlled, two cohort, sequential ascending single dose study. All patients will receive placebo and active doses of MYK491.The second part is a randomized, parallel,	ADAPTIVE RANDOMIZATION

			doubleblind, placebo-controlled, sequential ascending multiple dose study. All patients will receive placebo and/or active doses of MYK-491.	
NCT02898662	Lung Diseases	A Phase 2 PlaceboControlled, Randomized, Double Blind, Adaptive Dose Trial of the Safety and Efficacy of Inhaled AZD1419 in Adults With Eosinophilic, Moderate to Severe Asthma	The study has a withdrawal design.The patients will receive 13 once weekly inhaled doses of the study drug (AZD1419 or placebo). Treatment is initiated with 6 doses of the study drug on top of their ICS/LABA controller medication. Prior to the 7th dose of the study drug the LABA is withdrawn. The following 3 doses are given when ICS is tapered down. Dose 7 is given on top of 100% of their ICS, dose 8 is given on top of 50% of the ICS dose, which is then tapered down to 25% the following week and withdrawn completely prior to dose 10 of the study drug. During	ADAPTIVE DOSE DESIGN

			the last 3 weeks of treatment (ie last 4 doses), the study drug is given as monotherapy. SABA is used as reliever medication during the whole study period. Primary endpoint is Loss of asthma control, defined as any of the following criteria: a) An increase of ACQ-5 to 1.5 or more b) A reduction of 30% or more in morning peak expiratory flow (PEF) from baseline on 2 consecutive days c) At least six additional reliever inhalations of SABA in a 24-hour period relative to baseline on 2 consecutive days and d) An exacerbation requiring systemic corticosteroids. When the endpoint is met, patients will resume their regular ICS/LABA controller medication and will be followed for an additional 4 weeks, when they do an Early Discontinuation (ED) Visit and will	

			thereafter leave the study. For patients not loosing their asthma control, the full Observational period is up to week 52, when they will do an End of Treatment Visit (EOT). Study procedures are the same on ED and EOT Visits.	
NCT00976560	DEPRESSION	A Six Week Randomized, Double-blind, Multi-center, Placebo-controlled, Exploratory, Adaptive Design Study to Explore the Antidepressant Properties of the p38 MAP Kinase Inhibitor GW856553 Compared to Placebo in Adult Subjects With Major Depressive Disorder	In this randomized, double-blind, multi-centre, placebo controlled, exploratory, adaptive design study, the antidepressant and plasma cytokine lowering effects of the GW856553 will be investigated in adult subjects diagnosed with MDD. Subjects will receive oral doses of GW856553 or placebo for six weeks. Safety tolerability, pharmacokinetics and pharmacodynamics, defined as biomarkers in blood and clinical symptoms, will be assessed. The primary endpoint is the change from baseline associated	ADAPTIVE SAMPLE SIZE REESTIMATION

			with GW856553 versus placebo at Week 6 in the Bech (6-item HAMD-17) score. Interim analyses of the primary endpoint will be performed throughout the study to potentially adapt the study design by changing the randomization ratio and/ or reducing the total number of subjects to be randomized into the study. Exploratory analyses will be performed by associating changes in cytokine levels and selected clinical symptoms; PK/PD modelling will also be used to identify the most sensitive clinical and biological markers.	

It is evident from the review of Clinical Trials.gov that adaptive methodology design predominantly used in phase II trial after the interim analysis as presented in Table 4. After the phase I trial, a phase II trial which is conducted to evaluate the investigational drugs' therapeutic effects at the recommended dose. The outcome in terms of the efficacy in Phase II trials are often short term[12]. When a new drug or device showspromising efficacy, a Phase III trial will be conducted with a longer term as a confirmatory assessment. Sequential design in contrast to the one stage study design uses the accumulated data to perform an interim analysis from which the results are taken into consideration to adaptively change the study plan. Detailed comparison on the number of clinical trials for each phases represented graphically in Figure 2.

Table 4. Adaptive Study Designs in Different Clinical Trial Phases. Source: Clinical Trials.gov

Clinical Trial Phases	Total Number of clinical trials	Adaptive trials
Early Phase 1	19759	198
Phase 2	23412	291
Phase 3	12591	91
Phase 4	10498	42

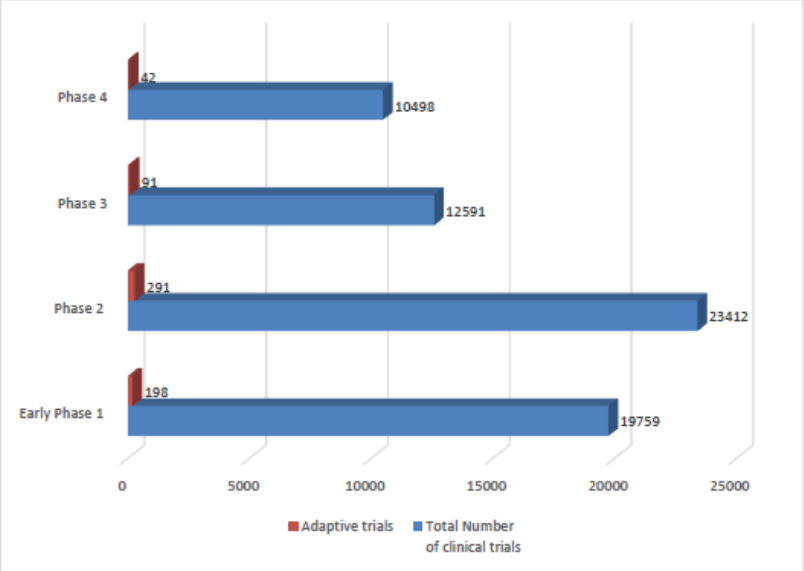

Figure 2. Number of Adaptive Trials in Different Phase of the Clinical Trials Conducted During 03-2018. Source: Clinical Trials.gov

Limitations

The limitations for this project as the main data source Clinical Trials. gov posed some issues in terms of the methodology used in the adaptive trials which could not be retrieved, and methods were redundant in register. Adding to this, since all the registered clinical trials up to were included for analysis to understand the current trends, studies without the final results, unpublished studies were also taken for review and also the device studies not classified under Phase studies[13]. Given the limitations, results are not void as the objectives of this project is to investigate the types of Adaptive Design trials being undertaken in differentphases of clinical trials in the sampled therapeutic area within a specified duration.

Conclusions

A general overview of the current trends of Adaptive design implementation in the clinical trials were discussed and list of studies from each adaptive type were listed with the brief description. Due to the limitations in the inability to extract the study results for all trials fromClinical Trials.gov using the search terms, extensive review of each adaptive trial designs couldnot be analysed. The conclusion is that the use of Adaptive designs appears to be increasing incertain diseases and in some of the diseases it is still underutilized. FDA and other regulators,researchers are still exploring how and the extent to which they may be incorporated into the evaluation of experimental therapies bearing in mind that focus will be mainly in feasibility, validity, flexibility, integrity and efficiency. As the new regulatory guideline are already established, future investigations of adaptive designs could examine ongoing dynamics in trialsand based on this project, there are some suggestions to be given to the researchers to include the adaptive design or methodology to be indicated in the study title which certainly helps to retrieve the data easily.

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Technology Adoption by Rural Women: A Unified Theory of Acceptance and Use of Technology (UTAUT2) Analysis

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Abstract

This article analyses the factors that affect the adoption of technology by rural women in the Umguza district of Zimbabwe. The Unified Theory of Acceptance and Use of Technology 2 (UTAUT2) model, provides the theoretical framework for understanding the factors that influence rural women's adoption of technology. By situating the investigation within the UTAUT2 framework, the study seeks to offer a more refined understanding of the determinants affecting technology adoption among rural women and the implications for inclusivity. A deductive approach was used, and information was collected through a survey of 250 rural women in the 19 wards of Umguza district, as well as reviewing secondary data in the form of government, non-governmental, industry reports and scholarly articles. Regression analysis was used to draw insights into the factors influencing the adoption of technology by rural women. The study concluded that Performance Expectancy (PE), Facilitating conditions (FC), Social Influence (SI) and Effort Expectancy (EE) influence technology adoption by rural women in Zimbabwe. However, Hedonic Motivation (HM), Price Value (PV) and Habit (HT) were found not to influence the decision to adopt the technology. The results of this study help to shed light on the factors affecting technology adoption among rural women and map strategies to promote technology adoption. The recommendations from this study can provide insights to government, private sector, and civil society seeking to promote the adoption of technology by rural women and contribute to the body of research on digitalisation and adoption of technology by rural women.

Keywords: *Constructs, Digitalisation, Rural Women, Technology Adoption, Utaut2.*

Introduction

The advent of digitalisation has seen many countries adopting digital technologies to drive economic growth and has changed the way people interact, communicate, learn and work [1]. The digital economy in sub–Saharan Africa has been growing with over 160 million people accessing broadband services between 2019 and 2022, a 115% increase in internet users was experienced between 2016 and 2022 and over 191 million additional people have made or received a digital payment between 2014 and 2021 [2]. The number of active mobile phone subscriptions in Sub-Saharan Africa reached 415 million in 2022 and is expected to reach 689 million by 2028 [3]. This increasing access to mobile phones and the internet has the potential to unleash great opportunities for rural women when the adoption of technology is fully realised. Zimbabwe, among other African countries, has been experiencing a rapid adoption of digital technologies. According to the Postal and Telecommunications Regulatory Authority of Zimbabwe (POTRAZ), the number of active mobile subscriptions by the end of December 2023 stood at 14,973,816, representing a 97.7% mobile penetration rate and the internet penetration rate at 73.3% [4]. This extensive reach of mobile phones has the potential to present wide opportunities for rural women in the country. In 2013, the AU (African

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Union) initiated and launched the SMART Africa initiative, which aimed to achieve socio-economic development through ICTs (Information and Communications Technology) [5]. To ably implement this requires that there be ubiquitous access to ICT.

Studies conducted show that women are 50 per cent less likely to use ICT tools than men, thereby creating a gap, which is referred to as the digital gender divide[6]. In order to close this gap, it is critical to understand the factors that drive or deter rural women from adopting digital technology. The unified Theory of Acceptance and Use of Technology 2 (UTAUT2) model provides a framework for understanding and exploring variables relevant to technology adoption for this study. The UTAUT2 extends the original framework which included performance expectancy, effort expectancy, social influence and facilitating conditions to add three more constructs namely, hedonic motivation, price value and habit [7]. In bridging the gap between the theory around technology adoption and the actual experiences of rural women, the study seeks to recommend pathways through which technology can be an enabler of empowerment and socio-economic development for rural women. The adoption rates and patterns among rural populations, especially among women, remain understudied and poorly understood. This study aims to bridge this knowledge gap by examining the factors influencing technology adoption by rural women in Zimbabwe, employing the Unified Theory of Acceptance and Use of Technology 2 (UTAUT2) as the theoretical framework. The correlation between ICTs and gender inequality is a relatively new phenomenon in Zimbabwe, with only a few studies undertaken in this regard [8]. This highlights a research gap and the need for further exploration of how ICT adoption and usage may impact gender equality. Understanding the specific dynamics of ICT adoption among different gender groups and its implications for gender inequality in Zimbabwe is crucial for promoting inclusive and equitable development.

Literature Review

The digital divide is a form of discrimination and is defined as an inequality in the power to communicate and process information digitally [9]. Technology plays a significant role in socioeconomic development, offering opportunities for education, health, agriculture, and business advancements [10]. For rural women, who often face societal and economic barriers, technology can provide pathways to empowerment, improved livelihoods, and greater inclusivity in the digital world [11, 12]. The significance of understanding technology adoption among rural women in Zimbabwe cannot be overstated. Rural women play a pivotal role in the socio-economic fabric of Zimbabwe, often being at the forefront of agriculture, education, and family welfare initiatives [13]. However, barriers such as limited access to technological infrastructure, low literacy levels, and socio-cultural constraints significantly hinder their ability to leverage technological advancements [14]. Researchers advocate for the adaptation and application of established technology adoption models like UTAUT2 in diverse contexts to broaden their empirical support and enhance their practical relevance [15].

The benefits brought about by technology adoption are shown to be far-reaching as this can help address barriers such as limited access to markets, financial services, and information. Adoption of digital technologies has the potential to bridge the gender gap, create new economic opportunities, and empower women in various aspects of their lives [16]. Opportunities resulting from the adoption of digital technologies include efficient use of mobile banking services, which enable rural women to access savings, credit, and insurance facilities, which are essential for entrepreneurial activities and income generation [17]. The benefits of adopting technologies include more business

opportunities, higher productivity and greater social connectedness. Adopting digital technologies enables rural women to participate in decision-making processes, hence the importance of adopting technologies has far-reaching tangible and intangible benefits [11]. Rural women have experienced improved access to markets, agricultural productivity and new avenues for employment resulting from adopting digital technologies. Mobile phones and digital platforms have created new avenues for income generation, provided access to market information, and facilitated financial transactions for rural women [18].

Technology adoption encourages networking and collaboration among rural women, promoting knowledge sharing, collaboration, and mutual support in their daily livelihood [19]. Additionally, it can result in cost savings, increasing the affordability and sustainability of entrepreneurship. The adoption of digital technologies empowers rural women to function efficiently in various aspects of life. Government policies and initiatives that support infrastructure development, subsidize the cost of technology, and promote digital literacy are critical [20]. Education and training programs that focus on building digital literacy are paramount [21]. Such efforts not only equip individuals with the necessary skills to use technology but also demystify technology and mitigate socio-cultural anxieties associated with its adoption.

Moreover, the customisation of technology to meet local needs and contexts significantly enhances its adoption. This includes the development of applications and services in local languages and the design of technology that is relevant and useful to the local populace, ensuring it addresses specific challenges or enhances aspects of life [22].

One of the most widely recognised barriers to technology adoption in developing countries is the issue of accessibility. This includes both the availability of technological infrastructure and the affordability of technology for the average citizen [20]. In many rural areas, the lack of reliable internet connectivity and electricity significantly hampers the adoption and effective use of technology. Additionally, the digital literacy rate poses a significant challenge. A considerable proportion of the population in developing countries lacks the necessary skills to leverage digital technologies effectively, arising from inadequate education and training opportunities [23]. The complexity of some technologies, coupled with language barriers—where technology interfaces are not available in the local language—further exacerbates this issue. Socio-cultural factors also play a critical role in influencing technology adoption. Traditional beliefs and values can affect perceptions of technology, sometimes viewing it with suspicion or as irrelevant to local needs and contexts. Moreover, gender roles and inequalities often result in women having less access to technology than men, limiting their opportunities for socioeconomic empowerment [11].

In conclusion, the literature review highlights the importance of inclusive digital transformation strategies that address rural women's needs and limit barriers for women and society to maximise the benefits of digitalisation. The case of Umguza women provides valuable insights into how the economic empowerment of rural Zimbabwean women requires the rollout of digital infrastructure and the creation of programs to improve digital literacy, affordable solutions for services like the internet, and a participatory design of digital solutions.

Theoretical Basis and Research Hypothesis

The UTAUT2 model is an extension of the 2003 UTAUT model by Venkatesh, Morris, Davis and Davis. It consolidates elements from eight models which were previously used to explain technology adoption which include the Theory of reasoned Action, the Technology Acceptance Model (TAM), the Motivation model, the Theory of Planned Behaviour (TPB), a combined Theory of Planned Behaviour/Technology Acceptance Model, the

Model of PC Utilisation, the Innovation diffusion Theory and the Social Cognitive Theory. The UTAUT2 model therefore presents a robust theoretical framework for investigating why rural women adopt or shun technology because it extends the assessment of technology adoption beyond merely analysing utility and ease of use [24]. The core constructs of the model namely performance expectancy (PE), Effort Expectancy (EE), Social Influence (SI), and Facilitating Condition (FC) are critical as they encompass critical predictors of technology adoption and use. Several significant issues come to the forefront, and these include questioning the benefits, relevance, and effectiveness of digital technology for rural women, examining the accessibility of resources, understanding the role of communities and support networks, and addressing the responsibility of stakeholders in tackling digital infrastructure gaps [18]. This enhanced model also integrates three additional elements which are Hedonic Motivation (HM), Prive value (PV), and Habit (HT). These are very critical to rural women whose adoption may hinge on perceived enjoyment (HM), the economic assessment of technology compared to its benefits (PV) and the degree to which the use of technology becomes automatic and a key part of their daily routines of the technology [25]. Table 1 below summarises the definitions of the seven key constructs in respect of rural women's technology adoption.

Table 1. Definitions of UTAUT2 Constructs

Construct	**Definition**
Performance Expectancy (PE)	The degree to which rural women believe that using technology helps them improve productivity and performance
Effort Expectancy (EE)	Ease of use of the technology as perceived by rural women
Social Influence (SI)	The impact of social factors on the rural woman's decision to adopt technology i.e. influence of peers, family, and social networks
Facilitating Conditions (FC)	The degree to which rural women believe that technical infrastructure, technical support and training exist to support technology adoption
Hedonic Motivation (HM)	The degree of fun or pleasure from using technology
Price Value (PV)	The trade-off between perceived benefits and monetary cost of using the technology

Habit (HT)	The extent to which rural women automatically use technology in response to cues in their environment

The study developed and tested the following Hypothesis:

H1. PE influences technology adoption by rural women.

H2. EE influences technology adoption by rural women.

H3. SI influences technology adoption by rural women.

H4. FC influences technology adoption by rural women.

H5. HM influences technology adoption by rural women.

H6. PV influences technology adoption by rural women.

H7. HT influences technology adoption by rural women.

Materials and Methods

The study utilised a quantitative approach, employing a survey method to analyse the adoption of technology by rural women. Data collection involved a survey conducted by administering questionnaires, with close-ended questions, to 250 Umguza women in all 19 wards in the district. Using recommendations from prior studies on sample size, a ratio of 1:10 was used for each set of factors to be analysed [26]. The questionnaire had a total of 24 items yielding 240 respondents, hence 250 questionnaires were distributed A stratified random sampling technique was applied to select participants, ensuring a representation across different wards within the Umguza District.

The project methodology involved a literature review of various articles, guided by the UTAUT2 framework which provided insights into the performance expectations of rural women regarding digital technologies. Primary and secondary data sources were used in data collection. Statistical analysis techniques were used on the quantitative survey data and informed the interpretation and conclusions of the results about the analysis of technology adoption by rural women. Recommendations were made on how to promote the adoption of technology by rural women in Umguza guided by the study findings. The study findings play a great role in informing policymakers, organisations and individuals who deal with women empowerment and the rural women themselves on providing suitable strategies to promote technology adoption. The study also contributes to the existing body of research on technology adoption through digitalisation and how it impacts the livelihoods of rural women. The main channel for disseminating these findings will be academic publications, industry reports and presentations to various and relevant conferences, workshops and seminars.

Results

The analysis of data included classifying the responses following the UTAUT2 constructs. Then SPSS was used to generate descriptive statistics. Reliability testing and regression analysis were done to analyse and present the data from the responses. A total of 250 responses were obtained signifying a 100% response rate as snowball sampling was used where respondents referred the researcher to potential respondents who fit the criteria.

Demographic Characteristics of Respondents

The demographic characteristics of the 250 respondents are summarised in Table 2 below.

Table 2. Demographic Characteristics of Respondents

Variable		**No of respondents**	**% Contribution**
Age (yrs)	16-24	26	10.4
	25-30	59	23.6
	31-40	59	23.6
	41-50	44	17.6
	51-64	34	13.6
	65+	28	11.2
Education Level	None	54	21.6
	High school certificate	84	33.6
	Diploma	63	25.2
	Degree +	49	19.6
Occupation	Formal	61	24.4
	Informal	106	42.4
	Paid Agricultural work	42	16.8
	Unpaid Agricultural work	34	13.6
	Other	7	2.8

The questionnaire distribution was equitable across the relevant agent groups from 16 years of age. 16 years was set as the lower limit as it is the minimum age at which an individual can purchase a mobile network Subscriber Identification Module (SIM) card for connectivity purposes and register it in their name. The majority of the respondents, 47.2% were between the ages of 25 and 40 years of age. These are the age groups that are touted as being most economically active and have an interest in using technology to advance their income-generating activities. In terms of education, the highest number of respondents had high school certification. This is in line with the situation obtaining in most rural areas where a large proportion of females do not advance beyond high school education. Cultural norms normally

favour the education of the males over the females. 21% of the women did not have any formal education and these were mostly women found in the 51+ years groups. The bracket with the informally employed had the highest number of respondents. This is reflective of the overall picture in the macro environment. The women in this group have small businesses where they sell their wares from agricultural produce, second-hand clothes, foodstuffs, takeaways and other small enterprises. The formally employed consisted of those working as teachers, nurses, non-governmental organisations (NGO) workers and those in government departments.

Reliability Test

The reliability of the elements was estimated using Cronbach's coefficient values as shown in table 3. The Cronbach's alpha value of the constructs range between .881 to 0.941 indicating high internal consistency and reliability. A Cronbach's alpha value of 0.70 and above is acceptable for research purposes, as it means that the questionnaire is measuring the same underlying construct consistently [27].

Table 3. Reliability Analysis

Construct	**Number of items**	**Cronbach's Alpha**
Performance Expectancy (PE)	4	0.940
Effort Expectancy (EE)	4	0.910
Social Influence (SI)	4	0.895
Facilitating Conditions (FC)	4	0.881
Hedonic Motivation (HM)	3	0.961
Price Value (PV)	2	0.941
Price Value (PV)	3	0.922
Technology Adoption / behavioural Intention **(BI)**	3	0.941

Descriptive Statistics

Table 4 displays the means and standard deviations of the constructs and the dependent variable (BI), which is technology adoption.

The performance expectancy construct scored the highest average ($\bar{x}$ =3.850, σ=0.893) with respondents showing a level of agreement that the four variables (usefulness, helps accomplish tasks, increases productivity, increases chances of improving income) measured under this construct influenced their decision to use technology.

Facilitating conditions came second as an influencing construct to technology adoption ($\bar{x}$ =3.800, σ=1.196). This shows that rural women must have the resources they need to access technology, to know how to use technology, for the technology to be compatible with other systems they use and for there to be someone to assist them whenever they face challenges with the technology.

Social influence registered as third ($\bar{x}$ =3.678, σ=0.551). The items measured under this construct showed that it was important to the respondents for people who influence their behaviour to approve of their use of technology, for people who are important to them to approve their use of technology, for the people or resources assist them to learn the use of technology to be helpful and for there to be support systems as they embrace technology.

Effort expectancy was in the middle of the road in fourth place ($\bar{x}$ =3.654, σ=0.627) The four items measured included ease and understandability of technology, ease of skills acquisition, ease of use, and ease of operation.

The hedonic motivation construct was fifth ($\bar{x}$ =3.477, σ=1.030) and focused on whether using technology was fun, enjoyable and entertaining for rural women.

Price Value was the sixth construct ($\bar{x}$ =3.440, σ=0.778). The 2 items measured focused on whether technology provides good value for the money the respondents pay as a fee to access and whether technology provides good value.

The construct with the least averages was the habit construct ($\bar{x}$ =3.259, σ=1.141). The 3 items used to measure this construct focused on whether using technology was a habit for the rural women, whether they were used to using technology and whether it was a must for them to use technology.

Table 4. Descriptive Statistics for BI and the Seven Constructs

Construct	Mean	Standard Deviation	Position
BI	**3.690**	**0.540**	
PE	3.850	0.893	1
EE	3.654	0.627	4
SI	3.678	0.551	3
FC	3.800	1.196	2
HM	3.477	1.030	5
PV	3.440	0.788	6
HT	3.259	1.141	7

Regression Analysis: Influence of the Constructs on Technology Adoption and Intention to Use (BI)

Table 5 shows an R^2 of 0.787 which means that the predictors (PE, EE, SI, FC, HM, PV, HT) explain 78.7% of the independent variable (BI). The remaining 21.3% is explained by other factors not included in this study.

The ANOVA, Table 6 summarises the key components used to determine whether there are any statistically significant differences between the means of the independent groups. Table 6

shows the F value, with 7 and 242 degrees of freedom (df), is 58.19 with a probability of occurrence of <0.0001.

The critical value is a cut-off value, that defines the rejection regions. The value obtained from the F-table is 4.49418, hence the study concludes that there is a significant difference among the means. By extension, this means that the predictors can be used to explain the dependent variable.

Table 5. Model Summary

Model	**R**	**R^2**	**Adjusted R^2**	**Std. Error of the Estimate**
1	.887[a]	0.787	0.780	0.3879
Predictors: PE, EE, SI, FC, HM, PV, HT				

Table 6. ANOVA[a]

Model		**Sum of Squares**	**df**	**Mean Square**	**F**	**Sig.**
1	Regression	157.9912	7	22.5702	58.19	<0.0001
	Residual	113.2425	242	0.4679		
	Total	271.2432	249			
a.**Dependent Variable**: BI						
Predictors: PE, EE, SI, FC, HM, PV, HT						

Discussion and Recommendations

Table 7 showcases results from the inferential analysis which shows that PE, EE, FC and SI are supported and hence influence BI. However, SI, FC and PV are not supported and therefore do not influence BI with respect to Umguza rural women.

PE is critical in influencing technology adoption. In the study, it takes a pole position by ranking, of the factors rural women consider. Other studies have concurred with this result and suggest that when rural women experience and see tangible benefits, their intention to use technology increases [28]. From the study, Umguza women were lured to use technology by experiencing and observing increased agricultural yields by those using mobile agricultural applications for weather and disease control. Some women hinted at experiencing access to a wider market base through selling on WhatsApp business and Facebook marketplace.

However, when the performance of the technology is below expectations, it may bring about rejection and shunning of its use [29]. Issues that arise are lack of training, poor connectivity and applications that fail to meet user expectations.

From the findings, the study recommends that interventions aimed at increasing technology adoption should focus not only on access to technology but also push for enhancements of the perceived performance benefits of the technology. For these rural women, this includes technology that can assist them in managing

their crops, animals, and smallholder plots in order to maximise output. Service providers should concentrate on bringing convenience through digital tools to access connectivity, digital financial services and educational courses to enhance the lives of rural women. It is also important to roll out roadshows to educate women and showcase successful examples of technology adoption.

EE was found to have a moderate influence on technology adoption. The rural women are demonstrated to be at different levels of education which speaks to their literacy levels ranging from highly literate to not literate. It is therefore important that the technology be understandable and easy to use. Studies highlight that the perceived ease of use impacts rural women's willingness and ability to use technology [30]. When technology is viewed as complex or too challenging, it negatively affects its adoption regardless of the benefits. Technology should require minimal technical skills because rural women live in remote areas and may not be able to access technical support. The study suggests that technology providers and retailers should tailor technologies to suit the educational and literacy levels of rural women. The user interface for the applications needs to be user-friendly and allow users to choose the level they want to operate at within the applications, the same way as one would do when playing console or online games. Local content and language are also an important customisation to encourage adoption.

Concerning SI, the findings are in line with other studies [31]. The rural women's intention to use technology is influenced by the suggestions, opinions and recommendations of those important to them. The majority of the respondents, who make up the age bands of twenty-five and forty years, exhibited an affinity for keeping in line with the trends in technology hence the opinions and support of others were important to them. Based on the findings, interventions by the government and stakeholders must leverage on these social structures. The use of testimonials, community leaders and influencers in shaping perceptions and driving technology adoption.

FC significantly impacts technology adoption and according to the study, the construct takes second place in importance after PE. The responses from the respondents show a high level of agreement that having resources available was important to their decision to adopt the technology. Studies done in other developing countries support the findings of this research [32]. There are however studies done in developed countries where they found that facilitating conditions were insignificant as a determinant of technology adoption as there was already widespread availability of infrastructure, digital skills and digital literacy [33]. For this study, FC, is a critical factor as infrastructure like base stations, internet connectivity and smartphones are not universally available to all rural women hence it becomes the foundation for technology adoption. The implication here is that even if technology is useful, the lack of facilitating conditions, limits adoption. It is recommended that government and mobile network operators provide the necessary infrastructure like base stations, affordable mobile phone payment plans and internet connectivity to enable access. This should be supported by training programs to develop skills and opportunities for rural women.

HM does not influence the intention to adopt technology for the rural respondents. Fun, pleasure and entertainment elements in technology were not important to the respondents. Hedonic motivations were merely seen as a hygiene factor that increases engagement with technology and helps in formulating positive attitudes towards technology use [34]. The Umguza women experience sporadic connectivity, and slow speeds due to some areas only accessing 2G networks and lack of electricity so they only use their mobile phones for basic connectivity and do not see the need for hedonic factors. There were also some religious sects that the women

were patrons of that discouraged leisure activities through technology. The findings from the study suggest that service providers need to expand their coverage to remote areas and provide higher access bands like 3G and LTE/4G to rural areas. This will enable faster connectivity speeds, an increase in use cases by rural women and higher revenues for the service providers. Content creators should explore providing relevant, fun content for the rural markets. The government needs to facilitate training on the safe usage of online tools to avoid issues like cyberbullying and exploitation affecting rural women.

PV is not an influence of technology adoption. Other studies support this conclusion [35]. The share of wallet for the rural women for technology use is mandated by available funds and any further change or increase in technology products or choices does not stretch the budget. What is key for service providers and policymakers is to avail cheaper solutions to cater for connectivity needs so that rural women can access more for the same value at no prejudice to their other needs.

The last construct is HT, and it is not supported as a determinant that can influence technology adoption by rural women. Several studies are shown to omit habit as a construct when using the UTAUT2 model, due to users being in the early stages of adoption and warn researchers to refrain from using experience as a proxy to measure habit since experience is necessary but is not a sufficient condition to form a habit [36]. The findings show the importance of driving use over time so that the rural women form a habit, and this can lead to extended use of technology. The strategies for habit formation need to encourage good, frequent and responsible technology use. This can be done through training and upskilling rural women on the importance of digital connectedness for economic and social purposes.

Table 7. Summary of Inferential Analysis

Hypothesis	**Standardised Estimate**	**Standard deviation**	
	Result	**Result**	**Recommendation**
H1.PE influences TA	0.2113	<0.0001	Accept Hypothesis
H2:EE influences TA	0.1259	0.0031	Accept Hypothesis
H3: SI Influences TA	0.1207	0.0318	Accept Hypothesis
H4: FC influences TA	0.4464	<0.0001	Accept Hypothesis
H5: HM influences	-0.0078	0.8774	Reject Hypothesis

TA			
H6: PV Influences TA	0.0397	0.4651	Reject Hypothesis
H7: HT Influences TA	0.0454	0.256	Reject Hypothesis

Conclusion

This study examined the factors affecting technology adoption by rural women in Umguza district in Zimbabwe. Based on the findings and discussions above, the requirements of the paper were satisfactorily met. This study has shed light on the dynamics of technology adoption among rural women, emphasizing the underexplored realm of applying the UTAUT2 model to this demographic. With regards to the constructs of the UTAUT2 model, Performance Expectancy (PE), Facilitating Conditions (FC), Effort Expectancy (EE), and Social Influence (SI), were found to influence technology adoption. Hedonic Motivation (HM), Price Value (PV) and Habit (HT) were rejected as influencers of technology adoption among the women in the Umguza district. Recommendations from the study advocate for tailored solutions, strategies and initiatives that cater for rural women's unique needs and contexts. This study contributes to the evolving landscape of technology adoption research by showcasing the factors affecting adoption behaviours among rural women. The findings pave the way for more targeted and culturally sensitive approaches in enhancing technology adoption initiatives for rural women in Zimbabwe, which may lead to inclusive digital empowerment and societal development

Future Research

Future research should concentrate on the myriad of socio-cultural and religious issues that affect rural communities. A more comprehensive analysis of these factors is required to understand some of the unique issues that arise from religious practices, traditional culturalism and social structures in the rural areas. Future studies need to expand the scope of the study to a nationwide view to capture all the issues at a national level to enable a wider view of factors affecting technology adoption and implementation of solutions.

Conflict of Interest

No conflict of interest was registered by this study as engagements with respondents were done willingly, anonymously and independently. Clear and comprehensive information about the study objectives, procedures, potential risks, benefits, and voluntary nature of participation was provided and informed consent was obtained from participants, ensuring they understood their rights, how their data would be used, and their ability to withdraw from the study at any time By following the above procedure, the writer ensured that conflict of interest was eliminated, thereby ensuring greater transparency and accountability to the research subject.

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