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THE MEANING AND PRACTICE OF INCLUSION AMIDST GENDER DIVERSITY ON BOARDS OF PUBLIC SECTOR ORGANIZATIONS IN UGANDA

Regis Namuddu M.[1], Nabasirye Massy[2], Kehbuma Langmia[3]
[1]Makerere University, School of Business, Department of Leadership and Governance, Kampala, Uganda.
 ritzyregis@gmail.com, ORCID: 0000-0003-4716-9340
[2]Makerere University, School of Business, School Registrar's Office, Kampala, Uganda.
 mnabasirye@mubs.ac.ug,
[3]Howard University, Department of Strategic, Legal and Management Communication, Washington DC, USA.
 Klangmia@gmail.com, ORCID: 0000-0001-8508-6883

ABSTRACT

Purpose- Despite progress in achieving gender diversity on corporate boards, there is a growing recognition that mere representation of women does not guarantee their inclusion in terms of active participation and influencing board decisions. This research paper aimed at generating a substantive grounded theory that gives the meaning of inclusion in the boardroom and what should be the ideal practice of inclusion on boards of public sector organizations in Uganda

Methodology- A qualitative study was carried out applying a constructivist grounded theory approach. This approach acknowledges the researchers' introspection and involves interpretation of data. A purposive sampling method and snowball technique were used to obtain a sample of 16 female directors serving on boards of public sector organizations in Uganda. Semi-structured interviews were used to obtain data. The collection of data and analysis were done concurrently using the coding method to analyze data and to enable a thematic analysis of the themes that define inclusion and the ideal practice of inclusion within boards.

Findings- Findings indicate that inclusion means diversity, gender sensitivity, equal opportunity, exploiting potential, and adopting a board charter. On the other hand, the developed ideal practice of inclusion model had some themes similar to the meaning of inclusion. The themes included; Gender Sensitivity, Diverse competencies, Necessary skills, Inclusive behavior, Exploiting potential, and board charter.

Conclusion- The original value of this paper lies in its exploration of the complementary relationship between gender diversity and inclusion on boards. Highlighting the importance of inclusion efforts to reap the benefits of gender diversity on boards. Additionally, by applying the constructivist grounded theory approach this paper provides practical guidance for organizations that strive to achieve gender diversity and inclusion on boards

Keywords: Female directors, board of directors, ınclusion, gender diversity, public sector organizations.
JEL Codes: J16, G34, M14

1. INTRODUCTION

The United Nations Sustainable Development Goal (SDG)10 Promotes social, economic, and political inclusion of all, irrespective of status. Similarly, SDG 5 considers the promotion of gender equality and ending all forms of discrimination against all women and girls everywhere (AUO, 2018). In line with the two goals, gender diversity on corporate boards has gained significant attention as a means to foster equality and harness the benefits of diverse perspectives(ILO, 2019). However, much attention has been paid to gender diversity (having women appointed on boards) at the expense of inclusion on boards (how women are engaged when they get on boards). The focus on gender diversity is vivid where developed countries such as Norway, Spain, and France have taken strong initiatives to increase the representation of female directors on corporate boards by implementing gender quotas (Seierstad *et al*, 2021). Elsewhere, organizations use national public policies to increase the number of women on boards(Klenk *et al.,* 2022; Seierstad *et al.,* 2015). Global and local networks are also used to influence women's access to boards(Verhoeven *et al.,*2022). The investors also influence women's appointment to boards (Nor *et al.* 2016). Corporate governance guidelines encourage appointing authorities to appoint women to boards (Hamdan *et al.*, 2022).

In Uganda, the context of interest for this study, The Uganda Gender Policy (2007) promotes women's inclusion in social political, and economic governance activities. This is because women have historically been underrepresented in corporate

leadership roles and largely due to cultural norms(Nakawesi and Magezi, 2018). Consequently, public sector organizations have made efforts to increase the representation of women on boards through various initiatives and policies (Rahman *et al.,* 2023). Specifically, many public sector organizations have ensured that they have at least one-third of the board members being women (UNMA Act., 2012). Moreover, Uganda has the Equal Opportunities Commission (EOC) that monitors the progress of gender equality in different fields including education, political, economic, and social activities but does not pay attention to women on boards(The Equal Opportunities Commission, 2022). Uganda as a country, has now seen an improvement in respect to the presence of women on boards of public entities and as such, has reduced gender imbalance The gender composition in governing boards question, therefore, appears to be progressively addressed. Nonetheless, another issue of concern that has emerged, relates to inclusion. In this regard, research shows that after women's access to boards, the intentional inclusion of female directors in board decision-making is required otherwise, their presence may be just a gender yardstick that has no impact (Binti, *et al.*, 2018). An ideal practice of inclusion entails women's voices not only being heard but also valued, and that their perspectives influence decision-making processes. Gender inclusion goes beyond simply having women present in board positions. Incidentally, the terms diversity and inclusion are often used interchangeably. Inclusion complements diversity and so, gender diversity is incomplete without inclusion, (Fredette *et al,* 2016). "Diversity is being invited to the party; inclusion is being asked to dance" (Diligent Institute, 2022 p.2) Inclusion is feeling that you belong to a workgroup and that your uniqueness is appreciated (Chung et al., 2019)

The available literature is scanty on women's inclusion on boards in Uganda. This provided an opportunity to undertake this research with a view of establishing, in the respondents' own opinion, What is the meaning of inclusion in the board context? what is the ideal practice of inclusion on boards? By addressing these research questions, this study provided insights into the process of inclusion within boards, shedding light on the necessary conditions and practices for creating an inclusive environment aimed at leveraging gender diversity on boards.

2. LITERATURE REVIEW

2.1. Theoretical Underpinning

Social constructionism theory informed this study. The theory emphasizes that individuals and societies construct meaning through social interactions (Berger and Luckmann, 2016). These social constructs are not inherent or universal but are shaped and maintained through collective human interactions, cultural practices, and shared beliefs. The theory of social constructionism proposes that people collectively develop the meanings (denotations and connotations) of social constructs. This perspective recognizes that inclusion is socially constructed and varies across different contexts (Zhao, 2020). This study explored how inclusion is socially constructed on boards and how these constructions influence board dynamics and decision-making processes. However, the theory does not explain how inclusion unfolds. Therefore, a constructivist grounded theory approach was applied. That approach enables the researcher to explore the meaning and practice of inclusion making it possible to uncover the process and to generate a substantive theory derived from the female directors' experiences serving on boards of public sector organizations in Uganda.

2.2. The Gender Diversity Drive on Boards

For a considerable period, business leaders and policymakers have advocated for augmenting the presence of women on boards, emphasizing the importance of incorporating their unique perspectives into the decision-making process (World Bank, 2022; European Commission, 2019). Therefore, promoting the appointment of women on organizational boards is based on the business case that argues that women bring value to boards(Miholić, 2020; Martinez and Rambaud, 2019) and also the ethical case for women to be present as a way of promoting justice and equality (Seierstad, 2016). Gender diversity initiative on boards challenges the traditional gender stereotypes and biases about having women present on boards through legislation (Elomäki, 2018). The drive is influenced by multiple actors including micro, meso and micro levels of influence (Blommaert and Brink, 2020)

The Organization for Economic Co-operation and Development (OECD Factbook, 2019), the Institute of Directors South Africa (IoDSA)(KingVI, 2016), and the Commonwealth Association for Corporate Governance (CACG, 1999)promote the appointment of women on boards. In Uganda, the Capital Markets Authority charter promotes the recruitment of women to Publicly listed companies(Kibirango, 2003) and also the Institute of Corporate Governance in Uganda (ICGU) emphasizes recruitment with gender sensitivity on boards of both the public and private organizations (ICGU, 2008). Indeed, national policies have enabled the increase of female directors on boards (Hamdan *et al.*, 2022; Seierstad *et al.*, 2015) and also the global and local networks continue to influence women's access to boards(Verhoeven *et al*., 2022). Likewise, board ownership and board independence also drive the recruitment of women to boards to improve firm performance(Bozhinov *et al*., 2021)

The European Commission (EC) encouraged member countries to increase the number of women on corporate boards through mandatory gender quotas(European Commission, 2021). Mandatory board quotas are taken seriously appointing females to comply and avoid penalties unlike voluntary efforts (Mensi-Klarbach and Seierstad, 2020). Countries like Norway,

Spain, and France have aggressively promoted the inclusion of female directors by introducing gender quotas on boards(Seierstad, *et al.*, 2021; Egon Zehnder, 2018; Choobineh, 2016) In the same spirit, Organizations in the United Kingdom and Sweden set a target number of female directors on boards (Haley *et al.*, 2019). Likewise, practitioners and researchers advocate for a critical mass of at least 30 % female directors on boards as a means of promoting gender diversity (Ardito, *et al.,* 2021; Godfrey, *et al.,* 2020; Catalyst, 2020; Yang *et al.*, 2019; Deloitte, 2018).

The recent Deloitte (2022) report indicates that progress towards global gender parity on boards is occurring, although at a slow pace. The global average of women on boards currently stands at slightly below 20% (19.7%), which represents an increase of only 2.8 percentage points since the previous report in 2019. Based on this trajectory, achieving gender parity is not expected until at least 2045, which is over twenty years from now. While the rate of change remains disappointingly slow, there has been a slight acceleration compared to Deloitte's 2019 report, which projected parity to be reached by 2052. This reduction of almost a decade suggests a marginally improved timeline, albeit still far from satisfactory. Research shows that more interventions must be exported to have more women recruited on boards (Gabaldon *et al.,* 2016).

According to a report by the African Development Bank, women hold a mere 12% of corporate board seats across the African continent. In 2015, Kenya had the highest representation of women on boards among African countries, with 19.8%, closely followed by Ghana with 17.7% and South Africa with 17.4%, and Uganda had 12%. (African Development Bank, 2015) However, by 2021, Kenya had made significant progress, with boardroom diversity increasing to 36% from 21% in 2017, as reported by the Board Diversity and Inclusion Survey(James, 2021). The slow access of women to boards has fueled the continued focus on the gender diversity drive and not paying attention to inclusion. Likewise, in Uganda, the role of women on boards continues to be challenged by cultural norms(Muhoro, 2022; Nakawesi and Magezi, 2018) based on this, the study is significant in bridging the gap. Fostering inclusion amidst gender diversity on boards for the few women who access the boards.

2.3. Meaning of Inclusion and Inclusion within Boards

The terms diversity and inclusion are closely related and are often treated as interchangeable yet they carry different meanings. The relationship is that inclusion complements diversity by creating an inclusive environment and creating business value among diverse talents (Shore *et al.,*2017; Ferdman, 2014) Precisely, diversity means bringing together people of multiple identities and cultures to work together in a given setting while inclusion involves harnessing an abundance of ideas and perspectives from the diverse members in a beneficial way(Chang *et al.,* 2019). Hence inclusion is grounded in what we do with diversity when we value and appreciate people because of and not due to their differences or their similarities(Hwang and Hopkins, 2015). In other words, inclusion involves acknowledgement and meaningfully utilizing an individual's differences in the work environment (Ferdman, 2017). Its importance notwithstanding, boards have paid more attention to gender diversity at the expense of inclusion which aims at involving female directors and meaningfully exploit their potential within boards(Weck, et al., 2022).

Furthermore, the micro-level psychological theory on societal gender beliefs has firmly established that within groups, women may not enjoy the same level of influence and status as men do, even when women hold positions of power and occupy roles akin to men (Bae, *et al.,* 2017) The cultural norms and negative societal perceptions against women challenge their access to boards (Nakawesi and Magezi, 2018). These societal perceptions that challenge the role of women on boards have even penetrated the boardroom (Weck *et al.*, 2022; Ouedraogo, 2018; Potter, 2018) Therefore, as boards strive to attain critical mass and avoid tokenism, the gendered beliefs and biases against women require interventions (Elomäki, 2018).

Lack of intentional inclusion within boards is a potential hindrance to leveraging the benefits of gender diversity in Africa (Muhoro, 2022). Yet, minimal attention has been given to inclusion within boards. It is in the organization setting where significant attention has been paid to the inclusion of diverse employees within workplace activities. Indeed such studies show that the concept of inclusion has attracted great attention from researchers and practitioners due to its positive stance in appreciating and valuing individual differences(Deloitte, 2019; Qi et al., 2019)Mor-Barak and her colleagues in the social work field were the first to systematically research inclusion in an organization (Mor-brack*et al.,*1998) Thereafter other researchers have endeavoured to clarify that inclusion is imperative, especially for those who have been historically excluded (Kabat-farr *et a*l., 2020; Jansen, Otten and Zee, 2016) They further indicate that being always the minority in official work engagement, women's visibility should be promoted through workgroup inclusion(McCluney, and Caridad, 2018; Bae *et al.*, 2017)

In addition, literature revealed that embracing diversity along with inclusion reduces conflict and turnover(Mor Barak *et al.*, 2016; Welboume*et al.*, 2016). An inclusive climate ensures fair and unbiased treatment of workers (Le, and Johnson, 2020), and enhances the experience of belongingness and uniqueness (Chang *et al.*, 2019). Companies that de-emphasize differences create an inclusive climate where minority members and vulnerable women feel valued(Hills, 2019)similarly, encouraging communication from diverse members improves relationships among staff and this leads to a climate that promotes inclusion and consequently enables psychological safety(Madrigal-Moreno, *et al.*, 2020). Leveraging the potential

benefits of gender diversity requires shifting focus from just advocating for the presence of women on boards to paying more attention to female directors' inclusion when they access the boards(Fredette et al., 2016). Whereas inclusion has been examined elsewhere, little is known about the inclusion of women within boards of public sector organizations in Uganda.

Literature from Europe, Asia, and America, between 2016 and 2023 presented numerous studies on gender diversity on boards and many examined inclusion in the organizational context. This leaves a gap in the literature on inclusion in a broad context. In line with inclusion literature in Africa, studies focused on inclusion which means adding people into systems such as education(Kalanda, *et al.*, 2021; Kalanda*, et al., 2020)*. Inclusion of people with disability (Rohwerder, 2020). Financial inclusion (Okello *et al.*, 2016) and Inclusive leadership in organizations (Bagorogoza*et al.,* 2022). Likewise, existing research on organizational boards in Uganda focused on firm performance and the role of the boards (Tumwebaze *et al.*, 2022; Nalukenge, 2020; Summit, 2018; Nkundabanyanga, 2016). There is a gap in the literature on inclusion within boards in Uganda

3. DATA AND METHODOLOGY.

3.1. Research Design

The study conducted a qualitative research design applying the constructivist grounded theory methodology. Constructivist grounded theory is an approach to qualitative research that centres on crafting theories based on individuals' viewpoints and experiences. It recognizes reality as shaped by social constructs and personal subjectivity, highlighting the significance of researchers' introspection and involved interpretation of data. Through systematic data analysis and conceptualization, this method aims to extract insights that reflect the intricate array of participants' perspectives, culminating in the development of novel theories.(Charmaz, and Belgrave, 2019). Moreover, relativist ontology was applied to this study as it recognizes the role of subjective experiences, perceptions, and social contexts in shaping our understanding of the world. Likewise, constructivist epistemology was used. In constructivist epistemology, individuals are seen as active participants in the learning process, actively constructing meaning and understanding based on their prior knowledge and experiences. This approach adopts the systematic methods of coding and analyzing data (Glaser and Stauss, 1967)

3.2. Population and Sample Size

The research participants were female directors who have served for over two years on boards of public sector institutions in Uganda. The Uganda Gender Policy, (2007)made it possible to have female directors appointed on those boards. The organizations involved in the study included the National Environment Management Authority, UMEME Uganda, Uganda Registration Services Bureau, National Social Security Fund, Petroleum Authority Uganda, National Planning Authority, Uganda Railways Corporation, National Drug Authority, New Vision Group, Housing Finance Bank, Uganda Bureau of Statistics, Uganda Fund Services, Mandela National Stadium, and Uganda National Meteorological Authority. Thirteen participants were interviewed physically in Kampala, one in Jinja, one via phone, and another via Zoom. All participants had extensive board experience, having served for more than two years, which provided them with valuable insights into the perceptions of female directors on boards. Education-wise, all participants were highly educated, with four holding PhDs, eleven having master's degrees, and only one possessing a bachelor's degree. Purposive sampling was employed, along with a snowballing technique, to gather a sample of 16 participants. The sample size was determined based on data saturation, ensuring that enough information was obtained. This means that no new insights emerged after a total of 16 participants (Georgieva and Allan, 2008). The participants provided informed consent and were assured of the confidentiality and privacy of their responses.

3.3. Data Collection and Analysis

The researchers utilized semi-structured interviews to guide the interview process. Interviews were conducted until data saturation was reached. The researchers gathered in-depth insights into the experiences and perspectives of research participants. Data was collected and analysed concurrently. The applied inductive inquiry involves an interactive strategy where the research process involves cycles of data collection, analysis, and refinement of research questions or methods. This helped in understanding the social phenomena and constructing theories grounded in data (Charmaz, and Belgrave, 2011). Hence, the researchers employed a constant case comparative analysis method, a key aspect of grounded theory, to analyze the interview data. The process begins with open coding, identifying codes of the meaning and also the ideal practice of inclusion. Conducted axial coding to identify relationships between codes and to develop categories that capture the essence of the data. Engaged in selective coding to refine and integrate the categories and developed a model that explained the meaning of inclusion and a theoretical framework that explains the ideal practice of inclusion amidst diversity (Glaser and Stauss, 1967).

3.4. Study Credibility

The researchers enhanced the credibility and trustworthiness of the findings. memos were incorporated to validate and complement the interview data. Further, to enhance the credibility of the research, member checking was done. This is where the emerging findings were shared with participants to ensure accuracy and obtain their feedback to be considered.

3.5. Ethical Consideration

The researchers complied with ethical guidelines and regulations. It was voluntary participation. The researchers obtained informed consent from participants. Participants were assured of anonymity and privacy of information shared and their identity in the study was hidden, being identified as P1 up to P16.(P stands for Participant)

4. FINDINGS AND DISCUSSIONS

4.1. Meaning of Inclusion within Boards

The study intended to explore the meaning of inclusion within boards and also to establish the ideal practice of inclusion on boards. The main themes that emerged include; *diversity, gender sensitivity, equal opportunity, board charter and exploiting potential.* This section will be presented reflecting on the level of participants' views on a certain theme where terms like *Majority*, *all*, and *many* will be applied to where 11 to 16 participants were part. Then 10- 6 participants' responses will have the terms *several* or *on average* applied and for those that had few participants 5- 1 the term *a few* will be applied

Diversity. All the participants explained diversity as the meaning of inclusion and this emerged as the major category. They acknowledged that diversity is the situation of having people with diverse backgrounds being allowed to be part of the system so that no one is disadvantaged or left out. They affirmed that board work requires diverse resourceful people with the skills and capabilities needed. This was emphasized in the qualitative responses below;

"Inclusion means, different dimensions of diversity; gender, disability, religion all those kinds of diversities. The different groups of special needs to be included in whatever it is". (P6)

"Inclusion means giving people the opportunity to be part, to participate or benefit from a particular group, committee, sector so that no one is disadvantaged or left out based on their unique or particular identities" (P12)

Gender diversity. Whereas gender diversity is one of the dimensions of diversity, many participants singled it out as an important aspect of the meaning of inclusion to consider. They argued that boards have to consider both men and women among the needed diverse backgrounds and skills. They emphasized as below;

I think inclusion is driven more by the gender line. If we may think aloud gender diversity should reflect in the elements of diversity required on boards. This is because financiers, civil society and governments are recognizing the issue of gender equality. So like the 1.5 points that were given to Makerere female students, there was a boost given. (P5)

Inclusion in boards means knowing gender numbers, how many are male or female if you are to diversify opportunities and if women are few, then get more females to join the board so that we have gender balance in terms of gender (P3).

> **Memo** It is never considered inclusion without paying attention to having women as part of the board processes.

Exploiting Potential. Several participants attributed the meaning of inclusion to exploiting the potential. They emphasized that besides gender sensitivity, the presence of female directors should be leveraged by allowing women to exploit their potential, having women's views presented without gender biases. Allowing all members to participate. They explained the meaning of inclusion within boards as follows:

" In my view, when boards are formed they have various entities and representation and the fact that a lady is chosen to be on the board is the first step for inclusion. Then being listened to when you are attending the board meetings is also another. It is taking your suggestions and submissions as a board member (P15).

"Before we used to have many male-dominated boards whereby when there was an opportunity to select who to sit on the board the men were given priority, but because of the government policy of inclusion now the government entities even the private are taking it on themselves to ensure that there are women who are serving on boards. There is a competent woman. However, inclusion is not about getting any women and putting them on the boards. The board gets a competent woman able to serve, deliberate and make positive contributions to the affairs of the board (P4)

A few participants also attributed the meaning of inclusion to giving equal opportunities, ensuring the adoption of policies to enable equal treatment and participation. this was emphasised;

(Inclusion within a board context refers more or less to the same equal opportunity for as long as you have the qualifications for that position. You should be given an equal chance and nobody should be biased because of your gender" (P9)

"To ensure that the special interest groups are included, represented in a fair and just manner in the board context and are recognized and they are treated equally just like everyone else on the board("P6).

Board Charter. Several participants also acknowledged that inclusion within boards means adopting the board charter. being accountable for the decisions and what is taking place. They also remarked that some board charters support having female directors while others do not. Diversity emerged as the main theme among other themes as generated in Table 1 below;

Table 1: Selective Coding/Cross Coding Form A Cross-Case Comparative Analysis

Core categories	Sub Categories	Respondents	Rating%	Selected code	Main Theme
Board charter	a) Guidelines	2/16	12.5	b)18.7	
	b) Policies	3/16	18.7		
Diversity	c) Diverse skills	7/16	43.7	c) 43.7	**Diversity**
	d) Diverse background	5/16	31.2		
Gender sensitivity	e) Gender balance	6/16	37.5	e) 37.5	
	f) Appointing women	5/16	31.2		
Equal opportunity	g) Equity	5/16	31.2	g)31.2	
	h) Fair representation	2/16	12.5		
Exploiting potential	i) Participating	6/16	37.5	i)37.5	
	j) Contribution	5/16	31.2		

Figure 1: Graphical Representation of Themes Derived from the Cross-Case Comparative Analysis
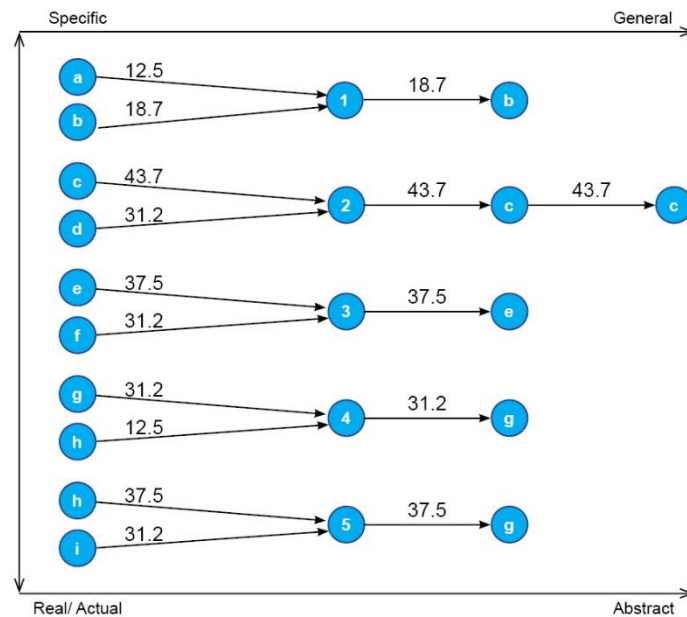
Figure 2: The Meaning of Inclusion on Boards Model
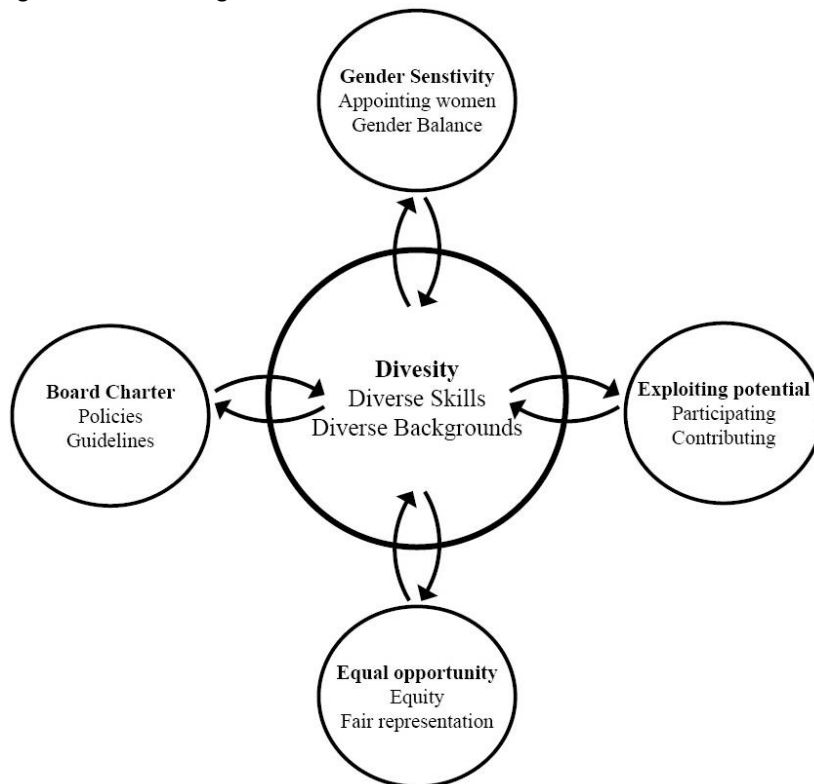
The emergent model explaining the meaning of inclusion from the experiences of the 16 participants in this study is represented a system, organized around the core category of *Diversity* (diverse skills and diverse background) . The circle around the core category signifies that there is a combination of other constructs that inform the core category and the core category embodies the main narrative of the meaning of inclusion. In this model diversity is embedded in several contextual inputs which flow into the core, interact with it in a mutual impact, and flow out again as actions and consequences indicated by double arrows.(Strauss and Corbin, 1998). The inputs in this model are *Board Charter*,(policies, guidelines), *Gender Sensitivity* (Appointed women, Gender balance), *Equal Opportunity* (Equity, Fair representation), *Exploiting Potential* (Participating, Contributing)

Therefore, the grounded theory statement for the meaning of inclusion on boards is "*The process of recruiting diverse members on the boards based on the policies in place, being gender sensitive and giving equal opportunities of participation in the board discussions and exploiting the potential of all board members*".

4.2. Ideal Practices of Inclusion on Boards

For this, some concepts overlapped with those of the meaning of inclusion. The participants acknowledged that the ideal practice of inclusion would be considering the *diverse representation of competencies but emphasised being gender sensitive amidst diversity*. This position also appeared in the meaning of inclusion earlier presented.

Gender sensitivity. The qualitative responses alluded to the sensitivity of gender diversity as below;

It is now a requirement, just take the recent example of the National Social Security Fund NSSF board. The parliament rejected to pass a board that was composed of only men. It is now a policy when a board is set up they will state that at least two should be women (P4)

There should be deliberate policies for inclusion within organizations, having clauses or provisions for the inclusion of women (P6).

Inclusion is practised fairly when there are both men and women on boards. Years ago there used to be only men but I believe these days women are also part of the board (P8)

Necessary skills. Whereas gender diversity was noted as an ideal inclusion practice, the majority of the participants made further explanations that it is not all about having female directors present on the boards. They must be eligible for board governance. Having the necessary skills, they acknowledged that;

Before we are appointed we must have the required qualifications and we should also not sit back. We should sell ourselves, these days there are many platforms where we can sell our skills and ambitions so that we can be seen. We can use professional associations, social media, LinkedIn, and Facebook so that we are seen. It is up to us now to fight for ourselves to be sought after (P9)

I belong to one association of females on boards and we were founded through the Federation of Uganda Employers it is something that came from Norway they took stock in the 80s and they realized there is a way women would competently serve on boards. They had to be intentional about getting women who are credible to boards because they had the mandate all of them had to have a certain number of women on boards. They were not finding them so they took that federation of their employers and it started the training. They also came here in Uganda and we were the first African county to be trained. So it is not just to get the gender quota or a woman sitting in but the equipped person. Where they are chosen on merit you really see it is helpful and actually there may be research, maybe we do not have a lot of it here and you are going to contribute to this. You are going to open the doors then we are going to come in and start building on it (P5)

On this board that I serve, we are a bit many in relation to other boards that I know. You inevitably find yourself in some position of responsibility. It depends a lot again on your qualifications for example in finance you are put on a committee to chair and it doesn't matter whether you are male or female as long as you have qualifications (P7)

Board Charter. Several participants also asserted that the board charter should determine the ideal practice of inclusion. Spell out the composition and running of the board affairs. This was also echoed in the meaning of inclusion. They explained that:

Every institution has policies like human resource policies, and the board charter and so the original structure ensures that when the board is being nominated that they will include people from both genders and balanced people with experiences (P10)

There should be deliberate policies for inclusion within organizations. Some of the boards I have served on are government parastatals so they are set up by acts of parliament. Under those acts, there are clauses or provisions for inclusion and gender balance. So that is one way of addressing inclusion within boards. But there are those boards where it is silent, the policies and the board charters, procedures and practice don't mention inclusion and gender balance (P6)

İnclusive Behavior. Many participants also emphasized that it is not all about the board charter and gender diversity for the ideal practice of inclusion on boards, but it is ensuring and influencing inclusiveness. Enabling all the diverse members on the board to contribute and arrive at decisions that take into account everybody's perspective. Promoting a board culture that respects every one. Being listened to, making a contribution and taking their suggestions. They emphasized as below;

"The aspect of the role of the chairperson is important, how to ensure everyone is on board. The general rapport between and among board members and how to manage (P16)

"Being able to have everybody participate in the decision-making. By expressing themselves first of all and arriving at a decision which takes into account everybody's perspectives or views P3

Psychological safety. Finally, a few participants highlighted the issue of providing psychological safety for women. This was to help them express their views without fear of being rejected or frustrated. They stated that;

"Enabling women to feel comfortable sharing their views without worrying about trashing them (P6)
"Boards to ensure the promotion of psychological safety for the women, believing that they are unique and have creative ideas to bring to the table (P1)
The findings are presented in the table, figures and model presented next

Table 2: Selective Coding/Cross Coding Form A Cross-Case Comparative Analysis

Core categories	Sub Categories	Respondents	Rating%	Selected code	Theme/concept
Gender Sensitivity	a) Gender balance	4/16	25.0	b) 37.5	
	b) Gender equity	6/16	37.5		
Diverse Competencies	c) Diverse responsibilities	2/16	12.5	d) 31.2	
	d) Diverse Skills	5/16	31.2		
Necessary skills	e) Qualifications	7/16	43.7	e) 43.7	
	f) Trained Women	4/16	25.0		
	g) Expertise	3/16	18.7		
Inclusive behaviour	h) Board chairperson	5/16	31.2	h) 31.2	
	i) Inclusive board culture	2/16	12.5		
Exploiting potential	j) Contribution	11/16	68.7	j) 68.7	**Exploiting potential**
	k) Psychological safety	2/16	12.5		
Board charter	l) Inclusive policies	4/16	25.0	i) 25	
	m) Inclusive guidelines	2/16	12.5		

The table shows analysis results , the core categories were formed from the subcategories and these emerged from open coding which is not reflected (because they are too many words/phrases). In each subcategory the number of respondents was noted giving a perceptage of the mention of that particular theme. The selected coding colum shows the sub theme that had more mentions and they are bolded. Overall exploiting potential emerged as the core theme in it, contribution sub category had the highest number of respondents.

Figure 3: Graphical Representation of Themes Derived from the Cross-Case Comparative Analysis
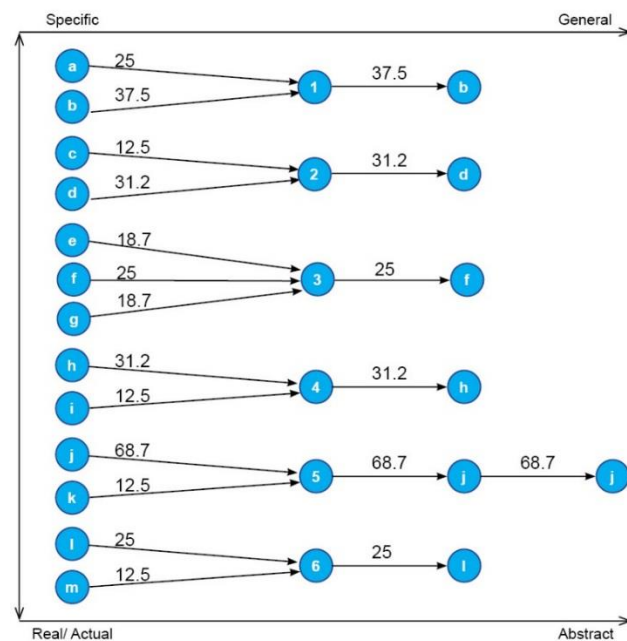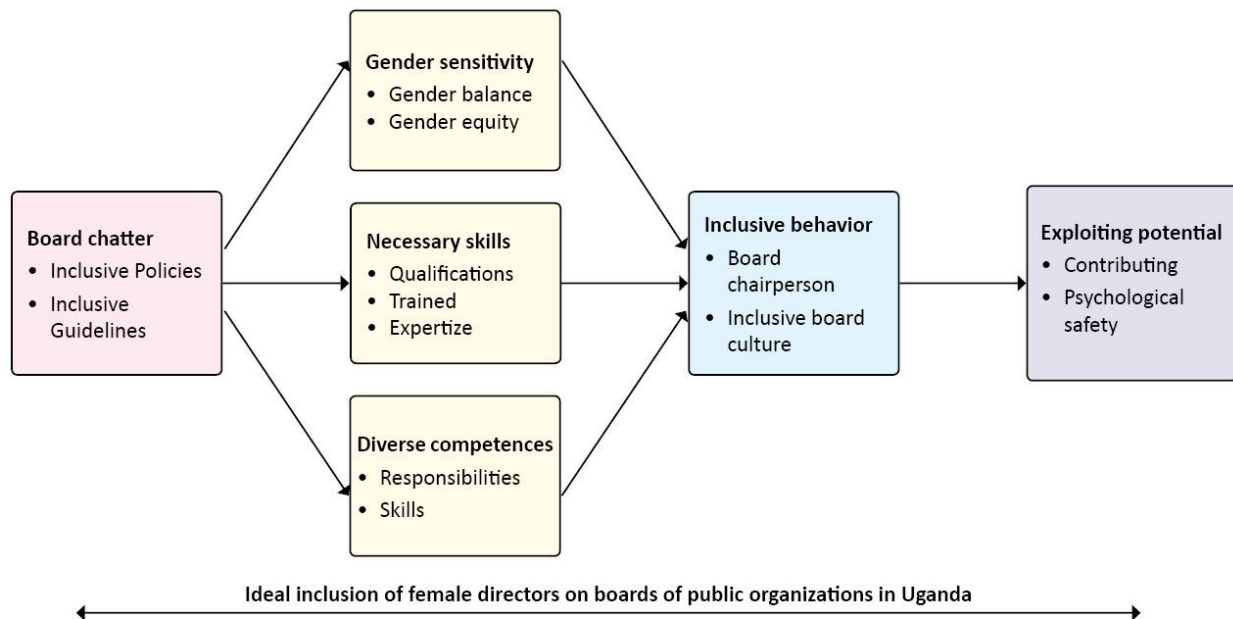
Figure 4: The Model of Ideal Inclusion for Boards

Ideal inclusion of female directors on boards of public organizations in Uganda

The emergent model explaining the ideal practice of inclusion from the experiences of the 16 participants in this study is represented as a process, beginning with a board charter that prescribes the board's inclusion direction, these influence gender sensitivity, appointing board members with the necessary skills and ensuring diverse representation of competencies. Having achieved that, the board further promotes inclusive behaviours which may not appear in the board charter. These are incusive behaviors and actios by the board chairpersons and an inclusive board culture. These end up enabling the board to exploit their potential. By embracing the process of ideal inclusion practices, boards can effectively leverage the full potential of their diverse members, ultimately leading to more effective and well-informed decision-making processes.

5. CONCLUSION AND IMPLICATIONS

The research intended to achieve two objectives one, to explore the meaning of inclusion in the board context and two, to understand the ideal practice of inclusion of female directors within boards. The conclusions and implications are presented and implications are identified in line with the research questions, literature review and the generated grounded theory.

The generated theory of the meaning of inclusion was "The process of recruiting diverse members on the boards based on the policies in place, being gender sensitive and giving equal opportunities of participation in the board discussions and to exploit the potential of all board members" This process is in line with other studies that defined inclusion in the organizational context. Chung et al.(2019) assert that inclusion means creating an inclusive environment for all members including the marginalized groups enabling them to feel belongingness and uniqueness. It also echoes the resource dependence theory that brings out the board's role of connecting the organization to the external environment explained by (Orazalin, and Baydauletov, 2020) However the generated meaning emphasizes gender sensitivity and exploiting the potential.

Understanding the ideal practice of inclusion gave rise to a grounded theory stating that "When boards prioritize diverse competencies, gender sensitivity, necessary skills, and foster inclusive behaviours under an inclusive leadership, it creates an environment conducive to exploiting the full potential of board members. By recognizing and leveraging the unique skills, perspectives, and experiences of board members, boards can enhance decision-making, drive innovation, and achieve better outcomes. This synergy of elements fosters a dynamic and inclusive board that maximizes the contributions and potential of each board member, leading to improved board effectiveness and organizational success". This is in line with Chang *et al*. (2019)who argue that inclusion involves harnessing an abundance of ideas and perspectives from diverse members beneficially. However, the developed theory brings in the element of inclusive leadership and driving innovation.

Diversity, gender sensitivity and exploiting potential were identified in both research questions. Embracing diversity onboards is in line with extant literature that has promoted the diversity of backgrounds, professions, skills and expertise for best corporate governance practices (Egon Zehnder, 2018; Hughes, *et al.*, 2017) Gender sensitivity as a theme for the meaning

and ideal practice of inclusion resounds in the studies that show aggressive promotion of gender diversity through affirmative action and legislation (Kolev, and McNamara, 2020; Knippen, *et al.,* 2019; European Commission, 2021; Credit Suisse Group, 2022) Similarly, Brieger *et al.* (2019) constructed a framework for promoting board gender diversity that elucidates the mechanisms through which action resources, emancipative values, and civic entitlements empower, inspire, and support women in assuming leadership positions on corporate boards.s

Exploring potential as the meaning and also the ideal practice of inclusion was explained as being able to participate and contribute to decisions, promoting an inclusive environment and appreciating uniqueness. This is also in line with studies that have concluded that diversity is incomplete without inclusion(Fredette et al., 2016). Similarly, Kuzmina and Melentyeva, 2021)affirm that female directors exploit their potential and that an increased representation of women on corporate boards yields significant positive impacts on buy-and-hold returns Participants also acknowledged that inclusion is influenced by the board's charters. This showed that it is important to incorporate inclusive practices within the board charter because it's the instrument of operation. This is in line with the Organization for Economic Co-operation and Development(OECD Factbook, 2019)), the Institute of Directors South Africa (KingVI, 2016) the Commonwealth Association for Corporate Governance(CACG, 1999) and the Capital Markets Authority in Uganda which encouragement to adhere to the corporate governance principles and guidelines.

Psychological safety as a means of ideal inclusion on boards is echoed in the studies that highlight the importance of psychological safety for members working together (Qian, *et al.*, 2020; Zhao, 2020; Markoczy*et al.,* 2020) Furthermore, the extension of diversity meaning to participation and psychological safety is in line with, Le and Johnson, (2020) who assert that inclusion focuses more broadly on the engagement of whole selves and learning from divergent perspectives it involves employee equitable practices, integration of differences and inclusion in decision making(Nishii, 2013). Necessary skills as a means of ideal inclusion practice showed that it was important to ensure that the recruited women have the necessary board competencies, they are trained and qualified. This is in line with studies that argue that women to be recruited on boards should be credible for board services(Gull*et al.*, 2018). In the same spirit Avolio, *et al.,* (2023) Confirmed that female directors believe in training and development, professional expertise, self-reflection, mindset, adaptability, networking, effective communication, empathy, diligence, critical decision-making abilities, interpersonal skills, support systems, and a strong sense of passion towards their work. Limited understanding and training and the absence of operational guidelines affect the effectiveness of the board(Mijumbi *et al.,* 2023)

Promoting an inclusive environment was also highlighted as an ideal practice of inclusion**.** This is in line with past studies that affirmed that an inclusive climate is creating an environment of feelings of safety, respect, support, value, trust, fulfilment, engagement, and authenticity within the organizations(Shore et al., 2017; Ferdman, 2014). Other studies concluded that inclusive leadership in organizations promotes member identification and better performance (Randel et al., 2018) promotes innovative behaviour(Javed *et al.*, 2020) enforces set values (Kuknor, and Bhattacharya, 2020) encourages participation in decision-making (Minehart *et al.,*2020; D'Aunno *et al.*, 2017)

In conclusion, this study established that inclusion within boards means appointing diverse members on the boards based on the policies in place, being gender sensitive and giving equal opportunities for participation in the board discussions thus, enabling exploiting the potential of all board members. On the other hand ideal inclusion unfolded as developing board charters that stipulate inclusive guidelines and inclusive policies. To be gender sensitive involves ensuring gender balance and gender equity; to recruit women who have the required skills including; qualifications and training experience on board matters. To leverage the potential of all board members an inclusive climate must exist being influenced by the board chairpersons and an inclusive board culture for members to exploit their full potential while experiencing psychological safety and contributing to board discussions. The meaning of inclusion almost had the same core themes as those of ideal inclusion except necessary skills and inclusive behaviour were over-emphasized in the ideal practice of inclusion. This showed how diversity is incomplete without inclusion.

This study highlights the importance of promoting inclusion amidst diversity on boards. By promoting inclusion, boards can create a more equitable and effective board environment that not only benefits the individuals involved but also contributes to the overall success and sustainability of the organization. Organizations need to recognize the value of gender diversity while considering the other diversity dimensions on boards and actively work towards fostering an inclusive environment that allows all board members to thrive and contribute their unique insights, ultimately driving organizational growth and success. Boards should have intentional initiatives to promote an inclusive environment for women on boards.

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DISCOVERING HARMONY: UNRAVELLING THE WORK-LIFE BALANCE OF HOTEL EMPLOYEES IN OMAN: AN EXPLORATIVE STUDY OF LUXURY HOTELS IN MUSCAT

Raja Tumati[1], Mithaa Al-Salmi[2]
[1]Oman Tourism College, Muscat, Oman.
 raja.tumati@otc.edu.om ORCID: 0000-0002-2194-2924
[2]Industry Practitioner, Oman Air, Muscat, Oman.
 maithatalib85@gmail.com, ORCID: 0009-0003-3933-7188

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ABSTRACT
Purpose- The main aim of this study is to analyse the work-life balance initiatives practised in Muscat hotels. The study also aims to examine the influence of work-life balance initiatives on employee career development and retention.
Methodology- As the objective of this study was to assess and quantify several factors to provide findings, quantitative research was used. A descriptive research design was employed to collect extensive data by thoroughly detailing the topic or testing hypotheses. The sampling technique used in this study was purposeful sampling, with hotel employees in Muscat serving as the major target group. Responses from 164 individuals were gathered for the study using a questionnaire.
Findings- Flexible Working Hours (4.27) was the work-life balance practise used in hotels to assist employees in finding a balance between work and family life. Career breaks (4.35) have the highest mean rating for work-life balance practises that motivate employees to stay with their employers. The results show that there is a positive and significant relationship between work-life balance and employees' career development, with a Pearson's r value of 0.451 and a p-value of 0.000 < 0.01. Further, the Pearson's r correlation shows that work-life balance and employee retention are positively and significantly correlated, with the obtained Pearson's r value of 0.634 and a p-value of 0.000 < 0.01.
Conclusion- The results of this research indicate that hotels that promote work-life balance will reap benefits such as higher job satisfaction, lower turnover rates, possibilities for career advancement, better morale, and higher organisational productivity.

Keywords: Work-life balance, luxury hotels, employees, career breaks, work-life balance initiatives
JEL Codes: N30, J53, M54

1. INTRODUCTION

The hotel sector is one of the fastest growing in the world, providing customers with food and beverages, lodging, and a hygienic atmosphere (Pizam, 2009). In addition, the hotel business is one of the primary economic drivers in the country (Sadiqe, 2014). Besides, the hotel industry encompasses a wide range of entrepreneurial activities that offer different services to guests and tourists (Wang & Walumbwa, 2007). Likewise, the industry is a crucial component of a region's social and economic development, as it offers many job opportunities (Sadiqe, 2014). The hotel industry has experienced a wave of success over the past decade and has grown significantly with an increase in global income (Pizam, 2009). However, employees, who are an essential part of the industry, have significantly contributed to its success (Maiti, 2017). Additionally, Elmadağ & Ellinger (2018) found that hotel staff are the most crucial resource and play a significant role in building positive and positive client experiences, which leads to increased customer satisfaction. Likewise, hotel employees' importance in the hotel industry is to enhance hotel performance and service quality and achieve organizational objectives, which leads to customer satisfaction and loyalty (Aggarwal, 2012). Hotel employees, including front desk workers, porters, waiters, and laundry room attendants, are significant because they are the ones who perform the fundamental role of ensuring that the firm works smoothly (Maiti, 2017). Workers are vital assets in the hotel industry because they act as the backbone of business success (Aggarwal, 2012). Similarly, Chand (2016) stated that the hotel industry's success depends entirely on its workers, who are key to the hotel's success. Ghebregiorgis (2018) described hotel employees as the backbone, treasure, and power of a hotel's success. However, a significant percentage of hotel staff members are quitting their

jobs. Compared to other industries, the hotel sector has a substantially higher turnover rate (Chand, 2016). It is crucial to pay attention to employee welfare and ensure that employees continue to work for hotels in the future. The balance between work and life is important as the turnover rates in hotel industry is high.

Work-life balance initiatives are thoughtful organizational plans created to diminish the conflict between professional and personal lives and empower workers to excel in their tasks (Lazar et al., 2010). Many employers have started offering work-life balance initiatives, such as working from home, flexible work times, compressed workweeks, teleworking, part-time work, job sharing, and retirement planning (Yadav & Rani, 2015). Cushing (2004) stated that the hotel industry has customarily been known to have a culture of elongated working hours, which can result in burnout, redundant exhaustion, and pressure on hotel workers, leading to dissatisfaction at work. Moreover, according to Peshave & Gujarathi (2014), the hotel industry is characterized by working long hours, and 12–14 hours are the average working hours of hotel workers. Therefore, managers in the hotel industry must look for the interests of their employees. However, Eldeen & Shawky (2017) argued that when work-life balance is set as an organizational goal and achieved, the industry would enhance organizational performance, involving increased cost-saving, enhanced productivity, enhanced social exchange processes, and minimized turnover.

The Sultanate of Oman was ranked as one of the top ten best countries for work-life balance and scored 9th for good work-life balance; employees were happy and satisfied with their work-life balance' (Times of Oman, 2018). The current work-life balance initiatives followed in Oman include flexible working hours, health insurance, shift work, and part-time and maternity leave (Belwal & Belwal, 2014). Furthermore, many organisations concentrate on work-life balance (WLB) because of its positive impact on workers, such as retaining highly talented and qualified employees, increasing productivity, and minimising worker absenteeism and turnover (Belwal & Belwal, 2014). However, research on employees' work-life balance in the hospitality sector, particularly the hotel industry, is at a minimum level, so this study was undertaken with the main objective of attempting to fill that gap: to analyse the work-life balance initiatives practised in Muscat hotels, and to examine the influence of work-life balance initiatives on employee career development and retention. The subsequent parts of the study followed a literature review on work-life balance initiatives in the hotel industry, as well as the effect of work-life balance initiatives on employee careers and retention, as well as methodology. Furthermore, the study's findings, discussion of the findings, conclusion, recommendations, practical implications, and limitations were all provided.

2. LITERATURE REVIEW

Anisha & Melvin (2020) stated that the concept of work-life balance (WLB) is known as the capability of individuals to balance and manage work and personal life, and the term work refers to ambition and career, while personal life is about family, pleasure, spirituality, health, and leisure. In addition, work–life balance (WLB) is crucial because it assists in preventing burnout and reducing the stress of employees in their workplace (Lazar et al., 2010; Silaban & Margaretha, 2021). Many studies claim that work-life balance is significant in the workplace, as it leads to positive results such as reduced turnover, job satisfaction, work engagement, retained workers, organizational commitment, increased firm productivity, and organizational citizenship behaviour (Konrad & Mangel, 2000; Wang & Walumbwa, 2007). Others who have examined imbalance in work life noticed that it caused employee resignations, perceived job overload, employee psychological well-being, and lowered psychological capital, which led to different behavioral and emotional issues such as guilt, depression, anxiety, and elevated sickness absence, which caused more absenteeism and poor performance among workers (Sen & Hooja, 2015). In addition, researchers have claimed that work-life balance is crucial for many reasons such as increased job satisfaction, improved morale, reduced recruitment costs, low turnover intentions, and improved employee performance and productivity in the workplace (Scandura & Lankau, 1997). Furthermore, many studies have claimed that there are many benefits of work-life balance, including happiness at the job, increased focus at work, employee retention, continuous improvement, increased employee retention, reduced stress, positive contribution, improved motivation, and productivity (Yadav & Rani, 2015). Furthermore, the work–life balance policies of organizations must assist employees in balancing their work and family, as well as help workers readily cope with the conflicting fields of professional and private lives (Eldeen & Shawky, 2017).

2.1. The Work-Life Balance Initiatives in the Hotel Industry

Human resource practitioners, researchers, and human capacity development organisations have focused more on work-life balance programmes in recent years (Agha et al. 2017). Garg & Yajurvedi (2016) detailed that work-life balance is about maintaining and creating positive work surroundings that allow workers to balance professional and other activities, such as family, leisure, personal development, and community, increasing workers' productivity and loyalty. However, Hobson et al., (2001) argued that a lack of work-family balance could influence turnover rate, health, satisfaction level, career longevity, and organizational loyalty, leading to dissatisfaction in both career and life. As a result, companies give utmost significance to work-family balance initiatives to get the finest out of their workers (Narayanan & Narayanan, 2012). Additionally, the hospitality industry realized the significance

of the work-life balance of its workers and started offering different initiatives, such as part-time work, teleworking, flexible schedules and job-sharing programs at the workplace (Kamran et al., 2014).

2.1.1. Flexible Working Hours

Recently, flexible working hours have attracted much interest from scholars and organizations as a family friendly policy (Shagvaliyeva & Yazdanifard, 2014). Scandura & Lankau (1997) mentioned that flexible working, also known as flexitime or flexitime, involves arrangements that enable workers to manage and decide their work schedules. Hotels in Muscat have introduced flexible working hours to assist employees in achieving their professional and personal responsibilities (Shagvaliyeva & Yazdanifard, 2014). Some organizations in Oman have introduced flexible working hours arrangements, including flexible scheduling and work-from-home, to promote employees' productivity and morale (Kutty, 2021). Hotels in Muscat provide flexible working hours because of the benefits of flexibility provided to employees, especially female staff (Belwal & Belwal, 2014).

2.1.2. Compressed Work Week

Employees in the hotel business can work long hours per day but fewer days per week; thus, they work fewer than five workdays and roughly 35 hours per week. For example, a permanent employee could work for four days at 10 hours rather than five 8-hour days (Wadsworth & Facer, 2016). According to Richman et al. (2008), compressed workweeks are suitable for hospitality employees because they increase workers' morale and productivity and reduce worker turnover, absenteeism, and stress. According to Alison and Hall (2017), compressed work weeks enable workers to concentrate on other tasks during downtime, such as training, enrolling in more challenging certificate programs, managing their own enterprises, and performing other crucial tasks. Moreover, Chaturvedi (2016) stated that although the hotel industry has a bad reputation for working long hours due to compressed work weeks, for some hotel employees, the workweek is now four days a week.

2.1.3. Working from Home

Working from home, telecommuting, or teleworking was one of the company's initiatives to improve employees' work-life balance (Elena, 2021). In addition, many hotels provide telecommuting jobs, including Hilton Hotel was one of them (Hilton Careers Team, 2020). According to Chaturvedi (2016), work-life balance initiatives are essential; therefore, some hotels have provided working-from-home options to their employees. However, Belwal & Belwal (2014) argued that, although some hotels provided working from home options in Muscat to their employees, others did not agree with the idea of working from home and did not think teleworking would be suitable for the hotel industry.

2.1.4. Health Insurance

According to Anita (2015), almost all hospitality organizations provide health insurance to their employees. In addition, hospitality employers' benefit from offering health insurance to their employees, which helps them retain and recruit high-quality employees (Prata & Silva, 2013). The hospitality industry provides health insurance to its workers to reduce turnover and absenteeism, and increase productivity in the workplace (Wedderburn, 2000). Additionally, according to Azeem (2010), some organisations provide health insurance benefits to their workers and family members, including longstanding disability insurance, life insurance, temporary disability insurance, vision and dental insurance, dismemberment insurance, and accidental death. Furthermore, Kutty (2021) noted that Muscat hotel employers provide medical insurance to all their employees, as well as their families in some situations. Employees can seek treatment in private hospitals.

2.1.5. Paid Parental Leave

According to Earle & Heymann (2019), parental leave is the time off work associated with a child's birth or adoption. In addition, Anita (2015) described that almost all hospitality organisations provide health insurance for their employees. Besides, employers' benefit from offering health insurance to their employees, which helps them retain and recruit high-quality employees (Peshave & Gujarathi, 2014). The hospitality industry provides health insurance for its workers to reduce turnover and absenteeism, and increase productivity in the workplace (Gibson, 2019). Earle & Heymann (2019) stated that the benefits of paternity leave include acknowledging the role of a spouse in helping his wife, protecting the well-being of the child and mother, assisting working couples in accomplishing work-life balance, and recognizing that women and men are complementary beings. Moreover, according to Kutty (2021), paid parental leave is a relatively prevalent practice in many organisations in Oman.

2.2. The Influence of Work-Life Balance Initiatives on Employee Career and Retention

Many researchers have emphasised the significance of work-life balance initiatives, such as time flexibility, a condensed workweek, working from their homes, parental leave, and health insurance, on employees' career development and retention of skilled and talented workers (Alison & Hall, 2017). Furthermore, Richman et al. (2008) discovered a link between work-life balance programmes

and workers' career advancement and retention. Furthermore, work-life balance initiatives aid employees accomplish their professional and family lives, which promotes employee retention and advancement in their careers (Roehling et al., 2001). Sumanarathna & Samarakoon (2019) also suggest that some work-life initiatives have a stronger influence on employee retention, as seen in Figure 1.

Figure 1: Work Life Balance Initiatives on Employee's Retention

According to Garg & Yajurvedi (2016), work-life balance influences worker career and retention: when workers have a positive or work-family balance, they increase their productivity and feel satisfied working for the organization, which makes the organization try to retain workers because they have provided benefits for the company and show good performance. Much of the literature claims that work-life balance practices, such as compressed work schedules, job sharing, career breaks, and flexible work hours, have a crucial and positive impact on workers' retention (Borstorff & Marker, 2007; Cegarra-Leiva et al., 2012). Moreover, the effect of work-life balance initiatives on employee career and retention is that work-life balance allows workers to work more effectively, which facilitates the retention of talented and valuable workers for companies (Konrad & Managel, 2000). Additionally, many researchers have claimed that work-life balance initiatives such as work-from-home programs, part-time work, Sabbatical leave, childcare facilities, fitness centers, and sports facilities are key drivers of employee retention (Perry-Smith & Blum, 2000; Kossek & Ozeki, 1998).

Furthermore, much of the literature claims that work–life balance policies have a strong influence on employee careers and retention, as work-life balance initiatives enhance productivity, increase loyalty, and reduce worker stress, which leads to employee retention (Narayanan & Narayanan, 2012; Roehling et al., 2001). Besides, Walker (2001) stressed that a healthy equilibrium between work and family life positively affects a business organisation as it increases productivity, retains talented employees, and motivates employees. Moreover, Kristen et al. (2017) emphasized that work-life balance practices, such as career breaks, job sharing, and paid maternity leave, have a positive influence on worker career and retention, as they attract top talent and increase organizational productivity.

3. METHODOLOGY

This study used quantitative research because it focuses on assessing and quantifying factors to produce findings (Williams, 2011). It comprised statistical evaluation and numerical data that addressed issues like "what," "who," "when," "where," "how much," and "how many" (Saunders et al., 2012). Additionally, quantitative research approaches involve gathering data in numerical form and then evaluating it with the aid of mathematical techniques, particularly statistics, to explain a phenomenon or problem (Apuke, 2017). This study employed descriptive research, which provides a detailed account of the circumstances, populations, and phenomena. It focused on addressing what, where, how, and when of the research, but skipped over the reasons (Sahin & Mete, 2021). According to Kabir (2016), descriptive research entails obtaining information to address queries regarding the actual instance of the study's topic, seeking to gather in-depth information and data by outlining the subject in great detail or testing hypotheses. In this analysis, non-probability sampling, also known as non-random sampling or a sampling technique, was utilized. Saunders et al. (2012) defined this method as one in which not every participant in the population has an equal chance of taking part in the study. Purposive sampling was used in this study, and hotel employees employed in Muscat, Oman, were the primary target population. The study was conducted on 164 people from Muscat and Oman. A questionnaire was used to collect information from the study participants (Williams, 2011). The questionnaire solicited responses from a population or sample whose opinions were closely related to the study's goals (Kothari, 2004). This was performed using the frequency distribution, percentage, rank, and

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weighted mean. A statistical method known as frequency distribution is used to ascertain the distribution of respondents and the frequency of respondents who fit a particular profile, such as gender, age, and marital status. Using the percentage, it was possible to determine the proportion of respondents and the percentage of respondents who met a particular profile. To draw conclusions, additional pertinent statistical tools, such as correlations, were used.

4. RESULTS

4.1. Respondents Profiles

Table 1 shows that 56.1 percent of the respondents were women and 43.9% were men. Between the ages of 21 and 30, 23.8% of the respondents were in this age range. The remaining respondents (31.6 %) were between 41 and above, while 44.6 % were between the ages of 31 and 40. Furthermore, 58.6% of the respondents held a bachelor's degree. A diploma was obtained from 29.9% of the respondents. Master's degrees were obtained from 11.5% of respondents. There was no response from a secondary school or a doctorate. Additionally, 26.3% of the respondents worked at the reception. Security occupations were held by 22% of the respondents. Respondents from the food and beverage section accounted for 17.7% of the sample. Of the respondents, 15.9% worked in a hotel operations department. Sales- and marketing-related respondents made up 12.8% of the sample, whereas other departments made up 5.3%. Finally, in terms of years of experience, the majority of respondents (39.1%) had 4 to 7 years of experience, while 31.7% had 0 to 3 years. Consequently, 11.5 percent had 11 or more years of experience, followed by 17.7% with 8–10 years of experience.

Table 1: Profile of Respondents

Description	Frequency	Percentage
Gender		
Male	72	43.9
Female	**92**	**56.1**
Age		
21-30	39	23.8
31-40	**73**	**44.6**
41 and above	52	31.6
Education level		
Secondary School	0	0
Diploma	49	29.9
Bachelors	**96**	**58.6**
Masters	19	11.5
Doctorate	0	0
Department		
Reception	**43**	**26.3**
Security	36	22.0
Food and Beverage	29	17.7
Hotel Opertations	26	15.9
Sales & Marketing	21	12.8
Others	9	5.3
Years of Service		
0-3	52	31.7
4-7	**64**	**39.1**
8-10	29	17.7
11 and above	19	11.5

According to Figure 2, 59.7% of the respondents were currently able to manage their job and personal lives, while the remaining 40.3% admitted that they were unable to do so. This indicates that only approximately 60% of people are currently able to manage their professional and personal lives, with the remaining 40% finding it difficult to do so. A total of 40% is substantial; therefore, the focus is crucial.

Figure 2: Do you feel that you are currently able to balance your work with your family?
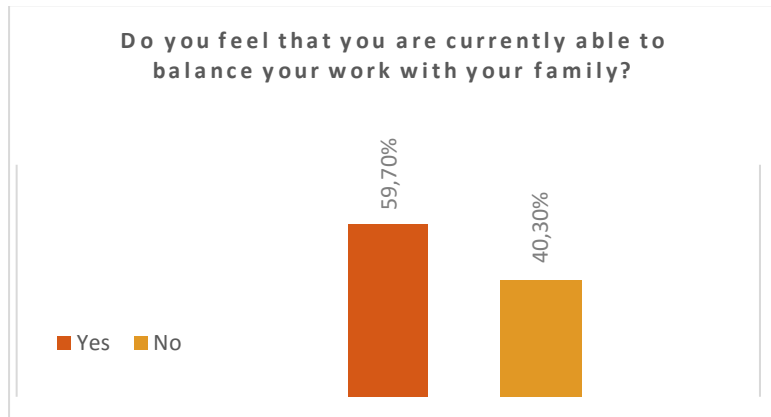
The work-life balance initiatives used in Muscat luxury hotels are listed in Table 2. The most popular work-life balance technique used in Muscat hotels was health insurance (82%). More and more businesses understand that by offering health insurance to their staff and workers, they can safeguard and promote their health and wellbeing, allowing them to be active and productive. The second, third, and fourth work-life balance initiatives that were used were emergency leave (73%), paid parental leave (61%), and career breaks (58%), respectively. This suggests that hotels in Muscat provide paid paternal and maternal parental leaves, career breaks, and emergency leaves to their staff. Job sharing (44%), flexible working hours (41%), and work-from-home options (37%) were further work-life balance initiatives implemented in Muscat hotels that were placed fifth, sixth, and seventh. On-site wellness programmes (34%), part-time employment options (17%), and reduced work weeks (8%) were other work-life balance efforts implemented at Muscat hotels. None of the respondents chose any of the work-life programmes listed below; possibly they were not available in their hotels. These initiatives include onsite childcare services, paid time off for life events, financial help for children's education, sabbatical leave, and paid time off for volunteering.

Table 2: Work-Life Balance Initiatives Practiced in the Hotels in Muscat

Work life balance initiatives	Percentage	Rank
Health Insurance	**82%**	**1**
Emergency Leave	73%	2
Paid Parental Leave	61%	3
Career Breaks	58%	4
Job Sharing	44%	5
Flexible Working Hours	41%	6
Work from Home Options	37%	7
On-site Wellness Programs	34%	8
Part-time Work Choices	17%	9
Compressed Work Weeks	8%	10
Onsite childcare Facilities	0%	11
Paid leave to attend life events	0%	12
Support children's education	0%	13
Sabbatical leave	0%	14
Paid leave to do community service	0%	15

Table 3 lists the work-life initiatives that have been found most likely to support employees in harmonizing work and family life. The highest mean score (4.27), which is ranked number one, is "Flexible Working Hours." By having flexible working hours, employees can more easily fulfil their commitments outside of work, such as taking care of family members, participating in various training sessions, exercising, and attending social and professional events. The second highest mean score is "Health Insurance (4.19)". It demonstrates how highly regarded health insurance is among the best work-life programmes among employees. Everyone's health is obviously vital, and when something goes wrong, workers find it difficult to concentrate and perform well. Paid parental leave (4.13) and part-time employment (4.06) are other work-life initiatives. "Strongly Agree" is the verbal interpretation

for each of them. This indicates that the employees genuinely cherish them. Other important work-life balance initiatives stated by respondents were compressed work weeks (3.96), career breaks (3.77), paid leave to attend life events (3.58), physical fitness and exercise facilities at work (3.24), and work-from-home options (3.01). The lowest mean scores recorded for two work-life balance initiatives, ranked 13 and 14, were paid leave to do community service (2.11) and sabbatical leave (2.04), respectively.

Table 3: In your opinion, which work-life balance initiatives may help you strike a balance between work and family life?

Initiatives	Mean	Standard Deviation	Rank
Flexible Working Hours	**4.27**	**1.071**	**1**
Health Insurance	4.19	0.993	2
Paid Parental Leave	4.13	1.116	3
Part-time Work Choices	4.06	1.217	4
Compressed Work week	3.96	1.292	5
Career Breaks	3.77	1.058	6
Emergency Leave	3.71	1.151	7
Paid Leave to Attend Life Events	3.58	1.260	8
Onsite Wellness Programs	3.24	1.244	9
Work from Home Options	3.01	1.394	10
Job Sharing	2.91	0.916	11
Support Children's Education	2.76	1.320	12
On-site Childcare Facilities	2.48	1.079	13
Paid leave to do community service	2.11	0.941	14
Sabbatical Leave	2.04	1.248	15
Total	**3.35**	**1.153**	**15**

Figure 3 demonstrates that 77% of respondents agreed that implementing work-life balance practices helps employees advance their careers and retention. This indicates that a large proportion of respondents agreed that implementing work-life balance practices aids employees in advancing their careers. None picked up the "no" option, while 23 percent selected "sometimes."

Figure 3: Do you believe that work-life balance practises assist employee retention and career advancement?

According to Table 4, career breaks (4.35) have the highest mean rating for work-life balance practises that motivate employees to stick with their employers. This indicates that a large percentage of respondents' favourable career breaks provide employees with a chance to recharge and avoid tiredness. During this break, employees might learn new skills that could help them offer new perspectives and creative ideas to the office. Flexible working hours (4.29), and emergency leaves (4.11), received the 2nd and third-best mean scores, respectively. There are several reasons why employees seek flexible working hours in the workplace. Improving general well-being, fulfilling oneself, a wide range of habits, obligations to one's family, alleviating stress, and leisure and recreational pursuits are the motivations behind the need for flexible working hours. Therefore, if organisations want to retain their employees, they need flexible working arrangements. Hotels should also provide emergency leaves, as respondents seek time

off from work to attend a few specific events in their lives. Companies must be aware of these factors and provide paid time for workers. Part-time employment opportunities (3.96), health insurance (3.72), paid parental leave (3.53), work-from-home choices (3.44), and shortened work weeks (3.26) are additional work-life policies that motivate employees to stick with their employer. Hotels are expected to consider these factors and accommodate staff to ensure retention. The lowest mean scores recorded for physical fitness and exercise facilities at work were 2.83.

Table 4: Which work-life practises do you think could motivate workers to stay with their employers?

Initiatives	Mean	Standard Deviation	Rank
Career Breaks	**4.35**	**1.117**	**1**
Flexible Working Hours	4.29	1.302	2
Emergency Leaves	4.11	1.074	3
Part-time Work Choices	3.96	0.989	4
Health Insurance	3.72	1.211	5
Paid Parental Leave	3.53	1.073	6
Work from Home Options	3.44	1.124	7
Compressed Work Weeks	3.26	0.974	8
Paid Leave to Attend Life Events	3.01	1.253	9
Onsite wellness programs	2.83	1.156	10
Total	**3.65**	**1.127**	**10**

Table 5 demonstrates a positive and significant association between work-life balance and professional development for employees. This was indicated by the Pearson's r value of 0.451 and a p-value of 0.000 < 0.01. The results suggest that work-life balance efforts by hotels can assist employees in advancing their careers.

Table 5: Relationship between Work Life Balance Practices and Employee Career Development

Variables		Work Life Balance Practices	Employee Career
Work Life Balance Practices	Pearson's r Correlation	1	.451**
	Sig. (2-tailed)		0.000
	N	164	164
Employee Career	Pearson Correlation	.651**	1
	Sig. (2-tailed)	0.000	
		164	164

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

Table 6 shows that work-life balance and employee retention are positively and significantly correlated, respectively. This was indicated by the Pearson's r value of 0.634 and a p-value of 0.000 < 0.01. The findings indicated that hotel employees benefited from work-life balance initiatives in various ways and preferred to stay in hotels for longer periods of time.

Table 6: Relationship between Work Life Balance Practices and Employee Retention

Variables		Work Life Balance Practices	Employee Retention
Work Life Balance Practices	Pearson's r Correlation	1	.634**
	Sig. (2-tailed)		0.000
	N	164	164
Employee Retention	Pearson Correlation	.634**	1
	Sig. (2-tailed)	0.000	
		164	164

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

According to Figure 4, 79.10% of the respondents agreed that workplace initiatives to help employees balance their personal and professional lives are beneficial for organizational productivity and success. This demonstrates that the majority of respondents thought initiatives to help employees balance their personal and professional lives were advantageous to the success and productivity of the organisation. No one has contested this assertion. However, 20.90% of the respondents stated that they were uncertain.

Figure 4: Do you think efforts to balance the work and personal lives of employees are beneficial for organizational productivity and success?

Do you think efforts to balance the work and personal lives of employees are beneficial for organisational productivity and success?

NOT SURE — 20,90%
NO — 0%
YES — 79,10%

0,00% 10,00% 20,00% 30,00% 40,00% 50,00% 60,00% 70,00% 80,00% 90,00%
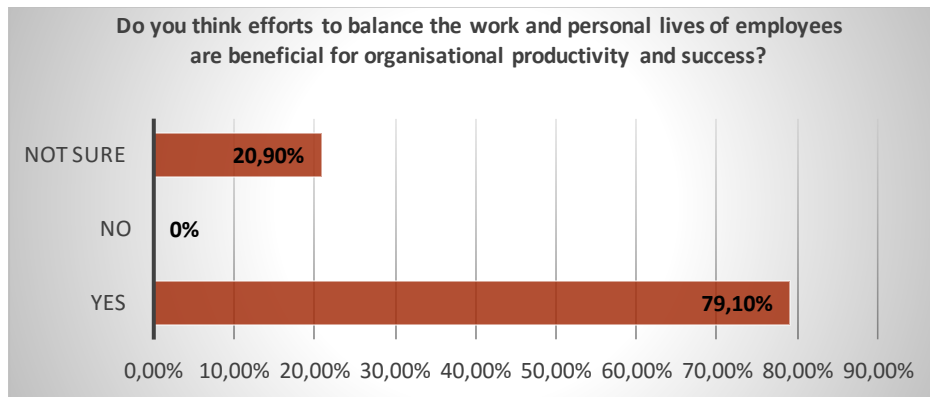
5. DISCUSSION

Objective One: To analyse the work-life balance initiatives practiced in Muscat hotels

The findings in Table 2 indicate that the majority of the respondents noted that the work-life balance initiative practiced by Muscat hotels includes flexible working hours (4.27). This finding is compatible with Peshave & Gujarathi (2014), who stated that the hotel industry offers flexible working hours to minimize the gravity of long working hours. The results further agree with Shagvaliyeva & Yazdanifard (2014) and Ghebregiorgis (2016), who stated that Muscat hotels have introduced flexible working hours to assist employees in achieving professional and life responsibilities and fulfilling work-life balance. In addition, some of the initiatives that Muscat hotels use are flexible working hour arrangements and flexible scheduling (Scandura & Lankau, 1997).

Based on the findings (Table 2), most respondents said that health insurance (4.19) is part of the work-life balance initiative practiced by the Muscat hotel. This finding agrees with the literature, which shows that organizations provide health insurance benefits to their workers and family members. Health insurance covers a large part of workers' medical insurance premiums (Wedderburn, 2000; Belwal & Belwal, 2014; Prata & Silva, 2013; Kutty, 2021). In addition, this is consistent with almost all hospitality organizations providing health insurance to their employees to reduce turnover (Anita, 2015; Wang & Walumbwa, 2007). Some hotels in Muscat offer a myriad of benefits to their full-time workers, including long-term disability insurance, temporary disability insurance, life insurance, vision insurance, dental insurance, dismemberment insurance, and accidental death (Hilton Careers Team, 2020). The previous findings are consistent with the literature that states that Muscat hotel employers state that 'medical insurance is a must, and we provide medical insurance for our workers, and they can go to private hospitals.'

In addition, the finding further noted that (Table 2) most respondents stated that paid parental leave (4.13) is a work-life balance initiative practiced by the Muscat hotel. The findings are consistent with those made by Earle & Heymann (2019), Anita (2015), Peshave & Gujarathi (2014), and Gibson (2019), all of whom suggested that paid parental leave can help working couples achieve a work-life balance and acknowledge that women and men are complementary beings. This finding is consistent with the literature, which states that the Hilton Muscat Hotel made the decision to provide parental leave to support their employees. This decision benefited all Hilton Hotel team members, including those paid on a salary and hourly basis (Great Place to Work, 2018). Moreover, the Muscat Hilton Hotel gives ten weeks of leave with full pay to the mother who has given birth, and adoptive parents and fathers can take paid leave for two weeks (Hilton Newsroom, 2019).

Objective Two: To examine the influence of work-life balance initiatives on employee career and retention

Based on the findings in Figure 2, the majority of the respondents (77 %) stated that the implementation of work-life balance practices helps worker retention and career advancement. These findings match the literature that there is a direct relationship

between work-life balance programmes and workers careers and retention; work-life balance initiatives help workers manage their work and family lives, which influences employee retention and career development (Roehling et al., 2001; Garg & Yajurvedi, 2016). In accordance with the findings (Table 3), the majority of respondents stated that career breaks (4.35) encourage employees to remain with their employers. This finding is compatible with the literature, as Perry-Smith & Blum (2000) and Silaban & Margaretha (2021) described that work-life balance influences a worker's career and retention. According to the authors, when workers have a positive work-family balance, they will increase their productivity and feel satisfied working for the organization, which makes the organization try to retain workers because they have provided benefits to the company and show good performance. Furthermore, the other literature that is compatible with this finding is that work-life balance practices such as compressed work schedules, job sharing, career breaks, and flexible work hours have a crucial and positive impact on worker retention (Borstorff & Marker, 2007; Cegarra-Leiva et al., 2012).

Table 4 demonstrates a positive and significant association between work-life balance and career advancement for employees. This was indicated by the Pearson's r value of 0.451 and a p-value of 0.000 < 0.01. The results suggest that work-life balance efforts by hotels can assist employees in advancing their careers. These findings are consistent with the literature (Alison & Hall, 2015), which states that work-life balance initiatives such as flexible working hours, a compressed workweek, working from home, paternity leave, and health insurance have a positive influence on employees' career development, retaining skilled and talented workers. Additionally, Walker (2001) stressed that a healthy equilibrium between work and family life positively affects a business organization as it increases productivity, retains talented employees, and motivates employees to develop. Furthermore, the findings are consistent with the literature showing that work-life balance initiatives such as work-at-home programs, part-time work, sabbatical leave, childcare facilities, fitness centers, and sports facilities are key drivers of employee retention and career progression (Perry-Smith & Blum, 2000; Kossek & Ozeki, 1998; Kristen et al., 2017).

Table 5 shows that work-life balance and employee retention are positively and significantly correlated, respectively. This was indicated by the Pearson's r value of 0.634 and a p-value of 0.000 < 0.01. The findings indicated that hotel employees benefited from work-life balance initiatives in various ways and preferred to stay in hotels for longer periods of time. These results are in line with those reported in the literature. According to Richman et al. (2008), work-life balance initiatives such as flexible working hours, a compressed workweek, working from home, paternity leave, and health insurance have a positive influence on employees' careers, retaining skilled and talented workers. The results further agree with Narayanan & Narayanan (2012), Roehling et al. (2001), and Cegaraa-Leiva (2012), who claim that work–life balance policies have a strong influence on employee careers and retention, as work-life balance initiatives enhance productivity, increase loyalty, and reduce worker stress, which leads to employee retention. These results are further compatible with the literature showing that the effect of work-life balance initiatives on employee career and retention is that work-life balance allows workers to work more effectively, which facilitates the retention of talented and valuable workers for companies (Kossek & Ozeki 1998; Konrad & Managel, 2000; Borstorff & Marker, 2007).

6. CONCLUSION

The study's main aim was to examine the work-life balance initiatives used in Muscat hotels and investigate the impact of these initiatives on employee retention and career opportunities. Based on these findings, work-life initiatives are important for hotels and will aid staff in balancing their personal and professional lives. Flexible work schedules were one of the work-life efforts that assisted hotel employees in striking a balance between their jobs and personal lives. Additionally, career breaks are a work-life policy that motivates employees to stick with their company. The results also show that work-life balancing practices help with employee retention and career progression and that efforts to help employees balance their personal and professional lives are good for an organization's productivity and success. The main outcomes of the study demonstrate a favourable correlation between work-life efforts and employee careers and retention. Finally, respondents believe that hotels strive to strike a balance between employees' work and their personal lives, which is good for organizational performance and productivity.

6.1. Recommendations

It is critical to accommodate employee requirements in accordance with the hotel's work–life balance practices because a sizable portion of respondents in the current study claimed that they were unable to reconcile their job and personal lives. Instead of implementing the same initiatives for all employees, hotels have to clearly communicate the work-life balance initiatives that are being implemented to staff members and assist them in choosing the initiatives that best suit them. Besides, hotels should develop innovative work-life initiatives for staff members because they lower workplace stress, such as sabbatical leave, part-time work, and phased retirements. The study also recommends that Muscat hotels offer career breaks to staff members because they are critical to employee growth, work satisfaction, productivity, and turnover reduction. This study suggests that hotel management implement more work-life balance practices, such as providing staff with paid time off to use fitness facilities, reducing the length of workdays for those with young children, and providing on-site childcare and options for working from home.

6.2. Practical Implications

To assist employees in balancing their professional and personal lives, hotel managers must implement work-life balance practises. The study's findings reveal a link between work-life balance practises and employee retention and job satisfaction; thus, hotels should implement multiple work-life balance initiatives. Managers must provide flexible work schedules, health insurance for employees and their families, support children's education, part-time employment options, and paid leave to do community service. Along with this, practices such as career breaks, paid time off for important life events, and reduced work weeks can help employees stay with a company in the long term. The majority of respondents indicated that work-life balance practices inspire them to work diligently, which increases organizational productivity and success. Therefore, hotel managers should encourage staff members to choose practices that best meet their needs.

6.3. Limitations

Like any study, this study has its limitations, and there is room for further investigation and numerous perspectives on this problem. Future research may look at the same topic in other towns and cities in Oman, as this study concentrates on luxurious hotels in Muscat. Work-life programs at other hotels in Muscat, such as those in the four- to one-star range, and their effects on organizational effectiveness and staff well-being may be the subject of future research. Future studies could also examine the value of career breaks in employee development and in increasing organizational productivity. Future research can also concentrate on the implementation of flexible working in hotels, as many respondents in the current study chose this practice as one of their top work-life initiatives. A qualitative study may also be conducted to determine more about work-life balance practices and how they impact employees. Finally, additional research can examine employees' ages and genders to see how they affect work-life balance.

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INTEGRATING CYBERSECURITY RISK MANAGEMENT INTO STRATEGIC MANAGEMENT: A COMPREHENSIVE LITERATURE REVIEW

Filiz Mizrak
Beykoz University, Business Administration, Istanbul, Turkiye.
fmizrak@medipol.edu.tr , ORCID: 0000-0002-3472-394X

ABSTRACT

Purpose- This literature review aims to delve into the nexus between cybersecurity risk management and strategic management, comprehensively exploring how organizations weave risk management strategies into their broader strategies to safeguard digital assets and infrastructure against the backdrop of ever-evolving cyber threats.
Methodology- The review employs a qualitative methodology, synthesizing insights from a diverse selection of scholarly works encompassing cybersecurity, risk management, and strategic management. These insights are analyzed to unveil patterns and trends that highlight the integration of cybersecurity risk management within strategic organizational frameworks.
Findings- The review uncovers a critical interdependence between cybersecurity risk management and strategic management, showcasing how organizations formulate proactive measures to mitigate cyber risks while aligning them with overarching strategic goals. It also underscores the role of organizational culture, leadership commitment, and technological advancements in shaping effective cybersecurity risk management strategies.
Conclusion- The synthesis of scholarly findings accentuates the pivotal role of cybersecurity risk management in modern organizations. The review underscores the importance of fostering a strategic mindset towards cybersecurity, with a proactive approach that integrates risk management efforts within the broader organizational strategy. This not only shields digital assets but also promotes resilience, enabling organizations to thrive despite an increasingly dynamic and hostile digital landscape.

Keywords: Strategic management, cyber security, cyber risks, risk management, organizational strategy.
JEL Codes: M00, M10, M15

1. INTRODUCTION

The contemporary business landscape is irrevocably transformed by the relentless wave of digitalization, ushering in unparalleled connectivity, efficiency gains, and transformative opportunities. However, this digital evolution is accompanied by an ominous undercurrent—the surging tide of cyber threats and attacks that jeopardize the very foundations of organizations' operations, data security, and reputation. As businesses pivot towards digitization to thrive in this era of innovation, the imperative to safeguard digital assets has never been more pressing (Lee, 2021).

The growing recognition of the need to align cybersecurity risk management with overall organizational strategies has emerged as a pivotal paradigm shift. No longer confined to the realm of IT departments, cybersecurity risk management now demands a seat at the strategic management table. Organizations are acknowledging that the repercussions of cyber threats extend beyond technical setbacks to profoundly impact business continuity, stakeholder trust, and competitiveness. Consequently, the integration of cybersecurity risk management within overarching organizational strategies has become an imperative of paramount significance (Thach et al., 2021).

This study embarks on a comprehensive exploration of the integration of cybersecurity risk management into strategic management. It seeks to unearth the intricate nuances of this integration, shedding light on how organizations forge a cohesive relationship between safeguarding against cyber threats and achieving overarching strategic objectives. While striving to provide a comprehensive understanding, it is important to note that this study may not encompass every context or organizational approach. The uniqueness of this research lies in its holistic approach, bridging the gap between cybersecurity and strategic management, and addressing the dynamic challenges of the digital age.

The paper unfolds as follows: the subsequent section delves into the dynamic landscape of cybersecurity risk management within the strategic context, exploring its implications and potential. This is succeeded by an exploration of how organizations formulate effective strategies to manage cyber risks within their strategic planning. Subsequently, the paper highlights the crucial alignment of cybersecurity risk management with organizational strategies, showcasing its practical implications. As the paper progresses, it unveils how integrated risk management enhances organizational resilience and facilitates effective incident response. The study also acknowledges the challenges and barriers that organizations may face during this integration process. A discussion on measuring the impact and assessing the effectiveness of integrated cybersecurity risk management follows, before the paper concludes by offering insights into future trends and directions in this critical domain.

2. LITERATURE REVIEW

2.1. Cybersecurity Risk Management in Strategic Management

The integration of cybersecurity risk management within the realm of strategic management represents a paradigm shift that acknowledges the inseparable link between digital resilience and organizational strategy. By weaving cybersecurity risk considerations into strategic decision-making processes, organizations embrace a proactive stance against evolving cyber threats, aligning protective measures with overarching business objectives. This symbiotic integration enables organizations to not only fortify their digital infrastructure but also leverage their strategic initiatives to bolster cyber resilience, cultivating a cohesive approach that safeguards assets, ensures business continuity, and upholds stakeholder trust in an increasingly digitized landscape (Giuca et al., 2021).

2.1.1. Explanation of the Concept of Cybersecurity Risk Management and Its Significance

Cybersecurity risk management stands as a multifaceted approach aimed at identifying, evaluating, and mitigating the potential risks posed by cyber threats to an organization's digital assets, sensitive data, and critical infrastructure. This proactive strategy involves a systematic assessment of vulnerabilities, potential threats, and the potential impact of breaches or attacks. The objective is to formulate strategies that minimize the likelihood of cyber incidents, reduce the potential damage, and enable effective recovery in case of a breach. (Jakka, Yathiraju & Ansari, 2022). The significance of cybersecurity risk management lies in its pivotal role in safeguarding the integrity, confidentiality, and availability of digital resources that underpin modern business operations. In today's interconnected world, where data is a strategic asset, cyber threats have the potential to disrupt operations, compromise customer trust, and inflict financial losses. By embracing cybersecurity risk management, organizations can proactively identify weak points in their digital infrastructure, assess their exposure to threats, and design resilient strategies to counteract potential risks (Goel, Kumar & Haddow, 2020).

Moreover, the integration of cybersecurity risk management into strategic management amplifies its importance. Traditionally relegated to an IT-centric role, cybersecurity now emerges as a strategic imperative that aligns with the organization's broader goals. As digital transformation drives competitive strategies, the strategic incorporation of cybersecurity risk management ensures that the organization's technological advancements are fortified against potential vulnerabilities. This alignment empowers organizations to navigate the complexities of the digital landscape with a proactive stance, fostering a culture of cyber resilience and positioning them to effectively manage potential threats (Ganin et al., 2020).

Ultimately, cybersecurity risk management not only safeguards an organization's digital assets but also bolsters its reputation, instills customer confidence, and contributes to sustained business growth. In an era where cyber threats are omnipresent and ever-evolving, the significance of this concept cannot be understated—it serves as a cornerstone in the strategic arsenal of organizations seeking to thrive in the digital age while mitigating the inherent risks.

2.1.2. Exploration of the Strategic Implications of Cyber Threats and Attacks on Organizations

The landscape of modern business has become irrevocably intertwined with the digital realm, ushering in unprecedented opportunities for growth and efficiency. However, this digital interconnectivity also ushers in a new era of vulnerability, where cyber threats and attacks hold profound strategic implications for organizations. Beyond the immediate technical disruptions, cyber incidents have the potential to reverberate across strategic dimensions. Customer trust, a cornerstone of sustainable business, can be eroded in the aftermath of data breaches. Reputational damage can thwart strategic partnerships and deter investors. The diversion of resources to mitigate and recover from cyber-attacks can disrupt planned initiatives and hamper strategic progress. Thus, the exploration of strategic implications goes beyond technical vulnerabilities, encompassing the potential upheaval of an organization's strategic trajectory, necessitating a holistic approach to cybersecurity risk management that is deeply enmeshed with strategic considerations (Dupont, 2019).

Furthermore, the strategic implications of cyber threats extend to the very heart of an organization's competitive advantage. Intellectual property theft, corporate espionage, and data breaches can erode the differentiators that set an organization apart in the market. As businesses increasingly leverage digital strategies for innovation and market expansion, the threat landscape becomes a critical factor in shaping these strategic choices. In this context, the ability to anticipate, assess, and mitigate cyber risks is an essential component of strategic agility (Ahmad et al., 2020).

The interconnectedness of modern supply chains further amplifies the strategic impact of cyber threats. A breach in one part of the supply chain can cascade, disrupting operations across multiple stakeholders. This calls for a collaborative strategic approach where organizations not only secure their own digital assets but also ensure the cyber resilience of their partners, suppliers, and customers. The failure to recognize and address these strategic implications can lead to missed opportunities, loss of market share, and diminished strategic agility in an era where adaptability is paramount (Saad et al., 2019).

In sum, the exploration of the strategic implications of cyber threats underscores the integral role that cybersecurity risk management plays in shaping an organization's strategic posture. The capacity to navigate these threats is not merely an operational concern but a strategic imperative that can dictate an organization's resilience, competitiveness, and ability to seize strategic opportunities in the digital age.

2.1.3. Discussion of the Need for Integrating Cybersecurity Risk Management within Strategic Management Processes

As organizations navigate the complexities of the digital era, the imperative to weave cybersecurity risk management seamlessly into strategic management processes has emerged as a critical necessity. Traditionally viewed as a technical issue confined to IT departments, the escalating sophistication of cyber threats and the far-reaching consequences of breaches demand a holistic shift. Integrating cybersecurity risk management within strategic management processes acknowledges the inextricable link between digital resilience and the achievement of organizational goals (Lee, 2021). The landscape of strategic decision-making is fundamentally altered by the inclusion of cybersecurity risk considerations. As organizations strategize for growth, innovation, and market positioning, the potential ramifications of cyber threats on these endeavors cannot be ignored. The alignment of cybersecurity risk management with strategic management processes ensures that potential vulnerabilities are proactively identified and mitigated, enabling the organization to progress without being hampered by preventable disruptions (Saad et al., 2019).

Moreover, the integration of cybersecurity risk management fosters a culture of organizational vigilance and preparedness. When cybersecurity is embedded within strategic discussions, it reinforces the message that digital resilience is a shared responsibility across departments and levels. This cultural shift enhances information-sharing, promotes cross-functional collaboration, and empowers employees to be proactive defenders against potential threats. The dynamic and evolving nature of cyber threats necessitates an agile response that can be best achieved through strategic integration. By identifying cybersecurity risks in tandem with strategic planning, organizations can allocate resources efficiently, prioritize initiatives, and align their risk management strategies with their growth trajectories. This integration also enables the identification of synergies where cybersecurity measures can complement strategic objectives, fostering a cohesive approach that addresses both protection and advancement (Dupont, 2019).

In a landscape where digital vulnerabilities can disrupt operations, tarnish reputations, and erode stakeholder trust, the integration of cybersecurity risk management within strategic management processes is no longer optional—it is an imperative. This convergence is not a mere technical adjustment but a strategic pivot that fortifies an organization's ability to achieve its goals while navigating the complex and evolving digital risk landscape.

2.2. Formulating Cybersecurity Risk Management Strategies

In the dynamic realm of digital threats, the formulation of effective cybersecurity risk management strategies stands as a cornerstone of organizational resilience. This section delves into the intricate process of crafting strategies that shield digital assets, data, and critical infrastructure from cyber risks, while harmonizing with broader strategic goals.

2.2.1. Examination of Methodologies Used for Risk Identification and Assessment

The process of identifying and assessing cyber risks is a foundational step in crafting robust cybersecurity risk management strategies. Organizations leverage a variety of methodologies, each offering distinct perspectives on potential vulnerabilities that could impact their strategic objectives.

Table 1: Methodologies Used for Risk Identification and Assessment

Methodology	Description
Vulnerability Assessments	A systematic review of an organization's digital infrastructure to identify known vulnerabilities. It involves regular scanning of networks, systems, and applications to pinpoint weak points that attackers could exploit. Vulnerabilities are uncovered, allowing proactive mitigation before malicious actors exploit them (Peterson, Haney & Borrelli, 2019).
Penetration Testing	Also known as "pen testing," this methodology employs ethical hackers to simulate cyber-attacks. It evaluates an organization's system security by mimicking real-world attacks, highlighting potential entry points, assessing existing defenses, and gauging the organization's readiness against cyber threats.

	(Munaiah et al.,2019).
Threat Intelligence	Gathering and analyzing information about current cyber threats, attack vectors, and tactics used by cybercriminals. Threat intelligence offers insights into emerging threats, enabling organizations to adapt risk management strategies in response to evolving cyber landscapes (Samtani et al. 2020).
Scenario Analysis	Organizations employ scenario analysis to explore hypothetical cyber-attack scenarios and their potential impacts on strategic objectives. By simulating various attack scenarios and evaluating their consequences, organizations gain a better understanding of potential risks and formulate strategies to mitigate their effects (Dupont, 2019).
Risk Assessment Frameworks	Frameworks such as NIST Cybersecurity Framework and ISO 27001 provide structured methodologies for assessing cyber risks. They guide organizations through a comprehensive evaluation of their risk landscape, facilitating vulnerability identification and potential impact quantification (Goel, Kumar & Haddow, 2020).
Data Analytics and Machine Learning	Leveraging data analytics and machine learning, organizations analyze large datasets to identify anomalies and patterns indicative of cyber threats. These technologies enable early detection of unusual activities, enhancing the organization's ability to respond swiftly to potential risks (Peterson, Haney & Borrelli, 2019).

This table presents a comprehensive overview of methodologies utilized for the identification and assessment of cyber risks within organizations. These methodologies collectively contribute to enhancing an organization's cybersecurity posture by systematically evaluating potential vulnerabilities and devising effective risk management strategies. Vulnerability assessments involve systematic reviews of digital infrastructure to uncover known vulnerabilities, enabling proactive mitigation. Penetration testing employs simulated cyber-attacks to gauge system security and preparedness. Threat intelligence gathers and analyzes data on current cyber threats, aiding in proactive adaptation to evolving threat landscapes. Scenario analysis explores hypothetical attack scenarios to understand potential impacts and formulate strategies. Risk assessment frameworks provide structured approaches to comprehensively evaluate risks. Data analytics and machine learning analyze large datasets to detect anomalies and patterns indicative of cyber threats, facilitating swift responses. Through these methodologies, organizations can better understand their risk landscape and make informed decisions to safeguard their digital assets and operations.

2.2.2. Overview of Strategies for Prioritizing Risks and Resource Allocation

Effectively managing cyber risks within the context of strategic management necessitates the strategic allocation of resources, a process intertwined with the challenge of prioritizing risks in alignment with an organization's overarching objectives. This critical phase requires organizations to delicately balance limited resources with the potential impact of identified risks, ensuring that the most critical vulnerabilities are addressed promptly to safeguard the strategic trajectory (Giuca et al., 2021).

Central to the process is the thorough assessment of the potential impact of each identified risk on an organization's strategic objectives. Risks that possess the capacity to significantly disrupt or hinder the attainment of key goals are accorded higher priority for resource allocation. By focusing on risks that carry the potential to derail strategic initiatives, organizations ensure that resources are channeled towards preserving the alignment between digital resilience and strategic advancement. Organizations also delve into the likelihood of a risk materializing, gauging the probability of its impact. This evaluation informs the prioritization process, emphasizing risks with higher probabilities of occurrence coupled with the potential for substantial consequences. Such an approach allows organizations to concentrate on risks that possess a heightened likelihood of manifesting, ensuring that their strategic pathways remain protected (Samtani et al., 2020).

Strategic resource allocation is further refined through a meticulous cost-benefit analysis. This entails weighing the potential costs of addressing a risk against the prospective benefits of risk mitigation. Risks with significant potential impacts and relatively lower mitigation costs emerge as prime candidates for prioritization. This judicious allocation ensures that resources are dedicated in a manner that maximizes risk reduction for the investment expended. Prioritization extends to risks that align directly with an organization's strategic priorities. This approach ensures that resources are devoted to safeguarding assets and initiatives crucial for the realization of long-term strategic objectives. By addressing risks that resonate with the strategic agenda, organizations secure the essential pathways leading to success (Ahmad et al., 2020).

The ever-evolving nature of the threat landscape necessitates a vigilant approach to emerging threats and vulnerabilities. Organizations stay proactive by promptly addressing new risks that exploit the latest vulnerabilities or employ innovative attack vectors. By keeping pace with novel threats, organizations are better positioned to preserve their strategic endeavors from unforeseen disruptions. The prioritization paradigm also accounts for risks that possess the potential to impact stakeholders, regulatory compliance, and public reputation. Addressing risks aligned with legal requirements and stakeholder

expectations is paramount, as it mitigates potential legal, financial, and reputational ramifications (Lee, 2021). In addition, resource optimization plays a pivotal role in the prioritization process. Organizations navigate the task of maximizing risk reduction within the constraints of available resources. This pragmatic approach seeks to achieve the optimal balance between addressing critical vulnerabilities and leveraging available resources for effective risk mitigation (Tvaronavičienė et al., 2020).

In sum, the strategies for prioritizing risks and resource allocation encapsulate the intricacies of aligning cybersecurity risk management with strategic imperatives. This orchestration of resources ensures that an organization's digital resilience fortifies its strategic pursuits, shielding against vulnerabilities that might compromise its overarching goals.

2.2.3. Alignment with Organizational Strategies

The integration of cybersecurity risk management into the fabric of organizational strategies is pivotal in safeguarding digital resilience while propelling strategic ambitions. This section delves into the strategic intricacies of aligning cybersecurity risk management with broader business strategies, illustrating how this harmonization becomes a catalyst for proactive risk mitigation and strategic advancement (Belalcázar et al., 2017).

Organizations that effectively align cybersecurity risk management with overarching business strategies recognize the inseparable link between digital protection and strategic execution. By weaving cybersecurity considerations into strategic conversations, these organizations elevate risk management from a mere technical function to an integral component of strategic deliberations. This alignment ensures that digital vulnerabilities are systematically addressed to fortify not only technological assets but also strategic initiatives (Tvaronavičienė et al., 2020). The integration of cybersecurity risk management permeates diverse aspects of strategic planning. Organizations incorporate risk assessment and mitigation strategies into investment decisions, product development, market expansion, and resource allocation. This integration ensures that cybersecurity is not an isolated function but an enabler of informed strategic choices, safeguarding strategic pursuits from potential cyber disruptions (Ahmad et al., 2020).

Effective alignment requires cross-functional collaboration, where cybersecurity experts engage with departments across the organization. Collaboration with legal, marketing, compliance, and innovation teams ensures that risk management is integrated into diverse strategic aspects. Such collaboration fosters a holistic approach that bolsters both digital resilience and strategic agility (Giuca et al., 2021). The alignment of cybersecurity risk management with organizational strategies yields measurable impacts. Organizations observe reduced incidents, improved incident response times, and minimized damage in the event of a breach. Tangible improvements demonstrate the pivotal role of risk management in supporting the organization's strategic pursuits.

In weaving together cybersecurity risk management and organizational strategies, organizations orchestrate a harmonious symphony where risk mitigation and strategic progression complement each other. The alignment ensures that the digital landscape is fortified against threats, fostering an environment where cyber resilience propels strategic success. Through real-world examples and collaborative strategies, organizations illustrate the tangible benefits of this alignment, solidifying the notion that proactive risk management is a strategic imperative that fortifies an organization's journey towards its goals (Lee, 2021).

2.2.4. Real-World Examples of Alignment

Leading organizations across various sectors have effectively demonstrated the alignment of cybersecurity risk management with their strategic objectives, showcasing the integration of digital resilience as a catalyst for strategic success. One such example is Amazon, the global e-commerce and technology giant. Amazon's strategic vision of customer-centric innovation extends to its cybersecurity approach. By seamlessly integrating risk management into their strategic planning, Amazon ensures the secure functioning of its e-commerce platform, safeguarding customer data and trust. This alignment is visible in its proactive adoption of advanced authentication measures, encryption protocols, and stringent data protection standards, which not only fortify its digital ecosystem but also uphold its strategic position as a trusted marketplace for consumers worldwide.

In the financial sector, JPMorgan Chase & Co. stands as a notable exemplar. Recognizing the symbiotic relationship between cybersecurity and strategic stability, the bank has strategically aligned its risk management approach with its overarching goals. JPMorgan Chase seamlessly integrates cybersecurity considerations into its strategic initiatives, embracing an adaptive risk assessment framework that anticipates evolving threats. By embedding cybersecurity into its strategic mindset, the bank not only safeguards its digital infrastructure but also ensures the continuity of financial services, bolstering its reputation and maintaining strategic resilience in the face of potential cyber disruptions (Manley, 2015).

In the realm of technology innovation, Google exemplifies the fusion of strategic planning and cybersecurity risk management. Google's commitment to offering secure and innovative digital services is seamlessly woven into its corporate strategy. The company prioritizes cybersecurity in product development, ensuring user data privacy and trust. By aligning risk

management with innovation, Google not only fortifies its digital offerings against potential vulnerabilities but also strengthens its strategic advantage in the highly competitive technology landscape (Alawida et al., 2022).

These examples underscore the significance of aligning cybersecurity risk management with broader organizational strategies. In each case, the integration of risk management fortifies digital assets, preserves reputation, and advances strategic objectives—a testament to the powerful synergy that emerges when cyber resilience becomes an integral component of strategic decision-making.

2.3. Enhancing Resilience and Response

The role of effective cybersecurity risk management extends beyond risk mitigation—it plays a pivotal role in enhancing an organization's resilience in the face of cyber threats. This section delves into how robust risk management fortifies an organization's ability to withstand and recover from cyber incidents. It also examines strategies for crafting comprehensive incident response plans that expedite recovery and minimize damage in the aftermath of an attack. Organizations that integrate cybersecurity risk management within their strategic fabric enhance their overall resilience. By proactively identifying vulnerabilities and preemptively mitigating risks, these organizations are better prepared to withstand cyber incidents. Effective risk management cultivates a culture of preparedness, enabling swift adaptation in the face of unexpected disruptions and reducing the potential impact on strategic initiatives (Alawida et al., 2022).

The development of meticulous incident response plans is a cornerstone of effective risk management. Organizations craft detailed strategies outlining the steps to be taken in the event of a cyber incident (Mizrak, 2021). These plans encompass detection, containment, eradication, and recovery procedures, ensuring a systematic and coordinated response that mitigates damage and minimizes downtime. Effective incident response extends beyond containment; it also encompasses swift recovery. Organizations employ strategies to restore compromised systems and processes, rapidly resuming normal operations while minimizing disruptions. This involves leveraging backup systems, validating data integrity, and implementing comprehensive testing protocols to ensure that recovery is efficient and thorough (Wallis & Dorey, 2023).

Notable cases underscore the impact of integrated risk management in enhancing resilience and recovery. The 2017 WannaCry ransomware attack that targeted the UK's National Health Service (NHS) serves as an illustrative example (Ghafur et al., 2019). Organizations with robust risk management practices, like NHS trusts that had proactive cybersecurity measures in place, were better equipped to respond swiftly and recover from the attack. Their integrated risk management bolstered their resilience, allowing them to manage the incident's impact effectively. In a similar vein, the Equifax data breach of 2017 demonstrated the significance of effective risk management in recovery. Equifax's swift response, including immediate containment, transparent communication, and comprehensive action to rectify the breach, underscored the value of integrated risk management in navigating the aftermath of a cyber incident (Kabanov & Madnick, 2021).

These cases illuminate the pivotal role of integrated risk management in enhancing resilience and response capabilities. Organizations that align risk management with strategic goals are better positioned to weather cyber incidents, ensuring minimal disruption to their strategic pursuits while fostering a culture of preparedness and recovery.

2.4. Studies in Literature on Cybersecurity

The ever-expanding realm of cyberspace has revolutionized the way businesses operate and interact, introducing unparalleled opportunities alongside unprecedented challenges. In an era dominated by Industry 4.0 and Industry 5.0, where advanced technologies have become the bedrock of global economies, the importance of cybersecurity cannot be overstated. As industries integrate and automate their processes, the vulnerabilities to cyber threats have surged, necessitating robust strategies to safeguard digital assets and operations (Giuca et al., 2021).

Table 2 presents a collection of diverse studies focused on cybersecurity, each shedding light on distinctive facets of this intricate domain. Ranging from the impact of cybersecurity on operations and supply chain management to the strategic management of cyber risks in various sectors, these studies collectively contribute to a comprehensive understanding of the multidimensional nature of cybersecurity in today's interconnected world. Through the summaries provided, readers can glean insights into the evolving landscape of cybersecurity research, spanning themes such as risk management, education, strategic planning, and its implications on vital sectors like healthcare, critical infrastructure, and small and medium-sized enterprises. By delving into the rich tapestry of these studies, we embark on a journey to comprehend the dynamics, challenges, and strategies that underpin the cybersecurity paradigm.

Table 2: Literature Review on Cybersecurity

Author & Year	Study Name	Summary
Kumar, S., & Mallipeddi, R. R. (2022)	Impact of cybersecurity on operations and supply chain management: Emerging trends and future research	The study discusses the emerging challenges of cybersecurity risks in the context of Industry 4.0 and Industry 5.0. It identifies research directions for robust strategies in global operations,

	directions. Production and Operations Management, 31(12), 4488-4500.	healthcare management, public policy, technology management, supply chains, and disruptive technologies to mitigate the impact of cyberattacks.
Cvitić, I., et al. (2017)	An overview of the cyber security strategic management in Republic of Croatia. In RCITD—Proceedings in research conference in technical disciplines (pp. 13-18). Zilina: EDIS—Publishing Institution of the University of Zilina.	This paper analyzes the strategic development of cybersecurity in Croatia, comparing it with EU member states' strategies. It identifies deficiencies and provides guidance for improving the National cybersecurity strategy in line with ENISA guidelines.
AlDaajeh, S., et al. (2022)	The role of national cybersecurity strategies on the improvement of cybersecurity education. Computers & Security, 119, 102754.	The study reviews leading countries' National Cybersecurity Strategic Plans and proposes aligning cybersecurity education programs with national cybersecurity goals using the GQO+Strategies paradigm, mapped to cybersecurity skills and competencies using the NICE framework.
Kure, H. I., et al. (2018)	An integrated cyber security risk management approach for a cyber-physical system. Applied Sciences, 8(6), 898.	This paper presents an integrated cybersecurity risk management framework for cyber-physical systems (CPS) in critical infrastructure sectors. It assesses the impact of vulnerabilities on critical assets and presents a model for proactive risk mitigation, using a power grid system as an illustrative example.
Alahmari, A., & Duncan, B. (2020)	Cybersecurity risk management in small and medium-sized enterprises: A systematic review of recent evidence. 2020 international conference on cyber situational awareness, data analytics and assessment (CyberSA) (pp. 1-5). IEEE.	This systematic review explores recent evidence on cybersecurity risk management in SMEs. It identifies key perspectives including threats, behaviors, practices, awareness, and decision-making that play a crucial role in SMEs' cybersecurity risk management.
Del Giorgio Solfa, F. (2022)	Impacts of Cyber Security and Supply Chain Risk on Digital Operations: Evidence from the Pharmaceutical Industry. International Journal of Technology, Innovation and Management (IJTIM), 2.	The study examines the impact of cybersecurity and supply chain risk on digital operations in the pharmaceutical industry in Dubai. It finds a significant positive association between cyber security, supply chain risk, and digital operations, highlighting the complex consequences of their relationships.
Solfa, F. D. G. (2022)	Impacts of Cyber Security and Supply Chain Risk on Digital Operations: Evidence from the Pharmaceutical Industry. International Journal of Technology, Innovation and Management (IJTIM), 2(2), 18-32.	The study investigates the effects of cybersecurity and supply chain risk on digital operations in the UAE pharmaceutical industry. Analyzing data from 243 personnel across 14 pharmaceutical manufacturing companies in Dubai, the research validates a significant positive association between cyber security and supply chain risk with digital operations. The study underscores the importance of managing cybersecurity and supply chain vulnerabilities to ensure the smooth functioning of digital operations, highlighting the need for further research to expand this understanding across diverse manufacturing industries and geographic areas.
Ghelani, D., et al. (2022)	Cyber Security Threats, Vulnerabilities, and Security Solutions Models in Banking. Authorea Preprints.	The paper addresses the pressing concern of data security in an increasingly digital landscape, focusing on the potential threats and vulnerabilities in cyber services, particularly in cloud-based storage systems. It emphasizes the need for intruder detection and proposes utilizing machine learning, biometric recognition, data learning, and hybrid approaches to safeguard data from intruders. The study presents a model for a secure banking system employing biometric impressions and digital signatures, aiming to mitigate threats posed by invaders.
Raimundo, R. J., et al. (2022)	Cybersecurity in the internet of things in industrial management. Applied Sciences, 12(3), 1598.	The study delves into the security challenges faced by IoT systems, particularly in the Industrial Internet of Things (IIoT) domain. It highlights the need for innovative cybersecurity solutions for IoT,

		which are essential to protect sensitive data and infrastructure. The review article discusses trends, opportunities, and threats in IIoT cybersecurity through a comprehensive analysis of 70 key articles, underscoring the necessity of robust cybersecurity measures to address security concerns in networked environments.
He, S., et al. (2022)	Blockchain-based automated and robust cyber security management. Journal of Parallel and Distributed Computing, 163, 62-82.	The study addresses the problem of automated and robust Cyber Security Management (CSM), proposing a decentralized system, B2CSM, that incorporates blockchain technology to ensure reliable CSM responses. The paper divides CSM into Network-centric, Tools-centric, and Application-centric categories and integrates blockchain to optimize CSM outcomes. The study demonstrates the effectiveness and efficiency of the proposed system through real-world dataset experiments, highlighting its potential to enhance cybersecurity management with distributed solutions.
Cheng, E. C., & Wang, T. (2022)	Institutional strategies for cybersecurity in higher education institutions. Information, 13(4), 192.	Focused on the vulnerability of Higher Education Institutions (HEIs) to cyber threats, the study offers institutional strategies for enhancing cybersecurity from a system-wide perspective. The paper reviews the evolution of cybersecurity trends and projections, highlighting the urgency of strengthening HEI cybersecurity capacities. The proposed strategies encompass governance, policies, training, AI-based threat management, security measures, and risk management. The study emphasizes a holistic approach to safeguarding HEI cybersecurity in the face of escalating cyber threats.

The table offers a diverse compilation of studies that delve into the multifaceted realm of cybersecurity, showcasing the intricate interplay between technology, management, and risk mitigation. From examining the impact of cybersecurity on global supply chains to unveiling the strategic management approaches adopted by nations and organizations, these studies collectively contribute to a comprehensive understanding of the critical role cybersecurity plays in today's digital landscape. The summaries highlight the evolution of research themes, encompassing areas such as strategic planning, risk management frameworks, education initiatives, and their far-reaching implications on sectors as varied as healthcare, critical infrastructure, and small businesses. This compilation serves as a testament to the urgency of addressing cybersecurity concerns and the ongoing efforts to fortify digital ecosystems against an increasingly sophisticated array of threats.

This compilation of studies presents a diverse range of perspectives on the critical realm of cybersecurity. Spanning from assessing the impact of cybersecurity and supply chain risk on digital operations in the pharmaceutical industry to proposing innovative security solutions for the banking sector, these studies collectively contribute to a holistic understanding of the multifaceted challenges posed by evolving cyber threats. The summaries provide insights into the urgency of safeguarding digital ecosystems, addressing vulnerabilities, and adopting advanced technologies to fortify cybersecurity measures. From exploring cybersecurity in the context of the Internet of Things (IoT) in industrial management to introducing blockchain-based solutions for robust cybersecurity management, these studies underscore the dynamic nature of the field. Furthermore, the discussion on institutional strategies for cybersecurity in higher education institutions highlights the necessity of a comprehensive approach to protect critical sectors. This compilation offers a glimpse into the ongoing efforts to address cybersecurity challenges across various domains and emphasizes the urgency of proactive measures to counter the growing cyber threats that continue to shape the digital landscape.

2.5. Challenges and Implementation Barriers

The seamless integration of cybersecurity risk management within strategic management is a formidable endeavor, fraught with challenges that organizations must navigate to achieve effective alignment. This section delves into the myriad challenges organizations encounter when striving to harmonize risk management with strategic objectives. It also discusses the implementation barriers stemming from organizational culture, resource allocation constraints, and communication gaps that impede the cohesive integration of these critical domains (Mohamed Mizan et al., 2019).

One of the prominent challenges lies in orchestrating a cultural shift that perceives cybersecurity not merely as an IT concern but as a fundamental strategic consideration. Shifting organizational mindset from reactive risk management to proactive strategic alignment requires overcoming ingrained attitudes and fostering a shared understanding of the strategic significance of cybersecurity. The integration of cybersecurity risk management necessitates resource allocation for risk identification,

mitigation, and recovery strategies. Organizations often grapple with resource constraints, as competing priorities vie for limited budgets and personnel. Allocating sufficient resources to ensure robust risk management can be challenging, especially when the immediate strategic impact may not be readily apparent (Alawida et al., 2022).

Effective integration hinges on seamless communication between technical experts and strategic decision-makers. Bridging the communication gap between cybersecurity specialists and senior management is crucial for translating technical insights into strategic insights and decisions. Miscommunication or lack of a shared language can hinder the alignment process. Striking a balance between risk aversion and innovation poses a conundrum. While stringent cybersecurity measures might safeguard against threats, they can potentially stifle innovative endeavors. Organizations grapple with aligning risk management practices to protect against threats without impeding strategic innovation (Kabanov & Madnick, 2021).

Organizations operating across jurisdictions must navigate complex regulatory landscapes that impact both cybersecurity and strategic initiatives. Regulatory requirements for data protection, privacy, and industry-specific compliance further complicate the integration process, demanding meticulous alignment of risk management and strategic decision-making to ensure compliance without compromising strategic goals. Overcoming these challenges demands concerted efforts (Kizilcan& Mizrak, 2022). Crafting a comprehensive communication strategy that bridges the gap between technical and strategic language fosters mutual understanding. Cultivating a risk-aware organizational culture requires top-down commitment, where leadership demonstrates the integration's value through actions and decisions. Aligning resource allocation with strategic goals involves transparent budgeting that recognizes cybersecurity as a strategic investment (Peterson, Haney & Borrelli, 2019).

In conclusion, recognizing and addressing these challenges and implementation barriers is pivotal for successful integration. By adopting strategies that emphasize cultural shift, effective communication, resource allocation optimization, and regulatory compliance, organizations can surmount these obstacles, forging a cohesive synergy between cybersecurity risk management and strategic management that fortifies their digital resilience and strategic pursuits.

3. RESEARCH METHOD

The methodology employed for the study titled "Integrating Cybersecurity Risk Management into Strategic Management: A Comprehensive Literature Review" is grounded in a systematic and structured approach. Through meticulous literature searches across diverse academic sources, relevant articles discussing the convergence of cybersecurity risk management and strategic management are identified and screened based on predetermined criteria. Extracted information is subjected to content analysis to categorize themes, frameworks, and best practices. By synthesizing these findings, the study constructs a comprehensive understanding of the existing landscape, highlighting patterns, trends, and research gaps. This process leads to the development of a conceptual framework illustrating the interplay between the two domains. Rigorous quality assessments ensure the credibility of included studies. This methodological rigor aims to provide a robust foundation for exploring the integration of cybersecurity risk management within the realm of strategic management.

4. FINDINGS

Amidst the era of widespread digitalization and intensifying cyber risks, the exploration of the interrelationship between cybersecurity risk management and strategic management reveals a nexus of paramount importance for contemporary organizations. Through the comprehensive analysis of various scholarly contributions, this review uncovers nuanced insights into the intricate dynamics that underpin the integration of risk management strategies within the strategic fabric of organizations. Notably, the findings illuminate the evolving landscape of cyber threats and attacks, necessitating a cohesive approach that synergizes cybersecurity risk management with broader strategic initiatives. The review underscores the significance of a proactive stance, emphasizing the need for organizations to intertwine risk mitigation strategies into their overall strategic framework. Furthermore, the findings highlight the role of effective cybersecurity risk management in bolstering resilience, enabling organizations to effectively navigate the intricate terrain of digital challenges. By synthesizing diverse perspectives, this review contributes to an enriched understanding of how the fusion of cybersecurity risk management and strategic management cultivates a robust defense against cyber vulnerabilities and engenders adaptability in the realm of digital adversities.

The evolution of the integration of cybersecurity risk management with strategic initiatives is poised to be both dynamic and transformative. This section delves into the anticipated future directions and emerging trends that will shape how organizations navigate the intricate intersection of risk mitigation and strategic advancement. Future integration efforts are expected to transcend traditional boundaries, resulting in a more holistic alignment of cybersecurity risk management with organizational strategies. This entails the integration not only of technology and processes but also of organizational culture, where cybersecurity becomes ingrained in the DNA of strategic decision-making at all levels.

Emerging technologies like predictive analytics and artificial intelligence (AI) are set to revolutionize the integration landscape. Organizations will increasingly leverage data-driven insights to predict cyber threats, enabling proactive risk

mitigation. AI-powered tools will enhance incident response by automating threat detection and containment, ensuring rapid and precise reactions to cyber incidents.

The future will witness the evolution of risk assessment methodologies from static evaluations to dynamic, real-time monitoring. Continuous risk assessment will enable organizations to identify emerging threats and vulnerabilities promptly, aligning risk management strategies with rapidly evolving strategic landscapes.

As regulatory requirements evolve, integration efforts will align more closely with compliance mandates. Organizations will not only align risk management with strategic goals but also with ever-changing regulatory frameworks, ensuring simultaneous compliance and strategic resilience. Emerging trends point towards increased emphasis on crisis simulation and training. Organizations will conduct regular simulations to test the effectiveness of their integrated risk management strategies, enhancing incident response readiness and fortifying the synergy between risk mitigation and strategic execution.

The integration process will foster greater cross-functional collaboration, transcending traditional departmental silos. Collaboration between cybersecurity experts, legal teams, strategic planners, and executives will ensure that risk management is woven into every strategic decision, from innovation initiatives to market expansion. The future will witness organizations fostering cyber-resilient cultures where every employee assumes responsibility for cybersecurity. This cultural shift will encourage proactive risk management from all levels, amplifying the integration's impact and reinforcing strategic resilience.

5. CONCLUSION

In navigating the intricate landscape of cybersecurity risk management within a strategic context, this study embarked on a comprehensive journey to uncover the symbiotic relationship between risk mitigation and strategic advancement. Through an in-depth literature review and exploration of case studies, key insights emerged that underscore the pivotal role of aligning cybersecurity risk management with organizational strategies.

The findings from the literature review demonstrated that the integration of cybersecurity risk management within a strategic framework is not merely a technical exercise, but a strategic imperative. Effective integration fortifies digital assets, safeguards strategic initiatives, and enhances organizational resilience in the face of cyber threats. By embracing a holistic approach that weaves risk management into every facet of strategic planning, organizations elevate cybersecurity from a technical consideration to a core element of strategic decision-making.

For organizations aiming to enhance their cybersecurity risk management practices, the implications are clear. The seamless alignment of risk management with strategic objectives requires a cultural shift, wherein cybersecurity is recognized as an integral aspect of achieving long-term goals. Cross-functional collaboration, transparent resource allocation, effective communication, and proactive regulatory compliance emerge as strategies for fostering successful integration.

In this digital era, the call to action for organizations is undeniable. The rapid evolution of technology and the expanding threat landscape demand that cybersecurity risk management cease to be an afterthought and instead be integrated into the very fabric of strategic planning. Organizations must prioritize the cultivation of a culture that recognizes cybersecurity as a shared responsibility and capitalizes on emerging technologies and trends to bolster resilience and secure strategic initiatives.

In the pursuit of growth and success, organizations must not underestimate the potency of integrated cybersecurity risk management as a strategic ally. As the digital landscape continues to shape the future, organizations that proactively align risk management with their strategic trajectories will be well-positioned to thrive amidst evolving challenges and opportunities. By embracing the lessons learned from this study, organizations can forge a future where digital resilience fortifies strategic aspirations, enabling them to navigate the complexities of the digital era with confidence and foresight.

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THE INFLUENCE OF EMPLOYEES' COMMUNICATION ON THE PRACTICES OF OCCUPATIONAL HEALTH AND SAFETY IN SMALL SCALE MINING FIRMS IN TANZANIA

Dominic Nkolimwa
İnstitute of Social Work, Department of Human Resource Management, Dar es Salaam, Tanzania.
nkolimwad@yahoo.com , ORCID: 0009000576000992

ABSTRACT

Purpose- This article is aimed at analyzing the influence of Employees' Communication (EC) on the practices of occupational health and safety in small scale mining firms.
Methodology- This study applied the explanatory research design whereby information from respondents was collected through quantitative method of the study which provided the statistical generalization of findings (Mashia *et al.*, 2016). This research design was selected because it enables the researcher to have greater control over the accuracy of findings. Data were collected from three regions namely Shinyanga, Arusha and Geita. These regions were selected because they are the dominant regions dealing with mining activities in Tanzania.
Findings- The findings revealed that employees' communication programme has a positive influence on implementation of organization safety support at workplace. Therefore, if the management concentrates on enhancing the employees' communication accidents, injury cases would be controlled. On the other hand, the results revealed that employees' communication has positive influence for the implementation of proactive hazard control at workplace. Yeong and Shah (2016) any organization which values its human resources tends to maintain health and safety by preparing the health and safety proactive hazard control strategies so as to protect employees at workplace.
Conclusion- This article concludes that employees' communication programmes significantly influence the implementation of OSS and PHC at the workplace. Therefore, organizations can realize safety of employees if there are serious strategies on emphasizing the employees' communication at workplaces.

Keywords: Occupational health and safety, management practices, small scale, employees' communication, mining firms
JEL Codes: M31, E21, D11

1. INTRODUCTION

The practices of occupational health and safety (OHS) are obligatory in most countries due to their essential role in promoting safety to all employees (Kessy & Raymond 2021; Yusuf et al., 2012). It helps to minimize the effects of hazards at workplaces and contributes to social, political and economic development (Suparna & Jaiswal, 2021). However, its implementation is still questionable to many working organizations especially in the third world nations because of the insufficient employee communication which results in illness, injuries, accidents and death at the workplace.

ILO (2014) posits that about 6300 employees are losing their lives every day with an estimate of 2.3 million fatalities occurring every year all over the world, following the poor implementation of OHS. It has been argued that organisations that ignore health and safety automatically affect their productivity due to employees' absenteeism, and loss of goodwill from the customers and the whole community in general (Bae, 2021; Katsuro et al., 2010). The mining sector seems to be among the working industries associated with poor OHS due to many cases being reported; such as poor lighting, pitfalls, knocked by machines/tools and insufficient oxygen are evidences that miners are at high risk. For instance, Michelo (2009) states that at least 165 injuries and 20 fatalities were reported at Zambia Copper Mining. Generally, small-scale mining employees are at high risk, especially in developing countries like Tanzania. Matters and deaths reported are probably caused by inadequacy of employee communication which is part of management functions (Mahmudul et al.,2017; Khdair and Wameedh, 2011). Small-scale mining is reported to be among the riskiest occupations in Tanzania. This is due to several limitations including poor employees' communication which causes severe accidents that count for the lives of individuals at the workplace (Abdulla et al., 2009).

Omofowa et al. (2021) the way workers are protected and compensated, following injuries and other ailments associated with exposing the workforce to hazardous substances, is a major public concern that needs proper employees communication and collective obligations to all employers to take appropriate action and feel accountable to their employees (Isa, 2015). For instance, loose rocks that fell and killed a miner in 2006. Pit collapses were blamed in March 2007 for the deaths of three miners in the same neighborhood. At least 65 miners drowned to death at Mererani in 2008 after floodwaters flooded through the mine's tunnels and pits (Maginga et al., 2013).

The literature on OSHA suggests that to protect employees from occupational accidents and create a safety culture, employee communication is important and needs to be emphasized to prevent accidents and injuries in the workplace (Jonathan,2016; Vredenburgh, 2002; Ali et al., 2009). The practice of employees' communication on OHS is contingent on priority since it depends on the managerial commitment to the matter. However, safety is significant to all human beings. Laursen and Foss (2013); Tan &Nasurdin(2011);Khdair and Wameedh(2013)and Demo et al. (2012) conducted studies on OHS and identified an appropriate leadership style that considers employees' attitudes and hiring practices as important elements of management practices for the safety culture. Other researchers like Desa, Habidin, Hibadullah, Fuzi, and Zamri (2013) listed rewards employees' involvement, employees' communication and management commitment as important elements towards improving working conditions of employees.

Based on the findings of various studies on OHS, there are different views among researchers on the factors influencing health and safety in the organization. Therefore, this article used employees' communication as an important factor that influences OHS to an organisation, an argument which has been supported by (Vecchio, 2007; and Keffane, 2014; and Keffane and Delhomme 2013).

The Tanzania government has made some efforts given this shortcoming as measures to protect its employees. The establishment of the Occupational Safety and Health Authority (OSHA) in 1997, the endorsement of Occupational Health and Safety (OHS) Act No. 5 of 2003, the establishment of the Occupation Health and Safety Policy of 2009, the Compensation Act No 20 of 2008, the ratification of ILO Convention No. 170 of 1993 in 2014 about safety in the use of chemicals at work; aimed to enhance the best practices of health and safety at the workplace.

Despite those measures, the mining industry in Tanzania is still hampered by injuries, accidents and deaths in mining workplaces. The literature shows that most of those accidents are associated with rock fall, fire explosions, and automobile equipment accidents, falls from higher heights, entrapment, flooding of underground workings and suffocation (Museru and Munthali, 2013). For instance, 14 miners were stranded for four days in 2017 (URT, 2017). Additionally, at Bulyanhulu Gold mines in 2015, six workers were stranded underground for 41 days until they were rescued, and at least 20 miners perished (URT, 2017; Reuters, 2015). However, the managers in charge of health and safety activities seem to be not able to control and reduce occurrences of death and accidents especially in small-scale mining firms (Schulte, Cunningham, Guerin,Hennigan, and Jacklitsch, 2019 & Surienty, 2012).

This was due to the persistence of occupational injuries, death, illness and accidents (Samage, 2014). The seriousness of enforcing employee communication among the managers responsible for employees' safety issues is still questionable. There is a lack of understanding of the role of employees' communication as one of the internal factors for effective OHS in Tanzania. Therefore, there is a need to consider the influence of employees' communication on the implementation of OHS in small-scale mining firms. Based on the aforementioned issues the literature did not consider the relationship between employees' communication and the implementation of Occupational Health and Safety in small scale mining firms. In response to that, this article analyzes the influence of employees' communication on the practices of OHS in Tanzania's small-scale mining firms.

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2. LITERATURE REVIEW

This article used the ERG theory proposed by Alderfer (1969) who expanded Maslow's basic needs by refining five stages into three. These stages are existence needs, relatedness needs and growth needs. The theory is popular and predominantly clarifies different ideas on organisational management with new methods of considering human behaviour and attitude (Yang and Chen, 2011). It describes the significance of safety to the employees at workplaces. Thus, it tells more about maintaining safety for all employees in an organisation. This theory has been used to explain and contribute to human behaviour which directly connects to health and safety in the workplace. Therefore, this theory is significant and relevant to this article since it explains safety issues in the organisation.

The theory insists on safety for all employees regardless of their status (Caulton, 2012). The existence needs in an ERG regard prevent fear, anxiety, threat, danger, and tension in the workplace as one of the basic needs of humans. In other words, a company's employees should have a safe and secure place to work in (Omofowa et al., 2021). Given all of these data, ERG can theoretically contribute significantly to the explanation of how employee communication affects the execution of workplace occupational health and safety. As a result,this notion is pertinent to this article since it clarifies workplace safety to workers.

Thefore, this theory is relevant in thus article because it explains the security behavior of employees in an organization. Employees' communication influences the implementation of Occupational Health and Safety at the Workplace, the reviewed literature by Sembe & Ayuo (2017) maintains that communication and information sharing is a safety management practice that uses mechanisms to emphasize how to apply safety knowledge, increase awareness, and promote the importance of individual and interdependent safe work. Well-designed and effective employees' communication, especially open communication on safety performance tends to stimulate the organisation's performance. Yorio &Wachter (2014) suggest that organizations might use print media (e.g., posters, journals and newspapers) to increase cognitive awareness of safe work and emphasize its importance or facilitate holding formal meetings designed to verbally convey information and exchange ideas with the workforce. According to Mashia et al. (2016) communication and information-sharing practices have been formally linked to safety performance and have been hypothesized to enhance both vertical and horizontal ties. Information sharing is characterized by mutual trust between parties where ideas surrounding the organizational safety programmes can be freely exchanged. Therefore,the following hypotheses were developed:

H1: There is a positive relationship between employees' communication and implementation of organisational safety support at the workplace.

H2: There is a positive relationship between employees' communication and implementation of proactive hazard control at the workplace.

2.1. Conceptual Framework

The link between independent and dependent variables is depicted in the conceptual framework below. Employees' Communication (EC) has highlighted the independent variables, whilst Organisation Safety Support (OSS)and Proactive Hazard Control (PHC) have highlighted the dependent variables, respectively.

Figure 1: Conceptual Framework
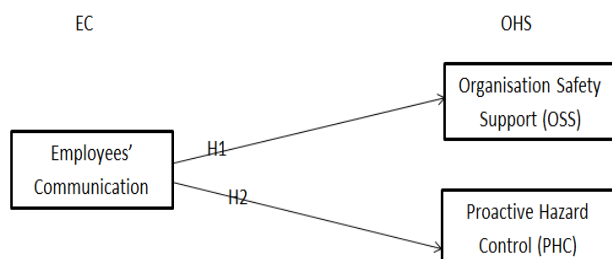
Source: Field Data (2023)

3. RESEARCH METHODOLOGY

The quantitative approach of the study, which allowed for the statistical generalization of findings, was used in this study's use of the explanatory research design to gather information from respondents (Mashia et al.,2016). This research design was chosen because it gives the researcher more control over how accurate the results are. Data were gathered from Shinyanga,Arusha and Geita regions in Tanzania. These areas were chosen because they are those in which mining operations predominate in Tanzania. Additionally, it has been noted time and time again that these areas have high incidence of mining-related accidents (Samage, 2014). Micah, and Ajay (2014) the quantitative data, approximately 297 questionnaires were employed, along with percentage and the structural equation model (SEM).

3.1. Measurement of Implementation of Occupational Health and Safety

The tools established to measure occupational health and safety (OHS) performance in this article are Organizational Safety Supprt (OSS) and Proactive Hazard Control (PHC). Safety rules, principles and procedures as well as the use of first aid are used to measure OSS and SSP in the workplace (Kaynak et al. (2016). Various publications have used the measure similar to measuring the accuracy of health and safety applications in the workplace because the provision of OSS and PHC is an indicator of heath and safety implermentattion in the organisation (Villanuera and Nunez, 2010). Communication between employees must facilitate the management of health and safety at the workplace. Ensuring safe practices in the workplace

should aim at controlling all work-related injuries, the availability of warning signs of danger and providing information to employees about safe practices (Khdair&Subramaniam,2011).

4. FINDINGS AND DISCUSSIONS

4.1. Organization Characteristics

The study was conducted among small-scale mining companies operating in the Geita, Shinyanga and Arusha areas; approximately 297 (94%) companies participated in this study. The main mining activities involve the extraction and sale of minerals. However, artisanal miners receive neither training nor benefits from these activities. The operations of these companies take place in a risky environment. Such activities appear to be motivated by poverty and other social problems in the community.

4.2. Employees' Communication on Occupational Health and Safety in Small Scale Mining Firms

Hypotheses were tested to justify the use of SEM in this article. These assumptions are normal data distribution, uniformity, and edge identification. Using the P-P regression plot, the standardized residuals in all study variables have a normal distribution. Furthermore, no multicollinearity problem is observed because the tolerance value (TV), inflated value factor (VIF), and all variables used in this article are respectively greater than 0.1 for TV and less than 10 for VIF,as recommended by William (2015), the data selection process also showed no heteroscedasticity problem because the scatter plot shows that the residuals are uniformly distributed around the axis. Outlier labeling methods were used, removing three outliers.

4.3. Direct Relationship between Employees' Communication on the Implementation of Occupational Health and Safety in Small Scale Mining Firms

In this part, two hypotheses are posed: H1 and H2. H1 indicates that EC has a positive influence on the implementattion of OSS programs in the workplace, and H2 indicates that EC has a positive influence on the implementation of OSS programs in the workplace. Path analysis results show that there is a significant relationship between EC programs and OSS implementation in the workplace (β =0.653, significant at the 0.001 level).

Furthermore, path analysis revealed a significant relationship between CE and SSP implementation in the workplace (β=0.700, significant at the 0. 001 level). Therefore, hypotheses H1 and H2 are each supported.

Table 1: The Regression Weights for the Direct Relationship

Path			Estimate	S.E.	C.R.	P	Label
OOSS	<---	EEC	.653	.109	6.015	***	
PPHC	<---	EEC	.700	.115	6.066	***	

Source: Field Data (2023), *** Means, it is significant at 0.001

The developed model shows the direct relationship between employees' communication and the implementation of occupational health and safety at the workplace. In this analysis, the model demonstrates influence of EC in identifying safety issues on the implementation of OSS and PHC at workplace. Also, the model shows the relationship between EC programmes on OSS and PHC. Figure 2 presents the model on the direct relationship between employees' communication and the implementation of occupational health and safety at the workplace.

Figure 3: The Developed Structural Equation Model for the Relationship
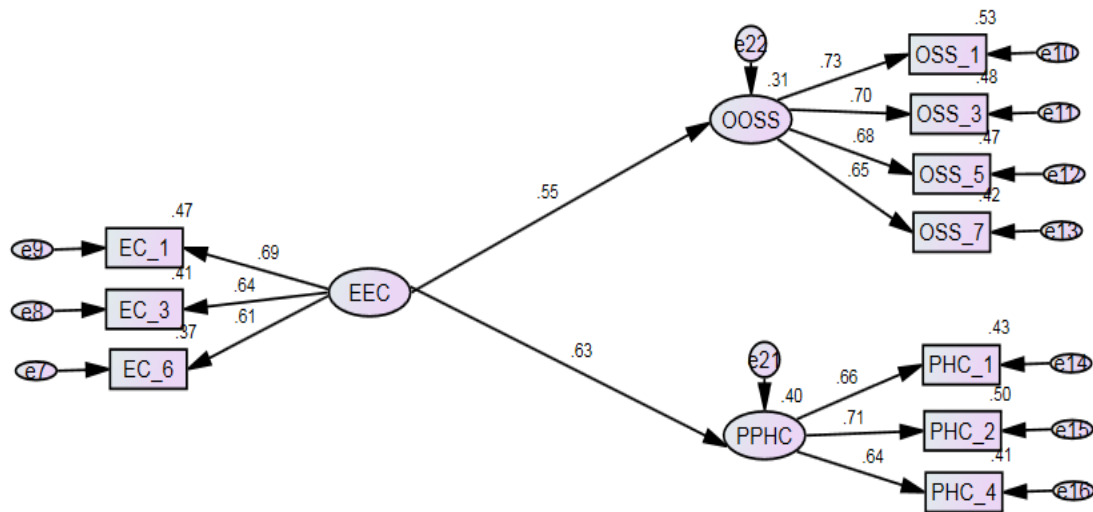
Source: Field Data (2023)

The model shows that the additional unit of the standard deviation of EC programmes led to the 0.653 significant increases in standard deviation of the implementation of OSS at workplace. Again, it shows that the additional unit in standard deviation of EC programmes led to the 0.700 significant decreases in PHC at workplace. This means that, the management practices namely EC implementation at workplace had different contribution on OSS and PHC at workplace.

The model was assessed to see whether it fits the data well by examining the model fit indices. The model fit indices included CMIN/df, GFI, AGFI, CFI and RMSEA. The indices indicated that the model fits the data well because they were all within the recommended values. The Chi-Square value was 139.454, P-value of 000 while the degree of freedom was 33. The Chi-Square value was insignificant which indicated that there was no statistically significant difference between the default model and saturated model. Table 2 below presents the model fit indices with the recommended value.

Table 2: Goodness of Fit Indices for the Direct Model

Goodness of Fit Measure	Calculated Index *	Recommended value	Author
CMIN/df	4.226	<5	Bollen (1989); Ullman (1996
GFI	0.917	≥ 0.90	Byrne (2010)
AGFI	0.862	≥ 0.80	Chau and Hu (2001
CFI	0.902	≥ 0.90	Hair et al. (2010)
RMSEA	0.004	< 0.08	Hoe (2008); Steiger (2007) cited by Hooper, Coughlan & Mullen (2008)

Source: Field Data (2023)

4.4. Discussion of Findings

Tthe results show that employee communication programs have a positive influence on the implementation of organizational support for workplace safety. Therefore, if management focuses on improving employee communication accidents, injury cases will be controlled. Asghar and Saeed (2012) support the finding that communication with employees helps a lot in reducing and controlling workplace accidents because when employees are informed, they will have knowledge and be aware of how to avoid accidents and unnecessary risks in the workplace. On the other hand, the results show that employees' communication has a positive influence on the implementation of proactive risk control in the workplace. Yeong and Shah (2016) any organization that values its human resources tends to maintaiin health and safety by preparing proactive health and safety risk control strategies to ensure employees are protected in the workplace. This is also supported by Mashia et al.(2016) argue that employee communication is an important risk peviosn control strategy to ensure workplace safety. Keffane (2014) emphasizes that communication between employees is a key factor in maintaing and changing workers' attitudes towards safety measures. Yorio and Wachter (2014) support the findings of providing guidance through communication with employees on hazard recognition and control measures as well as learning safety measures such as protective equipment to identify hazards and gain knowledge of emergency proceduresand preventative actions that will

maintaion health and safety at workplace. Sembe and Ayuo (2017) and Oakman and Bartram (2017) support these findings by asserting that employees rely on communication to receive feedback on security issues within the organization.

5. CONCLUSION AND IMPLICATIONS

5.1 CONCLUSION

The article investigated the influence of employees' communication on the implementation of health and safety in small scale mining. The literature informed that employees' communication has contribution to the process of minimizing accidents at workplace (Mashia et al., 2016). This argument is supported by Keffane, 2014; Irawanto, 2015; Kaynak and Toklu, (2016) states that employees' communication has an impact towards maintaining safety of employees at the workplace (Asumeng et.ai.,2015). Therefore, this article concludes that employees' communication programmes significantly influence the implementation of OSS and PHC at the workplace. Therefore, organizations can realize safety of employees if there are serious strategies on emphasizing the employees' communication at workplaces.

5.2. IMPLICATIONS

The results revealed that employees' communication programmes significantly influence the proper implementation of health and safety at the workplace. Thus, if all organizations (private and public) emphasize on the employees' communication in health and safety matters, accidents, risks injuries and deaths at workplaces will be reduced in high rates and production will be improved. Therefore, managers should put emphases on health and safety issues in their organizations, if really they want to improve their efficiency. Also government officials should make sure that all organisations prepare and design strategies for improving employees' communication so as to enhance provision of health and safety compliance. If employees' communication is provided it maintains the organisational health and safety culture to the management and employees at large. Ultimately, it minimizes risks at the workplace.

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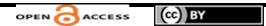# CONSUMER'S BUYING BEHAVIOR ON COTTON CLOTHING BETWEEN THE AGE GROUP 18-24

Siddhartha Gupta[1], Mohammad Ali[2]
[1]Chittagong University of Engineering & Technology, Department of Mathematics, Chittagong, Bangladesh.
 ali.mehidi93@gmail.com , ORCID: 0009-0003-7582-1209
[2]Chittagong University of Engineering &Technology, Department of Mathematics, Chittagong, Bangladesh.
 siddharthaguptabarun84@gmail.com , ORCID:0009-0006-8554-3953

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ABSTRACT

Purpose- The Garment industry plays a vital role in the Bangladeshi economy and contributes to its export earnings. The present study has focused on primary factors of buying behavior of undergraduate students between the age group of 18-24 during the purchase of their cotton apparel. Therefore, the purpose of this study is to undertake the cotton cloth buying behavior among university students and investigate the independent predictors for their preference for such cloth.

Methodology- For identifying the independent factors, primary data was collected from 200 consumers through questionnaires across various departments of Chittagong University of Science and Technology, Chattogram, Bangladesh. The random sampling method was used for selecting the respondent. The University students who are in the age group of 18 to 24 have been selected for surveying. It is a cross-sectional study conducted among 200 students in which 65% are male and 35% are female participants. The data have been organized into four sections: clothing selection, understanding cotton, fiber composition in apparel, and marketing influences. The participants were asked to rate their responses in terms of agreement or disagreement as follows: strongly agree – 5, agree – 4, neutral – 3, disagree – 2, and strongly disagree – 1. The data has been analyzed with the help of statistical tools like percentage analysis, Z test, and Chi-square analysis.

Findings- At a 5% level of significance, it is seen that price (4.31) is the most important factor for the purchasing behavior of cotton cloths, followed by comfort (4.22) of the cotton fabric, type of fiber (4.10), manufacturers' websites (3.89), manufacturers' Facebook (3.84), fiber Awareness (3.71), Brand names (3.70), Prefer of cotton cloth(3.64), and Magazine advertisements (3.54) are important factors on consumers purchasing behavior but Television advertisements (3.36), Radio advertisements (3.32), Durability (3.31), Internet advertisements (3.20), Influences of friends wear (3.10), and Facebook and Twitter (2.83) are less important factors.

Conclusion- This study has focused on the knowledge regarding cotton cloth, habits, and buying behavior among University students. It is observed that male and female consumers have no significant difference regarding fiber awareness, brand names, price, comfort, affordable, versatility, internet advertisement, magazine advertisement, Facebook and Twitter advertisement, and manufacturers' websites, etc. during purchasing of cotton cloth but there is a significant relationship between male and female consumers about the type of fiber, and friends wear.

Keywords: Consumer preference, cotton clothing, buying behavior, chi-square test, university students, apparel Industry.
JEL Codes: C10, C12, C13, C19

1. INTRODUCTION

Bangladesh is a developing country and it has a large population. More than 23% of the population is between 15-29, and it is well known that younger people are more intrigued by trends than older people. Consumer behavior is the process a consumer uses to decide what to buy. Consumer attitudes toward products and services are always evolving. Generational behavior and buying patterns have been analyzed because it is the largest demographic group in Bangladesh. Apparel is a product category that reflects a consumer's personality traits. Apparel buying behavior is comprised of several determinants that are attributes of the product or brand that determine which product or brand the consumer will buy. Plenty of research works related to various aspects of buying behavior, consumer preferences, brands, and determinants of fashion apparel have been published at home and abroad. However, the present work has been reviewed by some of the previously published works. Retailers of garment bazaars in the National Capital Region (NCR) in the Philippines take into account the attitudes of consumers as well as their subjective norms, perceptions of control, and intentions to make purchases(Adan and Ramos, 2023). Hasan et al. (2021)

analyzed the purchase behaviors of the consumers of organic cotton clothing which lie at the top and bottom of the apparel supply chain. It is observed that a strong positive attitude is formed in the context of Bangladeshi consumers whereas fewer relationships were found to have in American consumers. Koca and Koc (2016) studied the sustainable attributes of clothing selection among older generations. It is noticed that males and older generations need to pay more attention to the connection between excellent clothing and sustainability(Barrera and Villarroel, 2022). To ascertain the distinctions between male and female consumer clothes purchase behavior, Maran et al. (2017) conducted research on the extent to which gender influences the purchasing behavior of customers buying fashion goods. It is observed that male and female consumers were discovered to have varied opinions of fashion and brand awareness in their purchase behavior. Maria and Justin (2019) studied the effect of color psychology on consumer buying behavior in the apparel market. According to the study, selecting a hue that is connected to something negative may adversely affect customers' retrieval cues and deter them from buying the good or service. Rathwa et al. (2021) discussed the consumer buying behavior and socio-economic characteristics of consumers who prefer branded apparel. Meeran and Ranjitham (2016) looked at how consumers felt about branded clothing. It has been noted that the top three brands of clothing that respondents continue to favor are Raymond, Peter England, and John Player. Marina et al. (2019) studied how perceived quality and emotional worth affect buying patterns for branded clothing in India. In the city of Coimbatore, India, Mythil (2020) studied the relationship between the variables that influence consumers' purchasing decisions for branded clothing. Consumer behavior for clothing is influenced by characteristics like monthly income, gender, and peer pressure, according to Deepali Saluja (2016). The study demonstrates that factors such as age, gender, education level, and occupation have little bearing on customers' purchasing decisions. Lakshminarayana and Sreenivas (2018) studied consumer buying behavior toward branded Apparel in Karnataka to examine the socioeconomic traits of customers who favor branded clothes and to learn the factors that encourage consumers to buy branded apparel. Khare and Varshneya (2017) studied the purchase behaviors of organic cotton clothing among Indian youth consumers by considering past peer influence, eco-friendly behavior, and knowledge of organic clothing. The results of the study indicate that consumers' prior environmental responsibility plays a significant effect in their decision to buy green clothing, however, peer pressure and consumer knowledge of green clothing had no bearing on their decision to buy organic clothing. The product attribute has no significant effect on consumer purchase behavior but product pricing, social factors, and brand image significantly influence consumer purchase intention(Rai et al., 2023). Independent factors such as price, product experience, customer service, spiritual value, and emotional commitment are directly related to the shopping decisions of consumers(Tien, 2023). Purchase intention and Electronic word-of-mouth are positively correlated with sustainability perception (Satir T. U., 2023). Vietnamese customers' perceptions of product origin and purchasing intentions toward Chinese items are affected by consumer ethnocentrism and general national image(Nguyen et al., 2023). The purchase intention of a smartphone is significantly affected by personal factors but social factors have no significant impact(Rakib et al., 2022). After all, this generation has a higher disposable income than other groups of the same age because many of them still live with their parents. This generation is price-conscious, fashionable, and aware of a brand's status and prefers shopping. This generation lives their lives through the internet and is not only tech-savvy but used to fast communication. When consumers choose what clothing to purchase, they are significantly impacted by the information provided to them by fashion, branding, and marketing efforts as well as by a variety of personal, psychological, and social elements. Price, brand, quality, aesthetic value, and usability are other values that manifest themselves as influencing attributes. Differences in people's shopping habits are a result of how important these values are and how high they rank on their priority list. Consumer behavior is crucial for manufacturers and retailers to create and use key marketing competencies to survive in the fashion industry. Clothing purchase behavior influencing factors of consumers can be categorized as personal, psychological, and cultural. Among these factors, personal factors are the most important factors for consumers' buying behavior. According to gender classification, individuals can create different clothing choices that depend on their psychological makeup and society's values. Therefore, characteristics such as social, physical, economic, and Psychological can affect clothing purchase behavior at different ages.

In our society clothes have a special status in our life. It would not be wrong to say that today's youth buying behavior is greatly influenced by factors such as social, cultural, personal, psychological, fashion, T.V. advertisements, etc. Advances in media, education, and technology have a variety of fabrics and apparel for today's consumers to choose from. Therefore, the present study is important for clothing purchasing behavior in the garment sector. These are the motivations behind the present work. The main goal is to find the influencing factor and the prominent impacting role on the consumer's buying behavior to buy cotton clothes.

The apparel and garments industry has the top place in Bangladesh as a result apparel intension and outfits among the customers are getting inflated. Hence it is very important to study the changing behavior of consumers. Therefore, the main aim of this study is to analyze the apparel buying behavior of Bangladeshi University consumers and it is assumed that apparel buying behavior provides actionable information to garment industries to adjust their arrangements for Bangladeshi

consumers. The statistical analysis has been done based on four statements such as understanding the fiber content in clothing, clothing choice factors, knowledge of cotton in clothes, and influences of marketing on purchases.

2. METHODOLOGY

To assess the pertinent data based on an empirical result, a qualitative approach to survey research was chosen. Particular questionnaires make up the survey. Participants were questioned about their preferences for cotton apparel purchases and how they affected those choices. The convenient probability sampling technique has been utilized to collect data for the current investigation. The sample size is taken in the following way:

$$SS = \frac{Z_\alpha^2 P(1-P)}{\alpha}$$, where SS = sample size, Z_α = 1.96 is the critical value at a 5% level of significance, P = population

percentage, and α = 0.05, level of significance. Therefore, according to the above formula, the required sample size for the

present study would be = $\frac{(1.96)^2 0.6 \times 0.4}{(0.05)^2} = 368.79$. It is observed that 369 is the maximum sample size for the

present study.

There are 43 public universities in Bangladesh. From these universities, we have chosen Chittagong University of Engineering & Technology (CUET) for the present study to collect the sample. Among the students, there is a similarity concerning purchase behavior, fashion patterns, clothing preferences, lifestyle, and so on. Thus, CUET which is located in the Chatttogram district, the southern part of Bangladesh has been taken as the sampling area in this study.

For the collection of primary data, the participants are randomly selected between the age group of 18 – 24 and requested to provide the information by completing the questionnaire form. For the collection of data, a pilot survey was conducted before setting the final questionnaire. Quantitative and qualitative data have been used for this study. The objectives of the present study were focused on the questions' design. The survey measured participant responses regarding their impact on clothing behavior using a Likert scale. The numerical scores of 1 to 5 have been assigned against the answers of strongly disagree - strongly agree. Additional questions were also included for more information about participants' such as ages, gender, and monthly income. The findings have been presented in four different groups: the first one is fiber content in clothing, the second one is clothing choice, the third one is understanding of cotton, and the last one is marketing influences on clothing purchases. The following steps have been taken to complete the current study.

Step I: Primary data was collected using a questionnaire and secondary data was collected from the sources of the internet and relative journals.

Step II: Sample size – 200 (male 65% and Female 35%). Important information has been illustrated through pie charts and bar diagrams.

Step III: The total Questionnaire is divided into four diversified scales which are awareness of fiber cotton, influences the generation's awareness of clothing choice to wear, understanding of cotton in clothing, and marketing influence the generation's cotton clothing purchase decisions.

Step IV: The collected primary data has been analyzed using Microsoft Excel.

Step V: Concluding the purchase behavior for the primary factors and further suggestions

- ➢ Research Type: Descriptive Research

- ➢ Sources of Data: Primary Data

- ➢ Research Approach: Survey Method

- ➢ Data Collection Tool: Self-structured Questionnaire

- ➢ Type of Questionnaire: Structured (Close-ended)

- ➢ The technique of Data Analysis: Z-test and Chi-square test

Sampling Plan:

    i) Study Population: Chattogram district of Bangladesh

    ii) Sampling Area: University Students (18 – 24 years)

    iii) Sampling Unit: One University

    iv) Sample Size: 200

    v) Sampling Technique: Convenient Sampling

3. DATA ANALYSIS AND INTERPRETATION

The survey has been established to answer the research goals of the present study. The survey was presented through 18 questions and the respondents rated their responses as follows: strongly agree – 5, agree – 4, neutral – 3, disagree – 2, and strongly disagree – 1. The mean and standard deviation for each statement has been calculated. The results have been divided into percentage and Chi-square analyses for further clarification.

Demographic Profile

Gender	Frequency	Percentage(%)
Male	130	65%
Female	70	35%
Total	200	100%
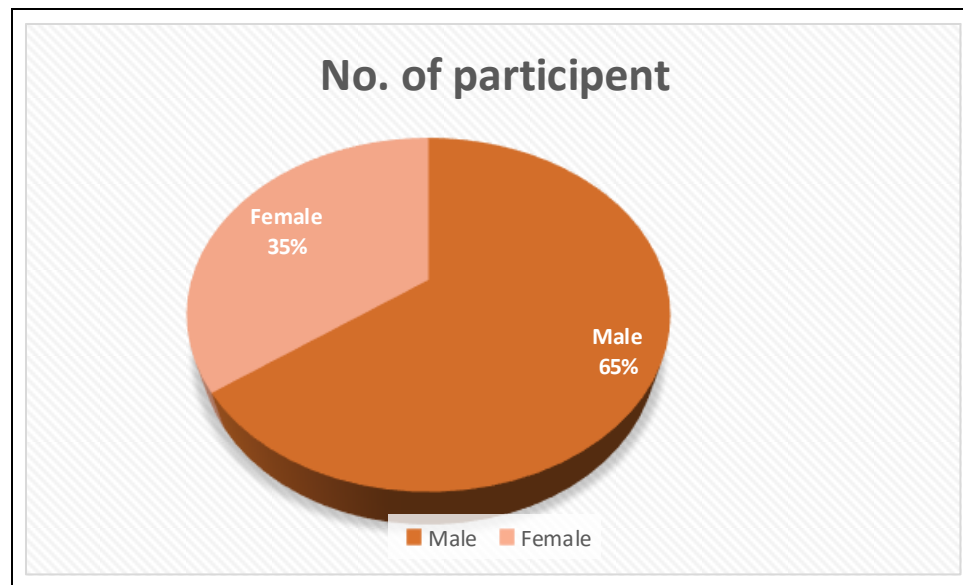
The above diagram depicts that out of the total 200 respondents, 65% of the respondents were male, and 35% were female respondents.

Statement 1: Understanding the fiber content in clothing

Gender	Strongly agree	Agree	Neutral	Disagree	Strongly disagree
Male & female	24.75%	56.50%	12.25%	3.50%	3%

Male &female

Strongly agree ■ Agree ■ Neutral ■ Disagree ■ Strongly disagree
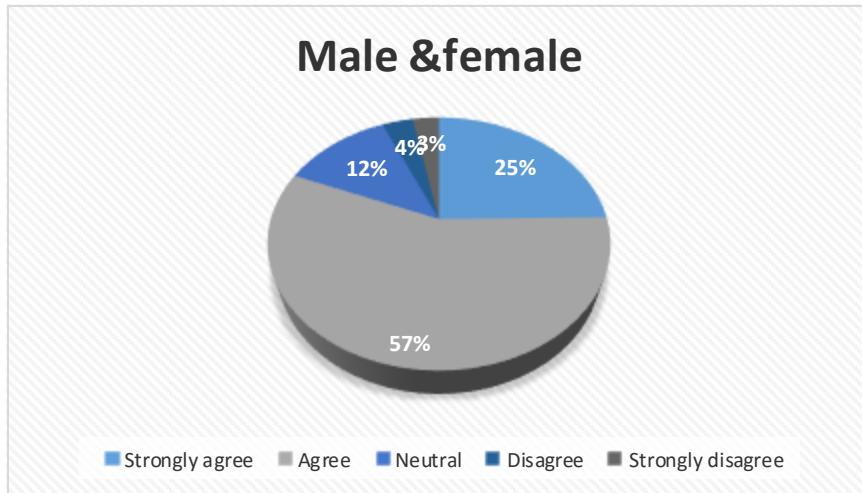
The above diagram illustrates that out of the total 200 respondents, 57% of the respondents agreed, 25% strongly agreed, 12% were neutral, 4% disagreed, and 3% strongly disagreed with statement 1.

Statement 2: Clothing Choice Factor
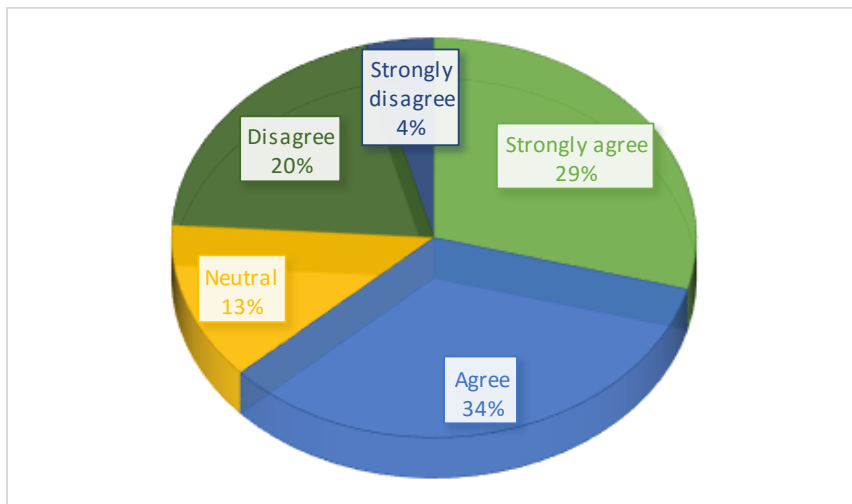
Illustration: The diagram depicts that out of the total 200 respondents, 34% of the respondents agreed, 29% strongly agreed, 13% were neutral, 20% disagreed, and 4% strongly disagreed with statement 2.

Statement 3: Knowledge of Cotton in Clothes

MALE &FEMALE

■ Strongly agree ■ Agree ■ Neutral ■ Disagree ■ Strongly disagree

3%
19%
9%
23%
46%
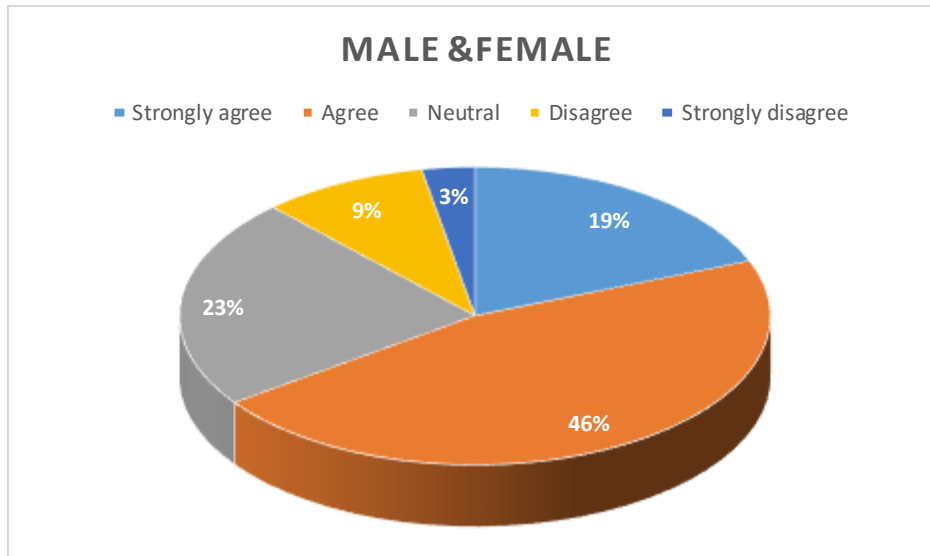
The diagram depicts that out of the total 200 respondents, 46% of the respondents agreed, 19% strongly agreed, 3% were neutral, 9% disagreed, and 3% strongly disagreed with statement 3.

Statement 4: Influences of Marketing on Clothing Purchases

Male &female

11% 13%
25%
33%
18%

■ Strongly agree ■ Agree ■ Neutral ■ Disagree ■ Strongly disagree
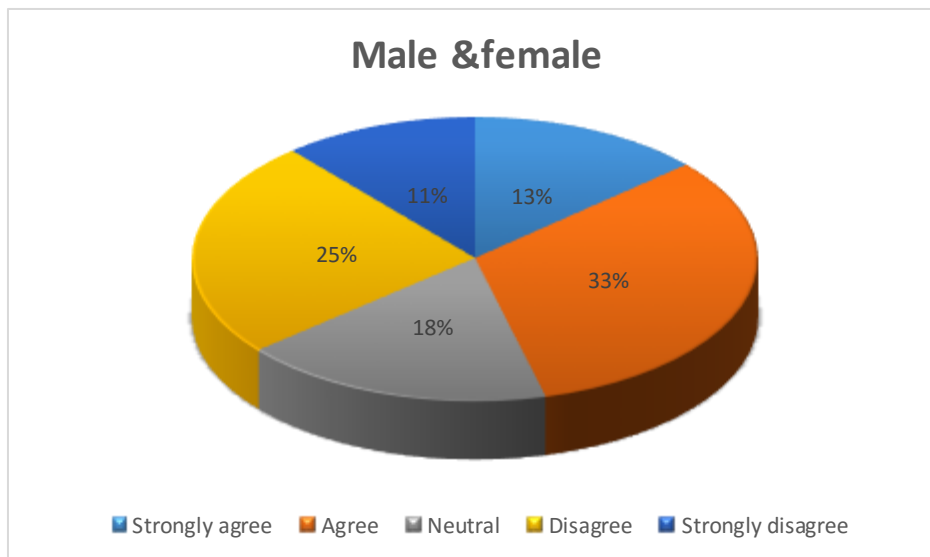
The diagram illustrates that out of the total 200 respondents, 33% of the respondents agreed, 13% strongly agreed, 18% were neutral, 25% disagreed, and 11% strongly disagreed with statement 4.

4. MEASUREMENT OF DEPENDENT VARIABLE

Consumer preferences of purchase behavior are considered as dependent variables for this study. To measure the preference of cotton cloths their choice was identified during the answering of the questions. A 5-point Rikart scale has been developed to explore the preference index of cotton cloths. The preference index of a respondent could fall from 0 to 5 where 0 indicates no satisfaction, 5 indicates high satisfaction, 4 indicates satisfaction, 3 indicates neutral, 2 indicates dissatisfied, and 1 indicates highly dissatisfied. The consumer preferences index for different independent factors by respondents is given in Table 1. From Table 1 it is observed that the maximum value of the preference index, the higher the purchase behavior for that particular

factor. Hence, price (4.31) is the most important factor for the purchasing behavior of cotton cloths, followed by comfort (4.22) of the cotton fabric, type of fiber(4.10), manufacturers' websites (3.89), manufacturers' Facebook (3.84), fiber Awareness (3.71), Brand names (3.70), Prefer of cotton cloth(3.64), Magazine advertisements (3.54), Television advertisements (3.36), Radio advertisements (3.32), Durability (3.31), Internet advertisements (3.20), Influences of friends wear (3.10), and Facebook and Twitter (2.83).

Table 1: Consumers' Preference Index for Independent Factors

Independent factors	No of respondents	Level of satisfaction					Preference index
		Highly satisfied (5)	Satisfied (4)	Neutral (3)	Dissatisfied (2)	Highly dissatisfied (1)	
Fiber awareness	200	40	107	28	10	10	3.71
Type of fiber	200	54	119	21	4	2	4.10
Brand names	200	56	73	30	36	5	3.70
Price	200	101	74	10	15	0	4.31
Influences of friends wear	200	17	57	66	48	12	3.10
Prefer cotton cloth	200	48	81	36	20	15	3.64
Comfortable	200	72	100	28	0	0	4.22
Durability	200	33	62	51	42	12	3.31
Television advertisements	200	26	83	39	40	12	3.36
Radio advertisements	200	24	69	65	30	12	3.32
Internet advertisements	200	22	70	55	31	22	3.20
Facebook and Twitter	200	24	51	28	61	36	2.83
Clothing manufacturers' Facebook	200	50	104	22	11	13	3.84
Clothing manufacturers' websites	200	48	106	29	9	8	3.89
Magazine advertisements	200	38	60	78	19	5	3.54

5. COMPARATIVE DATA ANALYSIS FOR MALE AND FEMALE RESPONDENTS

Statement 1: Awareness of fiber content in clothing for male and female (fiber awareness and fiber content)

Illustration: The above diagram illustrates that out of the 130 male respondents, 59% of the respondent agreed, 17% strongly agreed, 16% were neutral, 4% disagreed, and 4% strongly disagreed the other hand from 70 female respondents 52% of the respondents agreed, 39% strongly agreed, 5% are neutral, 2% disagree, and 2% strongly disagrees with statement 1.

Statement 2: What sways the generation's consciousness of the apparel they wear? (brand name, price of cotton cloth, friends wear)

	Strongly agree	Agree	Neutral	Disagree	Strongly disagree
Male	32%	34%	17%	14%	3%
Female	24%	33%	6%	31%	6%

The above diagram illustrates that out of the 130 male respondents, 34% of the respondent agreed, 32% strongly agreed, 16% were neutral, 14% disagreed, and 3% strongly disagreed on the other hand from 70 female respondents 33% of the respondents agreed, 24% strongly agreed, 6% are neutral, 31% disagree, and 6% strongly disagrees with statement 2.

Statement 3: Do younger generations recognize cotton as a strong, adaptable, durable, versatile, affordable, cotton prefer, and comfortable fabric?

Gender	Strongly agree	Agree	Neutral	Disagree	Strongly disagree
Male	17%	46%	25%	9%	3%
Female	24%	48%	18%	7%	3%
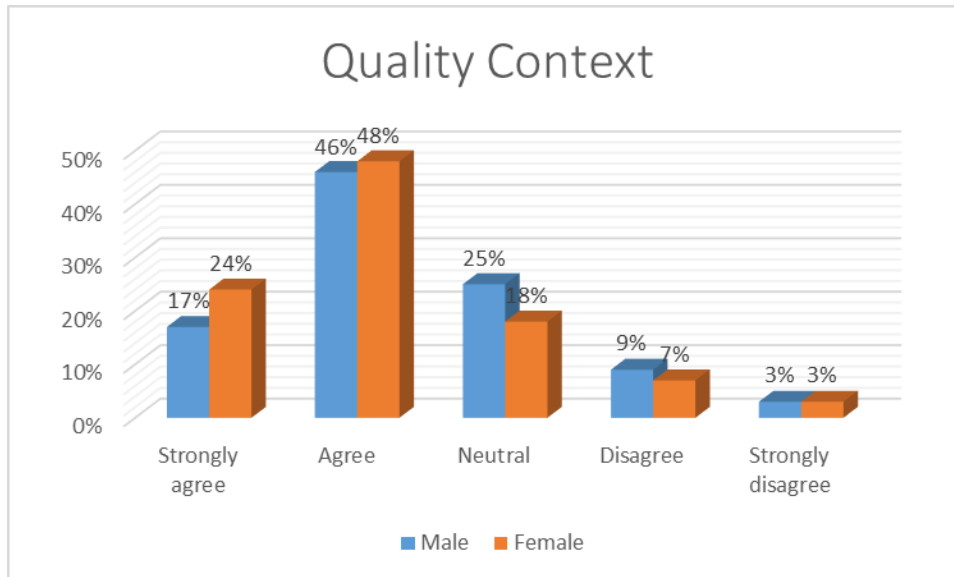
The above diagram illustrates that out of the 130 male respondents, 46% of the respondent agreed, 17% strongly agreed, 25% were neutral, 9% disagreed, and 3% strongly disagreed on the other hand from 70 female respondents 48% of the respondents agreed, 24% strongly agreed, 6% are neutral, 7% disagree, and 3% strongly disagrees with statement 3.

Statement 4: What marketing strategies affect the generation's decisions to buy cotton clothing? (TV advertisements, radio advertisements, Facebook and Twitter, internet advertising, manufacturers' Facebook)

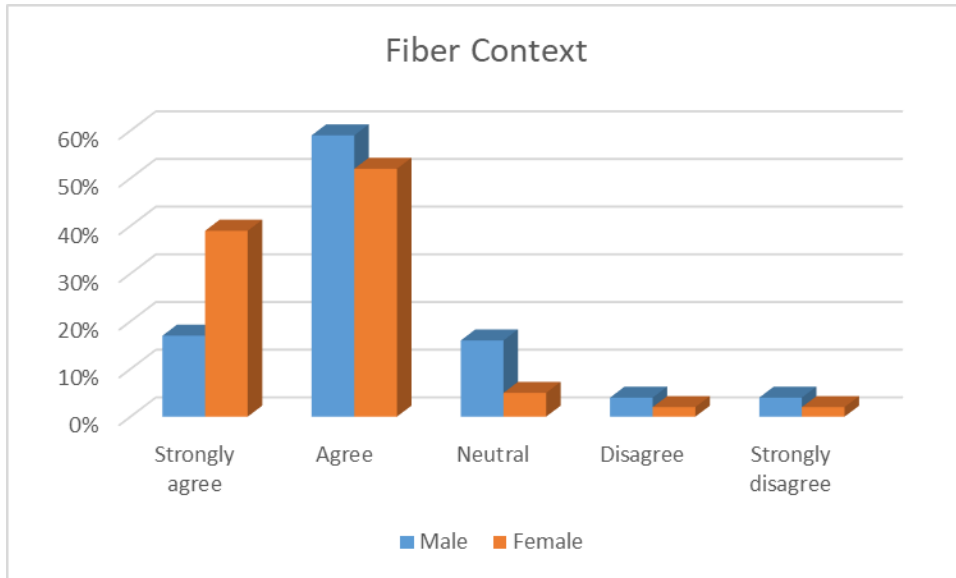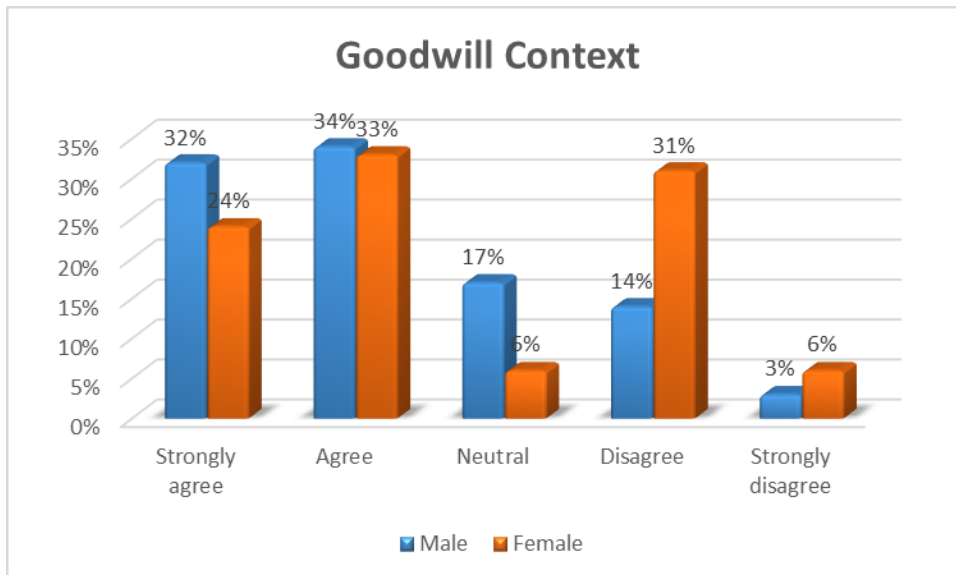|	Strongly agree	Agree	Neutral	Disagree	Strongly disagree
Male	12%	33%	20%	24%	11%
Female	16%	31%	14%	27%	12%
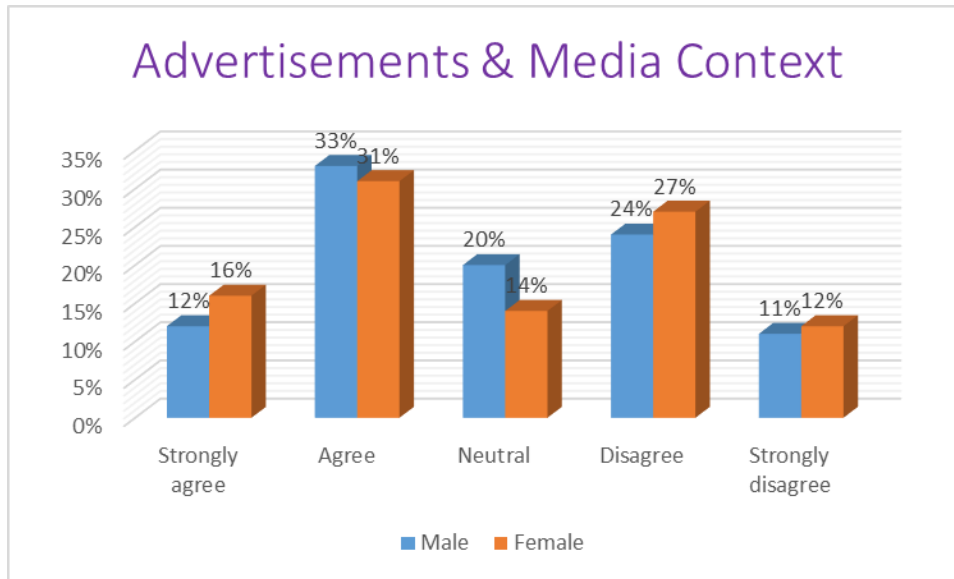
The above diagram illustrates that out of the 130 male respondents, 33% of the respondent agreed, 17% strongly agreed, 20% were neutral, 24% disagreed, and 11% strongly disagreed on the other hand from 70 female respondents 31% of the respondent agreed, 16% strongly agreed, 14% are neutral, 27% disagree, and 12% strongly disagree with statement 4.

6. STATISTICAL ANALYSIS

The data was utilized to identify the key determinants of cotton apparel purchasing decisions and marketing influences in the 18–24 age range. To calculate the participant's level of agreement with each statement, the mean and standard deviation for each forced-choice response were calculated. Each choice's quantity and frequency were also recorded.

6.1. Chi-Square Test for Observed Frequencies and Expected Frequencies ff Fiber Awareness of Male and Female Respondents

Step 1: H_0: There is no significant difference between observed and expected frequencies in fiber awareness of gender.

H_1: There is a significant difference between observed and expected frequencies in fiber awareness of gender.

Step 2: The level of significance is set at 1%, 5%, and 10% respectively and the corresponding Chi-square values are 13.28, 9.49, and 7.78 respectively for 4 degrees of freedom.

Step 3: The Chi-square test statistic has been applied.

Step 4: The degrees of freedom equal (5-1) = 4. If the calculated value of the Chi-square is greater than the critical value of the Chi-square then the null hypothesis will reject and vice-versa.

Step 5: The Chi-square ($\chi^2 = \sum \dfrac{(O-E)^2}{E}$) table is constructed [here, O = observed frequencies and E = expected frequencies].

Table 2: Chi-square table for fiber awareness of male and female consumers during purchasing behavior of cotton clothing

Observed values (O)	Expected values (E)	$O-E$	$(O-E)^2$	$\dfrac{(O-E)^2}{E}$	P - value		
					1%	**5%**	**10%**
21	31	-10	100	3.225806	.168565	.168565	.168565
69	59	10	100	1.694915			
23	25	-2	4	0.16			

9	7	2	4	0.571429	
8	10	-2	4	0.4	
27	25	2	4	0.16	
36	35	1	1	0.028571	
4	5	-1	1	0.2	
2	2	0	0	0	
1	1	0	0	0	
			χ^2 = 6.440722		

From Table 2 it is observed that at 1%, 5%, and 10% levels of significance, the p-value is > 0.01, 0.05, 0.1 which relates to the acceptance of the null hypothesis.

6.2. Chi-Square Test for Observed Frequencies and Expected Frequencies of the Fiber Content of Male Respondents

Step 1: H_0: There is no significant difference between observed and expected frequencies in the case of fiber content.

H_1: There is a significant difference between observed and expected frequencies in the case of fiber content.

Table 3: Chi-square table for the fiber content of male consumers during purchasing behavior of cotton clothing

Observed values (O)	Expected values (E)	$O-E$	$(O-E)^2$	$\dfrac{(O-E)^2}{E}$	P - value		
					1%	5%	10%
23	26	-3	9	0.346154	0.000084	0.000084	0 .000084
84	70	14	196	2.8			
19	18	1	1	0.055556			
2	20	-18	324	16.2			
2	8	-6	36	4.5			
			$\chi^2 = 23.90171$				

From Table 3 it is observed that there is a significant difference between observed and expected frequencies in the case of fiber content during the purchase of cotton clothing at 1%, 5%, and 10% levels of significance.

6.3. Chi-Square Test for Observed Frequencies and Expected Frequencies for Clothing Choice Factors on Purchase Behavior

Step 1: H_0: There is no significant difference between observed and expected frequencies in the case of clothing choice factors.

H_1: There is a significant difference between observed and expected frequencies in the case of clothing choice factors.

Table 4: Chi-square table for clothing choice factors on purchase behavior

Observed values (O)	Expected values (E)	$O-E$	$(O-E)^2$	$\dfrac{(O-E)^2}{E}$	P - value		
					1%	5%	10%
37	35	2	4	0.114286	.062566	.062566	.062566
46	45	1	1	0.022222			
28	18	10	100	5.555556			
15	20	-5	25	1.25			
4	8	-4	16	2			
			χ^2 = 8.942063				

From Table 4 it is observed that we can not reject the null hypothesis at 1% and 5% levels of significance but at a 10% level of significance, the alternate hypothesis can be accepted.

6.4. Chi-Square Test for Observed Frequencies and Expected Frequencies for Knowledge of Cotton on Purchase Behavior

Step 1: H_0: There is no significant difference between observed and expected frequencies in the case of knowledge of cotton.

H_1: There is a significant difference between observed and expected frequencies in the case of knowledge of cotton.

Table 5: Chi-square table for knowledge of cotton on purchase behavior

Observed values (O)	Expected values (E)	$O-E$	$(O-E)^2$	$\dfrac{(O-E)^2}{E}$	P - value		
					1%	**5%**	**10%**
39	36	3	9	0.25	.379332.	.379332.	.379332.
74	70	4	16	0.228571			
16	19	-3	9	0.473684			
1	4	-3	9	2.25			
0	1	-1	1	1			
			χ^2 = 4.202256				

From Table 5 it is observed that at 1%, 5%, and 10% levels of significance, with degrees of freedom 4, we can not reject the null hypothesis. It is also seen that at 1%, 5%, and 10% levels of significance, the p-value is > 0.01, 0.05, and 0.1 respectively which relates to the acceptance of the null hypothesis. The P-value is greater than 0.379332. Therefore, the result is not significant at p < .05, 0.01, and 0.1 respectively.

6.5. Chi-Square Test for Observed Frequencies and Expected Frequencies for the Influence of Advertising on Purchase Behavior

Step 1: H_0: There is no significant difference between observed and expected frequencies in the case of advertising.

H_1: There is a significant difference between observed and expected frequencies in the case of advertising.

Table 6: Chi-square table for the influence of advertising on purchase behavior

Observed values (O)	Expected values (E)	$O-E$	$(O-E)^2$	$\dfrac{(O-E)^2}{E}$	P - value		
					1%	**5%**	**10%**
21	21	0	0	0	.982949	.982949	.982949
32	35	-3	9	0.257143			
22	21	1	1	0.047619			
38	37	1	1	0.027027			
17	16	1	1	0.0625			
			χ^2 = 0.394289				

From Table 6 it is observed that at 1%, 5%, and 10% levels of significance with degrees of freedom 4, we can not reject the null hypothesis. It is also seen that at 1%, 5%, and 10% levels of significance, the p-value is > 0.01, 0.05, and 0.1 respectively which relates to the acceptance of the null hypothesis. It is concluded there is no significant difference between the observed frequency and expected frequency for the influence of advertisements during purchasing. The P-value is 0.982949. The result is not significant at p < .05, 0.01, and 0.1 respectively.

6.6. Z- test between male and female consumers about awareness of fiber content

Step 1: The sample mean $\left(\overline{X} \right)$ and sample standard deviation(S.D.) S is calculated by using the following formula: Mean

$$\overline{X} = \frac{\sum fx}{n}$$ and standard deviation (S.D.) $$S = \sqrt{\frac{\sum f\left(x - \overline{X}\right)^2}{n-1}}$$. Here $\left(\overline{X} \right)$ is the sample mean, f is the

frequency, n is the sample size, and S is the sample standard deviation.

Step 2: The confidence interval(CI) for the population mean is calculated by using this formula $\overline{X} \pm Z_{\alpha/2} \frac{S}{\sqrt{n}}$. Here $Z_{\alpha/2}$

is the critical value of the Z distribution and α = 0.05 is the level of significance.

Step 3: Null hypothesis, H_0: Male and female consumers have no significant difference in fiber awareness of cotton clothing.

The alternative hypothesis, H_1: Male and female consumers have a significant difference in fiber awareness of cotton clothing.

Step 4: Test statistics. Calculated the Z value by applying the formula $Z = \frac{\left(\overline{X_m} - \overline{X_f} \right)}{S_D}$. Where $S_D = \sqrt{S_m^2 + S_f^2}$

is the standard error of the difference between means, $S_m = \frac{S_1}{\sqrt{n}}$ is the standard error of the means of the male group,

$S_f = \frac{S_2}{\sqrt{n}}$ is the standard error of the means of the female group, S_1 is the standard deviation of the male group, S_2 is

the standard deviation of the female group, and sample size n is 200. Compare the Z value at a 5% level of significance.

Table 7: Calculation of Z value for fiber awareness between male and female consumers

Mean $\overline{X_m}$	S.D. S_1	Mean $\overline{X_f}$	S.D. S_2	$S_m = \frac{S_1}{\sqrt{n}}$	$S_f = \frac{S_2}{\sqrt{n}}$	$S_D = \sqrt{S_m^2 + S_f^2}$	$Z = \frac{\left(\overline{X_m} - \overline{X_f} \right)}{S_D}$
4.24	1.1	4.37	1.11	0.096	0.097	0.136	0.96

From Table 7 it is observed that the Z calculated value is 0.96 which ensures the acceptance of the null hypothesis. Therefore, it is concluded that male and female consumers have no significant difference in fiber awareness during purchasing cotton clothing.

Table 8: Calculation of Z value for clothing choice factors between male and female consumers

Mean $\overline{X_m}$	S.D. S_1	Mean $\overline{X_f}$	S.D. S_2	$S_m = \frac{S_1}{\sqrt{n}}$	$S_f = \frac{S_2}{\sqrt{n}}$	$S_D = \sqrt{S_m^2 + S_f^2}$	$Z = \frac{\left(\overline{X_m} - \overline{X_f} \right)}{S_D}$
3.78	1.19	3.38	1.4	0.11	0.12	0.16	2.48

From Table 8 it is observed that the Z calculated value is 2.48 which which ensures the acceptance of the alternative hypothesis. Therefore, it is concluded that male and female consumers have a significant difference in clothing choice factors during purchasing cotton clothing.

Table 9: Calculation of Z value for knowledge of cotton between male and female consumers

Mean $\overline{X}_m$	S.D. S_1	Mean $\overline{X}_f$	S.D. S_2	$S_m = \dfrac{S_1}{\sqrt{n}}$	$S_f = \dfrac{S_2}{\sqrt{n}}$	$S_D = \sqrt{S_m^2 + S_f^2}$	$Z = \dfrac{\left(\overline{X}_m - \overline{X}_f\right)}{S_D}$
3.65	1.25	3.83	1.17	0.11	0.10	0.15	1.2

From Table 9 it is observed that the Z calculated value is 1.2 which which ensures the acceptance of the null hypothesis. Therefore, it is concluded that male and female consumers have no significant difference in knowledge of cotton during purchasing cotton clothing.

Table 10: Calculation of Z value for influences of marketing between male and female consumers

Mean $\overline{X}_m$	S.D. S_1	Mean $\overline{X}_f$	S.D. S_2	$S_m = \dfrac{S_1}{\sqrt{n}}$	$S_f = \dfrac{S_2}{\sqrt{n}}$	$S_D = \sqrt{S_m^2 + S_f^2}$	$Z = \dfrac{\left(\overline{X}_m - \overline{X}_f\right)}{S_D}$
3.11	1.58	3.12	1.57	0.14	0.20	0.20	0.05

From Table 10 it is observed that the Z calculated value is 1.2 which is which ensures the acceptance of the null hypothesis. Therefore, it is concluded that male and female consumers have no significant difference in advertising during purchasing cotton clothing.

Table 11: Calculation of µ for fiber awareness on purchase behavior

Frequency f	Likert Scale (X)	fX	Mean $\overline{X}$	$X - \overline{X}$	$\left(X - \overline{X}\right)^2$	$f\left(X - \overline{X}\right)^2$	$S = \sqrt{\dfrac{\sum f\left(x - \overline{X}\right)^2}{n-1}}$	Population Mean, µ = $\overline{X} \pm Z_{\alpha/2} \dfrac{S}{\sqrt{n}}$
21	5	105	3.66	1.338462	1.791479	37.62107	0.6628	$3.55 \leq \mu \leq 3.78$
69	4	276		0.338462	0.114556	7.904379		
23	3	69		-0.66154	0.437633	10.06555		
9	2	18		-1.66154	2.760709	24.84638		
8	1	8		-2.66154	7.083785	56.67028		
$n = 130$		$\sum fX = $ 476				137.1076		
		Z critical value is ± 1.96						

Table 12: Calculation of µ for fiber content on purchase behavior

Frequency f	Likert Scale (X)	fX	Mean $\overline{X}$	$X - \overline{X}$	$\left(X - \overline{X}\right)^2$	$f\left(X - \overline{X}\right)^2$	$S = \sqrt{\dfrac{\sum f\left(x - \overline{X}\right)^2}{n-1}}$	Population Mean, µ = $\overline{X} \pm Z_{\alpha/2} \dfrac{S}{\sqrt{n}}$
23	5	115	3.95	1.046154	1.094438	25.17207	0.367797	$3.89 \leq \mu \leq 4.02$
84	4	336	3.95	0.046154	0.00213	0.178935		
19	3	57	3.95	-0.95385	0.909822	17.28663		
2	2	4	3.95	-1.95385	3.817515	7.63503		
2	1	2	3.95	-2.95385	8.725207	17.45041		
$n = 130$		514				67.72308		
		Z critical value is ± 1.96						

Table 13: Calculation of µ for clothing choice factors on purchase behavior

Mean $\overline{X}$	Standard deviation $S = \sqrt{\dfrac{\sum f\left(x - \overline{X}\right)^2}{n-1}}$	Population Mean, µ = $\overline{X} \pm Z_{\alpha/2} \dfrac{S}{\sqrt{n}}$
3.78	1.19	$3.58 \le \mu \le 3.98$
	Z critical value is ± 1.96	

Table 14: Calculation of µ for knowledge of cotton on purchase behavior

Mean $\overline{X}$	Standard deviation $S = \sqrt{\dfrac{\sum f\left(x - \overline{X}\right)^2}{n-1}}$	Population Mean, µ = $\overline{X} \pm Z_{\alpha/2} \dfrac{S}{\sqrt{n}}$
3.65	1.25	$3.44 \le \mu \le 3.86$
	Z critical value is ± 1.96	

Table 15: Calculation of µ for the influence of marketing on purchase behavior

Mean $\overline{X}$	Standard deviation $S = \sqrt{\dfrac{\sum f\left(x - \overline{X}\right)^2}{n-1}}$	Population Mean, µ = $\overline{X} \pm Z_{\alpha/2} \dfrac{S}{\sqrt{n}}$
3.11	1.58	$2.84 \le \mu \le 3.38$
	Z critical value is ± 1.96	

8. CONCLUSIONS

The present study has focused on the key factors of the consumers buying behavior of cotton clothing. To achieve this objective, four research goals such as fiber content, awareness of clothing, understanding of cotton fabric, and marketing influence on purchase decisions have been established. it is observed that the maximum value of the preference index, the higher the purchase behavior for that particular factor. Hence, price (4.31) is the most important factor for the purchasing behavior of cotton cloths, followed by comfort (4.22) of the cotton fabric, type of fiber (4.10), manufacturers' websites (3.89), manufacturers' Facebook (3.84), fiber Awareness (3.71), Brand names (3.70), Prefer of cotton cloth(3.64), Magazine advertisements (3.54), Television advertisements (3.36), Radio advertisements (3.32), Durability (3.31), Internet advertisements (3.20), Influences of friends wear (3.10), and Facebook and Twitter (2.83). The researchers concluded that consumers perceive cotton as a cozy, enduring, and adaptable fabric. This group believes cotton is too expensive, albeit to a significantly smaller extent. Most marketing media had low mean ratings (under 2.0), which suggests that the consumer is a hesitant buyer. The researchers concluded that consumers are influenced to purchase cotton clothes by the factors internet, Facebook, and manufacturer websites.

The data has been analyzed with the help of statistical tools like percentage analysis, Z test, and Chi-square analysis. From the analysis, it is observed that 59% of the male respondents but 52 % of the female respondents agreed with awareness of fiber content in clothing, 34% of the male respondents but 33 % of the female respondents agreed with awareness of clothing to wear, 46% of the male respondent and 48 % of the female respondent agreed with cotton fabric as durable, versatile, and comfortable fabric, and 33% of the male respondent but 31 % of the female respondent agreed with marketing influence the cotton clothing purchase decisions. At a 95% confidence level, it is observed that male and female consumers have no significant difference in fiber awareness, knowledge of cotton, and advertising while purchasing cotton clothing but in the case of clothing choice factors a significant difference exists. From the Chi-square analysis it is concluded there is no significant difference between the observed frequency and expected frequency for the fiber awareness, knowledge of cotton, and advertising during purchasing but in the case of clothing choice factors a significant difference exists. Therefore, significant factors like price, comfort, fiber content, manufacturers' websites, Facebook, awareness of fiber, brand names, and magazine advertisements play a major role in their purchase decisions.

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FAILURES PREVENTION METHODS FOR SUSTAINABILITY OF PRODUCTION-FAILURE MODES AND EFFECT ANALYSIS IN A BUSINESS: A CASE STUDY

Aysenur Erdil[1], Hikmet Erbiyik[2]
[1]Istanbul Medeniyet University, Istanbul, Turkiye.
 aysenurerdil@gmail.com, ORCID: 0000-0002-6413-7482
[2]Yalova University, Faculty of Engineering, Department of Industrial Engineering, Yalova, Turkiye.
 hikmeterbiyik53@gmail.com , ORCID: 0000-0001-8010-0199

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ABSTRACT

Purpose- Quality activities should include all product life processes, starting from the determination of customers' demands and prejudices to the service activities provided to customers. By integrating quality-oriented practices, conducting FMEA, and employing Pareto analysis, the research aims to enhance the system's reliability, efficiency, and overall performance. This, in turn, can lead to improved customer satisfaction, reduced costs, increased productivity, and a more sustainable and successful operation in the packaging department.

Methodology- In order to keep up with the rapidly developing technology, to be open to innovations with developing technologies, to be in an advantageous position against competitors and ultimately to satisfy customers and fulfil their satisfaction; it is necessary to meet the demands and needs of customers without error and at low cost. Failure Modes and Effect Analysis is applied to provide the sustainability of the production system without the failures. This study focuses on failure analysis, defining failure modes, and conducting error prevention studies within the context of businesses. The aim is to achieve zero failure and zero error by implementing effective prevention techniques. By identifying the root causes of failures and errors, businesses can develop strategies and procedures to prevent them from occurring in the first place. This proactive approach helps ensure a higher level of quality, reliability, and customer satisfaction. By emphasizing the importance of error and failure prevention, businesses can strive for continuous improvement, minimize disruptions in the production system, reduce costs associated with rework or product recalls, and maintain a strong competitive position. Implementing zero failure-error and zero error-failure prevention techniques is crucial for sustaining a reliable and efficient production system.

Findings- This research shows that quality is a science that people meet in reality, not simply a theoretical concept. All organizations in the universe should take their quality management systems one step further with their approach to quality processes. In this context, the concept of zero failure-error in production or service lines has become important. By applying FMEA and considering sustainability aspects, the research aims to enhance the manufacturing process, minimize risks and failures, and contribute to sustainable practices in the food industry.

Conclusion- The mentioned sample study on Failure Modes and Effects Analysis (FMEA) in food packaging within the production department of a food sector enterprise in the Marmara region highlights the importance of preventing possible failure modes and their impact on the sustainability of production. One key aspect emphasized in the study is the potential reduction of food and packaging waste by minimizing packaging or substituting oil-based materials with renewable resources. By utilizing environmentally friendly food packaging, various advantages can be achieved, including a decrease in food loss and waste, as well as a reduction in the negative environmental impact associated with managing packaging materials and waste. To accomplish this, it is crucial to address food demands throughout the entire food supply chain, with particular attention to transportation and consumption stages. In order to optimize the sustainability of food and packaging systems as a whole, it is necessary to consider the product and its packaging as an integrated system. By applying FMEA and considering the potential failure modes in food packaging, the study aims to identify areas for improvement and implement measures that enhance sustainability throughout the production process.

Keywords: Failure prevention, failure mode and effect analysis, quality, sustainable production.
JEL Codes: M10, L15, O14

1. INTRODUCTION

Sustainable manufacturing and production are essential for a nation's population. These concepts are crucial for ensuring the well-being of both present and future generations. By adopting sustainable practices, businesses aim to meet the needs of individuals and families while minimizing the adverse environmental and social impacts associated with their operations. The goal of this system is to offer better and higher-quality choices for meeting individual and family needs while minimizing the negative ecological and social repercussions of failures and defects. the objective of sustainable manufacturing and production is to provide improved and higher-quality choices that meet individual and family needs while minimizing negative ecological and social impacts. By adopting sustainable practices, businesses can contribute to a more sustainable future for all.

Failure Modes and Effects Analysis (FMEA) uses a Risk Priority Number (RPN) to assess and prioritize failures. This number is a combination of factors such as the severity, probability, and detectability of failures. As a result of the FMEA, the RPN values of potential failures are determined and listed in order of priority. It analyzes what type of failure each potential failure is and what effects this failure can cause. For example, a failure may affect product quality, cause delays in the production process or negatively impact customer satisfaction. As a result of FMEA, the type of each failure and its possible effects are determined. The FMEA recommends preventive or corrective actions to be taken to avoid or reduce potential failures. These actions can reduce the likelihood of failures occurring or minimize their effects. FMEA identifies the recommended actions and their effectiveness for each potential failure. FMEA results reveal weak points in business processes and opportunities for improvement. The analysis of potential failures helps to identify the strengths and weaknesses of processes. This information ensures that necessary adjustments are made in business processes and processes are made more reliable. FMEA results help businesses identify errors and risks, take preventive actions, and improve their processes. These results are an important resource for businesses to improve product and process quality, reduce costs, ensure customer satisfaction and meet safety standards (Bektaş, 2007; Canbolat, 2008; Chin et al., 2009; Xiao et al., 2011; Su et al., 2012; Aydan and Kaya, 2017) .

In the mentioned research, FMEA is presented as a preventive approach to identify and analyze failure modes in food packaging for the purpose of ensuring sustainability in production. The study explores various aspects related to failure definitions, types, and investigations within the context of an enterprise operating in the food industry. By conducting a representative investigation into process failure types and performing impact analysis, the study aims to proactively prevent potential failure modes in food packaging. This is specifically focused on the production department of the organization in the Marmara region. The objective is to enhance the sustainability of production by addressing and mitigating potential failures that could negatively impact the quality, safety, and efficiency of food packaging processes. Through the implementation of FMEA, the research aims to identify and understand the failure modes that may occur in food packaging, evaluate their potential effects, and develop preventive measures to minimize or eliminate their occurrence. By taking a proactive approach to identify and address potential failure modes, the study seeks to enhance the overall sustainability of production processes within the food industry, particularly in relation to food packaging. The research underscores the significance of failure analysis and prevention in the context of food packaging, highlighting its importance for ensuring sustainable production practices in the examined enterprise.

The objective of this research is to explore the risk variables associated with significant production arrangements in the regular operating of the production and processing system. The goal of this work was to provide a grading system for food packaging that would take into account three important aspects of sustainability: materials, functionality, and post-use destiny.

The research aims to introduce improvements that can aid in the management and control of processing phases, specifically in the packaging department, and enhance the performance of the proposed system. The study focuses on conducting a comprehensive evaluation of operating systems, considering adverse environmental conditions, contamination risks, and potential flaws. To analyze failure modes and their effects, the research utilizes a quality-oriented approach, particularly employing the Failure Mode and Effects Analysis (FMEA) methodology. This method allows for the identification and prioritization of relevant elements or factors that may lead to failure or errors in operational production systems. Additionally, Pareto analysis is employed as a tool to identify the most critical and impactful factors contributing to failure modes. By utilizing this analysis technique, the study aims to effectively control and prevent potential failures and mistakes in the operational production systems. The overall objective of the research is to enhance the quality and performance of the system by addressing and mitigating potential failure modes. By implementing quality-oriented practices and utilizing analytical tools like FMEA and Pareto analysis, the study seeks to establish a more robust and reliable operational production system in the packaging department, thereby improving overall efficiency and minimizing the occurrence of failures and errors.

2. LITERATURE REVIEW

2.1. Overview of the Concepts

Any system preserves a comprehensive definition of sustainability, emphasizing the importance of preserving the natural environment, preventing distortions, avoiding strain on the supply chain, and minimizing resource waste. Sustainability is achieved when a system allows for the continuation of a certain ecology or continuity without overburdening the supply chain or utilizing unnecessary resources. To ensure sustainability, it is crucial to strike a balance between environmental considerations, such as maintaining the Earth's carrying capacity, the financial aspect of providing a sufficient standard of living for all, and the societal and cultural imperative of developing political structures that align with individuals' desired value systems and empower them to have control over their circumstances. By integrating these elements, sustainable systems can be designed and implemented to meet present needs without compromising the ability of future generations to meet their own needs. It requires a holistic approach that considers environmental, economic, and social factors, taking into account the long-term impacts and interdependencies among them. Sustainability is not just about preserving the natural environment; it also encompasses social and economic dimensions, striving for a harmonious balance that supports human well-being, social equity, and economic prosperity while respecting the limits of our planet's resources (Munasinghe, 1993; Hueting and Reijnders, 1998; Sezgin and Kalaman, 2008; Özkök and Gümüş, 2009).

2.1.1. Sustainability in Product Design and Manufacturing-Production Eco-Efficiency

Emulating life's creativity consciously is a way to highlight some important points regarding sustainability and its connection to emulating life's creativity consciously. It is true that by aligning our actions and systems with the natural world, the chances of survival can be increased, and a sustainable future can be created. It consciously means drawing inspiration from the efficiency, adaptability, and regenerative capacity of natural systems. By understanding and incorporating these principles into our practices, more sustainable solutions could be developed. This includes designing products and systems that mimic the circularity and resilience found in nature. The example of Ricoh making copier machines more durable and moving towards a leasing model reflects the shift towards a more sustainable approach. By extending the useful life of their products, they reduce waste and resource consumption. This highlights the connection between business considerations and environmental impact, emphasizing the importance of finding ways to increase product value while minimizing environmental effects. Eco-efficiency, which focuses on optimizing resource use and reducing environmental impact, is indeed a crucial aspect of sustainability. By improving the efficiency of production processes, reducing waste, and utilizing renewable resources, businesses can enhance their eco-efficiency. In the context of production and manufacturing, sustainability should be a primary focus. This involves implementing sustainable practices in operation management systems, such as incorporating renewable energy sources, adopting circular economy principles, and optimizing resource utilization. Overall, by consciously emulating life's creativity and prioritizing sustainability in production and manufacturing, a more harmonious relationship between human activities and the environment could be created, ensuring a better future for generations to come (Munasinghe, 1993; Hueting and Reijnders, 1998; Sezgin and Kalaman, 2008; Özkök and Gümüş, 2009); (i) Reducing the material content of products and services, (ii) Reducing Energy Intensity (both in production and consumption); an example would be Whirlpool Energy Star refrigerators, (iii) Reducing Toxic Distribution, (iv) Increasing Durability, (v) Increase Recyclability.

2.1.2. Sustainable Packaging

The world has the potential for producing sustainable packaging that is obtained, produced, transported, and recycled using non-polluting renewable energy sources. This type of packaging has minimal environmental impact and does not contribute to pollution. It is important to note that sustainable packaging can meet market performance and cost requirements without significant environmental costs. Packaging plays a crucial role in reducing food loss and waste (FLW) by protecting food from degradation. However, the manufacturing and disposal of food packaging can have negative environmental effects, including the unresolved issue of post-use plastic packaging and its associated health and ecotoxicology concerns. Despite the potential negative impacts, packaging for food can have indirect positive environmental effects by reducing FLW and enabling effective product distribution. The overall benefits of packaging in terms of product preservation and security may outweigh its direct harm to the environment. However, striking a balance between these positive and negative effects is essential for making informed decisions about packaging and minimizing its ecological footprint. The work of Wikström and Williams highlights the need to consider the trade-offs between product preservation, security, and environmental impact when evaluating packaging. The approach developed by Molina-Besch and Palsson assesses packaging systems based on criteria such as material

manufacturing, transportation, domestic use, and end-of-life. Ratings on a scale of 1 to 5 are assigned to measure improvements or changes in these criteria. While this approach was initially developed for a specific applicant, it may be challenging to extend it to other users. Additionally, it can be difficult to identify instances of underpackaging (insufficient packaging for the product's requirements) or overpackaging (excessive packaging) without compromising the necessary qualities of the food product. Overall, sustainable packaging has the potential to mitigate environmental impacts and contribute to the overall sustainability of the food industry. Striking a balance between packaging functionality, environmental considerations, and product requirements is crucial for making informed decisions and reducing the ecological footprint of packaging (Wikström and Williams, 2010; Geyer et al., 2017; Guillard et al., 2018; Molina-Besch et al., 2018; Williams et al., 2020; Rahman et al., 2021; Ragusa et al., 2021; Coffigniez et al., 2021).

Packaging indeed has a dual nature and can be viewed from two different perspectives. On one hand, there are concerns about its direct environmental effects, especially when the packaging design relies on materials derived from fossil fuels and follows a linear, non-recyclable approach. This type of packaging contributes to resource depletion and generates waste that may persist in the environment for long periods. Existing standards only offer broad recommendations on how to measure packaging's ecological responsibility. The suggested paradigm identifies three sustainable components of food packaging, including circularity, packaging-related food losses and waste, and direct ecological effects of packaging. It offers a list of the most important environmental performance metrics and suggests specific methods for calculating each indicator. The framework is focused on the European Union's Circular Economy Package and the Product Environmental Footprint project. A technique to estimate the volume of food losses and waste attributable to packing has to be developed via further study (Wikström and Williams, 2010; Geyer et al., 2017; Pauer et al., 2019) .

On the other hand, there is a perception among consumers that packaging-related waste has a greater negative impact on the environment compared to food waste. This perception stems from the fact that food is organic and biodegradable, whereas certain packaging materials, such as plastics, can persist in the environment for hundreds of years. Consumers are often more aware of the visible presence of packaging waste and its potential harm to ecosystems and wildlife. It is important to note that both food waste and packaging waste have environmental consequences, and a comprehensive approach is needed to address both issues. Minimizing food waste is essential to reduce the overall environmental impact of the food sector, as it involves the efficient use of resources, such as water, energy, and agricultural land. Additionally, sustainable packaging solutions that prioritize recyclability, use renewable materials, and adopt a circular economy approach can help mitigate the negative environmental impacts associated with packaging. By shifting towards more sustainable packaging practices, such as reducing the use of single-use plastics, promoting recycling, and exploring innovative packaging materials, it is possible to find a balance between protecting the environment and ensuring the functional requirements of packaging for food products. This involves considering the entire life cycle of packaging, from sourcing materials to disposal, and adopting approaches that minimize waste generation, promote reuse, and facilitate recycling or composting. Education and awareness campaigns can also play a significant role in informing consumers about the environmental impacts of both food waste and packaging waste. By promoting responsible consumption and waste reduction practices, individuals can contribute to a more sustainable approach to packaging and minimize its negative effects on the environment (Williams et al., 2012; Principato et al., 2015; opinions of the authors). Packaging plays a vital role in protecting perishable items, such as meat and dairy products, from spoilage, contamination, and damage. By providing a barrier against external factors like air, moisture, and microorganisms, packaging helps extend the shelf life of these products. This, in turn, reduces the likelihood of food waste occurring before the consumer has the opportunity to use or consume them. Furthermore, packaging provides important information such as expiration dates, nutritional content, and storage instructions, which can help consumers make informed decisions and optimize their food usage. Clear labeling and proper portioning can also contribute to reducing food waste by enabling consumers to manage quantities more effectively and prevent overbuying or excessive food preparation. While it is essential to consider the environmental impacts associated with packaging materials and waste, there can be an environmental justification for additional packaging when it comes to certain food products. The added packaging can help maintain product quality, freshness, and safety, which in turn reduces the likelihood of food waste. It is worth noting that finding a balance is crucial. The goal should be to optimize packaging design and materials to minimize environmental impact while still providing the necessary protection and functionality for food products. This can involve exploring sustainable packaging options, such as recyclable or compostable materials, reducing excessive packaging, and optimizing packaging designs to minimize resource use. Overall, the role of packaging in reducing food waste should be acknowledged and considered alongside its environmental implications. Balancing the need for food protection and waste reduction with sustainable packaging practices is a key challenge that requires a holistic approach involving collaboration

between stakeholders throughout the supply chain. To maximize the positive environmental effects of packaging, it is important to consider the entire life cycle of the packaging, from material sourcing to disposal. Collaboration between stakeholders, including packaging designers, manufacturers, retailers, and consumers, is crucial in promoting sustainable packaging practices and driving positive environmental change across the food supply chain. By implementing sustainable packaging strategies, environmental impacts can be mitigated, waste can be reduced, and it can be worked towards a more environmentally responsible and resource-efficient food system (Heller et al., 2019; Wikström et al., 2019).

Scientists are becoming more interested in packaging, which has recently been highlighted as a crucial component to solve the major problem of sustainable food consumption (Angellier-coussy et al., 2013; Licciardello, 2017). Packaging plays a crucial role in enhancing food quality and safety during storage by controlling gas and vapor exchanges with the external atmosphere. This control helps to prevent the development of food safety problems, such as food-borne illnesses and chemical contamination, and extends the shelf life of food. By utilizing packaging materials that are appropriately sized and tailored to the specific requirements of different types of food, significant advantages can be achieved in terms of minimizing food waste. Packaging helps to protect food from physical damage, microbial growth, and exposure to oxygen, moisture, and light, which can all contribute to food deterioration and spoilage. By providing a barrier against these factors, packaging helps to maintain the quality and freshness of food for a longer period. By extending the shelf life of food, packaging can have a positive impact on reducing food waste. When food is properly protected and preserved, it is less likely to spoil or become unsafe for consumption, resulting in lower levels of discarded food. This can help in minimizing the amount of food waste generated throughout the supply chain, from production to distribution and consumption. However, it is important to recognize that packaging should be designed and used in a sustainable and responsible manner. This involves considering the environmental impacts associated with packaging materials, optimizing packaging designs to minimize waste and resource use, and promoting recycling and proper disposal practices. By adopting a holistic approach to packaging, its benefits in reducing food waste can be maximized while minimizing its potential negative impacts on the environment. It is crucial to shift the perception of packaging from being viewed solely as an additional expense to recognizing its role as a valuable tool for waste reduction and food preservation. By understanding the benefits of properly designed and utilized packaging, it can be work towards a more sustainable and efficient food system that minimizes both food waste and environmental impact. (Matar et al., 2010; Angellier-coussy et al., 2013; Verghese et al., 2015).

According to the EEA (2016), food supply chains contribute to a range of urgent environmental issues, including eutrophication, climate change, and biodiversity loss. The overall environmental impact of food supply chains is influenced by various factors, and the role of packaging in this impact is a topic of debate and ongoing research. Packaging can contribute to environmental issues through the generation of packaging waste, particularly when it is not properly managed or disposed of. Excessive packaging and the use of non-recyclable materials can lead to increased waste and resource depletion. To address these concerns, regulations and laws have been enacted in many regions to promote packaging waste reduction, recycling, and the use of more sustainable materials. On the other hand, packaging also plays a crucial role in protecting and preserving food, which can help reduce food waste and associated environmental impacts. The prevention of food waste through proper packaging can contribute to the conservation of resources, such as water, energy, and land, that are used in food production. Packaging can also enable efficient transportation, improving supply chain logistics and reducing greenhouse gas emissions. To achieve sustainable food supply chains, it is essential to adopt a holistic approach that considers the entire life cycle of packaging, from material sourcing and production to end-of-life disposal. This involves designing packaging with sustainable materials, optimizing packaging sizes and configurations to minimize waste, promoting recycling and reuse, and exploring innovative solutions such as biodegradable or compostable packaging. Furthermore, efforts to reduce the environmental impact of food supply chains should not solely focus on packaging, but also address other critical areas, including agricultural practices, transportation, energy use, and waste management. A comprehensive and integrated approach is necessary to achieve a more sustainable and environmentally responsible food system. Continued research, innovation, and collaboration among stakeholders are crucial in finding the right balance between packaging's role in food preservation and its environmental impact (Tencati et al., 2016; Beitzen-Heineke et al., 2017; Tua et al., 2017). By minimizing food waste, packaging contributes to resource conservation, as the resources invested in food production, including water, energy, and agricultural inputs, are not wasted in vain. It also helps to reduce the environmental impact associated with food production, such as land use, greenhouse gas emissions, and water pollution. However, it is important to strike a balance between the benefits of packaging in reducing food waste and its potential environmental impact. Sustainable packaging practices should be encouraged, such as using recyclable or compostable materials, optimizing packaging sizes to minimize material use and promoting recycling and proper waste

management. By considering the full life cycle of packaging and adopting sustainable practices, the environmental advantages of packaging in reducing food waste can be maximized while minimizing any negative effects (Williams et al., 2008; Bertoluci et al., 2014; Verghese et al., 2015). According to numerous studies (Büsser and Jungbluth 2009; Wikström and Williams 2010; Silvenius et al., 2013), the supplementary ecological impact of packaging has a bigger proportional influence on many food supply chains than its direct ecological impact. The manufacturing and end-of-life stages of packaging can have negative environmental impacts. The production of packaging materials often involves the extraction of raw materials, energy consumption, and the release of greenhouse gas emissions. Additionally, certain manufacturing processes may generate waste and pollutants that can harm the environment if not properly managed. Furthermore, the disposal or management of packaging waste at the end of its life can contribute to environmental pollution and resource depletion. Improperly disposed packaging, such as plastic waste ending up in oceans or landfills, can have detrimental effects on ecosystems, wildlife, and marine life. Inadequate recycling infrastructure and practices can also result in the inefficient use of resources and the loss of valuable materials.

2.1.3. Sustainable Packaging Coalition

The mission of the Coalition for Sustainable Packaging is to develop and express a strong, positive environmental perspective for packaging and promote new, useful packaging products and systems that, via supply chain cooperation, advance both economic and environmental well-being. Throughout its life cycle, sustainable packaging is advantageous, secure, and healthy for people and organizations. It is obtained, produced, shipped, and regenerated utilizing renewable energy, and it satisfies market standards for performance and cost. The usage of recyclable or renewable resources is maximized under this definition. It is created using materials that are safe in all likely end-of-life scenarios utilizing clean production technology and industry best practices. In addition to being physically constructed to maximize the use of resources and energy, it also efficiently recovers and uses waste products in industrial and/or commercial cradle-to-cradle cycles. The layout and construction of the package have a big impact on how long a food product will stay fresh. To protect product efficacy and integrity throughout transit and storage, the proper packaging supplies and techniques are selected. The packaging of a product acts as its outside appearance and is usually the only way for buyers to view the item prior to making an investment. Therefore, in a cutthroat market, packaging that is distinctive or unusual may boost sales. The packaging may be designed to enhance the product's reputation and/or distinguish it from rival brands. For example, larger labels could be used to accommodate ingredients. Packaging keeps food confined and safeguards it as it moves through the supply chain to the customer (Lewis et al., 2010; Lewis, 2012). Protection, which includes preventing breakage, spoilage, and contamination; promotion, which includes outlining the characteristics of the product, components, and advertising; information, which includes identifying the item, getting ready, and end-of-life management; simplicity, which includes getting ready and portioning; utilization and handling, which involves supplying for transportation and retailing; and minimizing waste, which includes lengthening shelf-life.

One of the most crucial aspects of logistics is packaging since it makes it possible for the good to be (Jantzen and Alexander, 1987; Prendergast, 1995): (i) Contained and safeguarded: The package shields both the product and the environment from harm. (ii) Apportioned: Packaging makes it possible to scale back industrial production's output to sizes that are manageable for different intermediaries and customers. (iii) Unitized: This improves materials handling by allowing many shipments to be handled simultaneously. (iv) Communicated: The package communicates with multiple channel participants. Packaging impacts logistics, but logistics also affects package since the visual appeal of the packaging will be greatly influenced by the system of distribution.

Equipment utilized for material handling during the distribution channel has an impact on packaging. Particularly, the package might need to be resilient to the pressures involved in mechanical or manual movement as well as flexible to relevant handling tools. Storage methods and facilities that are employed through the distribution channel have an impact on packaging. For example, the packaging must allow for order picking, allow for inspection, and protect the goods from any potential environmental threats (rodents, moisture, etc.) in the storage space. Selecting the package material and design that most effectively satisfies conflicting objectives regarding product qualities, marketing implications (including distribution needs and customer wants), ecological and waste management challenges, and expense is the key to effective packaging. In addition to being challenging, balancing numerous variables necessitates a unique analysis for each product, taking into account things like the features of the material used for packaging, the type of food to be packaged, potential food/package relationships, the target market, desired shelf-life, environmental surroundings during transportation and storage, final use of the product, eventual package disposal, and costs associated with the package throughout the production process. Some of these variables

are interconnected; for instance, the kind of food being consumed, and the material's characteristics affect the interactions between food and package throughout storing (Fellows and Axtell, 2002; Golan et al., 2004).

3. FAILURE MODES AND EFFECT ANALYSIS

Failure Modes and Effect Analysis (FMEA) is a system that segregates and compartmentalizes error possibilities and commonalities in order to identify possible error types and to upgrade the product. If we need to base the success of this system on a few things, these are the identification of errors in the same sector or in events experienced in the past. As a result of the errors and analyzes that have been made or detected, these errors can be removed from the system with the least effort and financial loss. As it can be deducted from this explanation, this analysis simultaneously reduces the financial loss of the business or sector and contributes to product upgrading. The purpose of this structure is to prevent possible bad consequences as well as to prevent loss of life and property. To give an example of this situation, an airline company should check its aircraft before flying so that there is no problem during the flight, let's say that the plane malfunctioned in the air and crashed. As a result, there were casualties and property losses, first of all, the brand reliability of the airline company, the brand name is damaged, maybe it may even go bankrupt after a while. FMEA is the step that can analyze all the negativities that may occur before and during production and while the product is delivered to the customer and enable us to take precautions and prevent them at best before encountering these negativities. This analysis is especially important in the production of products such as airplanes, cars, construction vehicles, which can cost human life, and its emergence is thanks to these products. The slightest mistake in these sectors can cause countless people to die and the company to be sued. Accurate risk analysis and potential error predictions are useful not only in these sectors but also in everyday products such as clothing and cosmetics (Chin et al., 2009; Xiao et al., 2011; Su et al., 2012).

3.1. Types of Failures

Types of Failures of   a system are listed as below (Baysal and Canıyılmaz, 2002; Eryürek and Tanyaş, 2003; Aydan and Kaya, 2017; Çevik and Aran, 2022; İnce, 2023);

Design Failures: As mentioned in the introduction, the glasses example is the product of a design error. Design errors, as explained in the example were presented in the introduction, and also the type of errors was defined in order to prevent the negativity that may occur before the production phase. Let's take a technology company as another example. A new product can be added to a line of headphones renowned for their sound quality.

System Failures: It investigates the problems that may occur in the functioning of the entire system and processes, including before and after the design, production, and post-production of the product, that is, in all processes from the production of the product to the arrival of the product in the hands of the customer. As a result of the research, it categorizes and systematizes the types of errors that may occur. It handles the system in a holistic way by testing their communication with each other, not piece by piece.

Service Failures: Service failures can be briefly said to be the disruptions that may occur in the process of the product from production until it reaches the customer's hands. This is not only in terms of transportation, but also if the product is faulty or damaged during the preparation phase before the product arrives, it belongs to this type of error.

Process Failures: In this type of failure, the types of failures are examined exactly that can occur in the production process. Although it is one of the most critical failures among the failure types in my opinion, it is important that it is the emergence stage of a product. A defective or unusable product, a product that is problematic in design but not possible to manufacture, will not mean anything if it is successful in other stages. No one wants to use a water bottle whose cap won't close or a keyboard that is difficult to press.

3.2. Identification of Failure Causes and Results

After categorizing the types of failures, it is identified in the first stage, the causes of the problems that it may be encountered in these categories are examined. For example, if the cause of an failures are considered in the assembly stage, one of the reasons for a failure that a package is not fully sealed may be that the machine that does this work does not apply enough pressure. In fact, the primary cause may be that the adhesive applied to the packaging is not strong enough. The causes of these types of failures are investigated by dividing them into error types. The probability of the finding causes are calculated due to the course of production. It can be evaluated numerically between 1 and 10 or as low, medium, high probability. For example, the

probability of a small-scale explosion in a chemical work is relatively high, while the probability of a large-scale explosion is lower. Although it is difficult to demonstrate these with numerical data, it is possible. Determining the probable causes and consequences is another criterion. This is also called knowability Types of Failures of a system are listed as below (Baysal and Canıyılmaz, 2002; Eryürek and Tanyaş, 2003; Aydan and Kaya, 2017; Çevik and Aran, 2022; İnce, 2023).

3.3. Effect Analysis

The effects of the identified failures anf the process of Failure Modes and Effects Analysis (FMEA) are presented together with the varieties to which they belong. During the analysis, the effects of identified failures are carefully examined, and their severity is assessed to prioritize the risks associated with each failure mode. By considering the probability of failure, detectability of the failure, and impact severity, a Risk Priority Number (RPN) is calculated for each failure mode. The RPN serves as a quantitative measure of the risk associated with each failure. The higher the RPN, the greater the attention and priority it should receive in terms of preventive measures. By focusing on failure modes with high RPN scores, the expert team conducting the FMEA can develop preventive scenarios to mitigate or eliminate those failures. These scenarios are designed to address the root causes and reduce the probability of occurrence, enhance detectability, and minimize the impact severity. After implementing the preventive measures, the impact of these actions should be evaluated by recalculating the RPN scores. This allows for a comparison between the initial RPN scores and the scores considering the effectiveness of the preventive measures. The objective is to observe a reduction in the RPN scores, indicating that the implemented measures have effectively reduced the risks associated with the identified failures. By following this iterative process of analyzing failures, creating preventive scenarios, and evaluating their impact, businesses can continuously improve their systems, reduce risks, and enhance the overall performance and quality of their operations. (Baysal and Canıyılmaz, 2002; Eryürek and Tanyaş, 2003; Aydan and Kaya, 2017; Çevik and Aran, 2022; İnce, 2023).

3.4. Benefits of Failure Types and Effects Analysis

The information and experience provided by this analysis guides the stages of product construction, such as making improvements, changing product parts and re-evaluating their quality. In a way, it can be said that it manages, changes and improves each stage (Baraçlı, 1998; Yılmaz, 2000; Franceschini et al., 2001; Baysal and Canıyılmaz, 2002; Eryürek and Tanyaş, 2003; Pillay and Wang , 2003; Chin et al., 2009).

- It determines how to make excess hazardous materials less hazardous
- Shows the results of a change in the product or process
- Helps us choose the easiest and least costly way
- Competition in the market strengthens our hand
- It helps us to increase our rate of development
- Contributes to the protection of the company or the place of the company in the sector and the image of the name
- Ensures systematic work and safe systematic work
- Minimizes the company's responsibility for the product
- Gains customer appreciation
- Identifies the limits and effects of control phases
- Minimizes buyer dissatisfaction and complaints

Challenges of Analyzing Failure Modes and Effects: The biggest problems and obstacles that encounter in this situation derive from the fact that there is no prior experience; otherwise, if experience has accrued, implementing this system would be even more challenging. One of the challenges of this approach in complicated systems is the high cost of the recommendations it discovers for failures (Baraçlı, 1998; Yılmaz, 2000; Pillay and Wang, 2003; Bektaş, 2007; Canbolat, 2008; Chin et al., 2009).

Failure Types and Effects Analysis Processes: (i) Defining the limits of FMEA; (ii) Establishing an FMEA team; (iii) Determine the system to be organized; (iv) Show the possible effects of errors; (v) Classify errors according to their priority; (vi) Finding suggestions to eliminate failures (Baraçlı, 1998; Yılmaz, 2000; Bektaş, 2007; Canbolat, 2008).

3.5. Steps of Application for Failure Modes and Effects Analysis

The phases of this application are presented as below (Baraçlı, 1998; Yılmaz, 2000; Bektaş, 2007; Canbolat, 2008; Canbolat, 2008; Aydan and Kaya, 2017; Çevik and Aran, 2022; İnce, 2023);

(i) Building A Team: Establishing a team at a level and number that can examine and analyze production stages and processes. The team we create should manage the HTSA by scrutinizing everything in detail and having various meetings and discussions.

(ii) To-Do List: At this stage, a schedule list is created, with the prioritized ones at the top. The features of the product to be made should be determined and listed in detail.

(iii) Detecting Failure Modes: Finding potential issues and ranking them according to importance—or, to put it another way, according to risk priorities—is known as the process.

(iv) Showing Possible Consequences of Mistakes: Finding the possible effects of the identified errors and showing where each error has an impact, and determining what the company's position in the sector will face when problems arise.

(v) Identifying the Cause of Failures: Once the results have been identified, it is time to investigate what might have caused the errors. The causes of errors list the reasons why problems occur during design.

(vi) Propositions to Eliminate Failure: After identifying possible failures and possible causes, a countermeasure, a suggestion, a material change, etc. is made.

3.6. Failure Modes and Effects Analysis Form

The use of forms in Failure Modes and Effects Analysis (FMEA) is indeed a common practice to systematically record and organize the data obtained during the analysis. These forms provide a structured format to document essential information and facilitate the analysis process. Typically, the FMEA forms include fields such as: Type of analysis, Function of the process, Leader of analysis, Risk prioritization classification, Product/process name, Analysis time, Revision number, Detection, Control system, Possible errors and their effects, Propositions and their consequences and Exposure. By utilizing these forms, the FMEA team can systematically document and analyze the relevant information, ensuring a structured and comprehensive approach to identifying, prioritizing, and addressing potential failures within the system or process being analyzed (see Figure 1; Scipioni et al., 2002; Chin et al., 2009; Wang et al, 2012; Liu et al., 2013).

Figure 1: Example of an FMEA Form

Source: Scipioni et al., 2002

The advantages of this method of evaluation are as follows: it helps to enhance the product's reliability, reliability, and freedom/security; it lowers undertaking costs; it confirms the fundamentals in design or procedure development circumstances; it identifies each concealing failure modes, effects, and comparisons for every design product; it aids in and provides for evaluation of the design circumstances and requirements. It offers to provide the overview of potential, important, and

substantial aspects, to encourage analysis of new products that are manufactured or research segments, maintain significant responsibilities for failure prevention, simplify the description of punishment & proactive operations, and to support and supervise risk-reducing actions (Chin et al., 2009; Wang et al., 2012; Liu et al., 2013).

This approach may be used in implementation as well as throughout the research's drafting evaluation portions. Even so, this has the necessary features to manage the approach while it is still in the design phase. This approach could potentially be used in application/cases and deployment scenarios in addition to the pattern evaluation scenarios of the research. Even so, this provides a good way to manage and employ the perspective while providing the design system perspective phases. In addition to research and evaluation, FMEA can also be applied in practical application and deployment scenarios. It provides a structured framework to analyze potential failures, prioritize risks, and develop preventive measures. By using FMEA in real-world cases and deployment scenarios, organizations can effectively manage risks and ensure the robustness of their systems or processes. Overall, FMEA offers a versatile approach that can be applied across various phases, including research, design, implementation, and deployment. It helps in managing risks, improving system reliability, and ensuring the effective utilization of the design system perspective throughout the lifecycle of a project or process (Chin et al., 2009; Hekmatpanah et al., 2011; Wang et al., 2012).

4. RESEARCH METHODOLOGY

The field research and literary analysis are conducted simultaneously. This research is useful for resolving issues as well. All references to field research or issues would be addressed in this overview of the literature. Materials for reference aid in problem identification, processing of data, and evaluation. Risk, management of risk, destruction, maintenance, and Failure Mode and Effect Analysis (FMEA) have a few theories that are connected to this issue. Data on possible risks that may arise for employees throughout the production procedure was gathered. Three manufacturing workers' responses to surveys provided the information on possible hazards. These three employees do tasks such as operating grinding machines, mixing dough, and roasting; they then complete a questionnaire. This information is required to determine the FMEA value and the primary Risk Priority Number (RPN) sequence which poses the greatest risk to workers.

4.1. Severity, Occurrence, and Detection

a- Severity: Significance of impact on client needs

b- Occurrence: How frequently a specific cause manifests itself and generates failure modes (ascertain from historical data if applicable)

c-Detection: The existing control strategy's capacity to identify (then stop) a specific reason (may be challenging to predict early in procedure activities) (Chin et al., 2009; Xiao et al., 2011; Su et al., 2012).

4.2. Rating Definitions Typical Scales

Both quantitative and qualitative scoring "anchors" come in a huge diversity. One of two scale kinds is 1-5 or 1-10. The teams can more easily decide on scoring using the 1–5 scale. The most popular scoring range of 1–10 could be used for greater estimation accuracy and large score fluctuation. It would be done in comparison to the data after it has been obtained. The choice of scoring scale, whether it is 1-5 or 1-10, depends on the specific needs and preferences of the team conducting the analysis. A 1-5 scale provides a simpler and more straightforward scoring system, allowing teams to make quick decisions and assessments. On the other hand, a 1-10 scale offers a wider range of scores, providing greater granularity and potentially more accurate estimations. This can be useful when there is a need for more detailed analysis or when there is a significant variation in the scores.

The selection of the scoring scale should be based on the requirements of the analysis and the capabilities of the team involved. It is important to ensure that the scoring system chosen is consistent and effectively captures the relevant factors and their impact on the failure modes being assessed (see Table 1).

Table 1: The Three Factors O (Occurrence), S (Severity) and D (Detection) of System FMEA

Rating	Severity	Occurrence	Detection
High 10	Hazardous without warning	Very high and almost inevitable	Cannot detect
	Loss of primary function	High repeated failures	Low chance of detection
	Loss of secondary function	Moderate failures	Moderate chance of detection
	Minor effect	Occasional failures	Good chance of detection
Low 1	No effect	Failure unlikely	Almost certain detection

Source: Slinger, 1992

The FMEA approach is used in this study to examine the risks that might be harmful when carrying out the production process. The Risk Priority Number (RPN) is a calculation used in Failure Modes and Effects Analysis (FMEA) to prioritize risks based on severity, occurrence, and detection ratings. The RPN helps determine the level of risk associated with each failure mode and identify which failures should be addressed first for risk mitigation. This FMEA technique assigns a ranking based on severity, occurrence, and detection ratings, called a Risk Priority Number (RPN). The RPN is calculated by multiplying the severity, occurrence, and detection ratings assigned to each failure mode. The severity rating represents the seriousness of the potential consequences if the failure were to occur. The occurrence rating represents the likelihood or frequency of the failure mode happening. The detection rating represents the ability to detect or identify the failure mode before it leads to adverse effects. The formula (1) is used to calculate RPN value (Van Leeuwen et al., 2009; Sankar et al., 2001; Pillay and Wang, 2003, see Table 1).

$$RPN = S \times O \times D \tag{1}$$

RPN = Risk Priority Number, S = Severity, O = Occurrence, D = Detection

When you have obtained the RPN value, further calculation of critical Risk Priority Number (RPN) is used to see how many failure modes above RPN critical Value are and provide solutions to factors that risk the occurrence of hazards in work.

Once the RPN value has been determined, the critical Risk Priority Number (RPN) -Formula (2) calculated to assess which failure modes are exceeding the critical RPN number and to offer remedies for variables that increase the likelihood that workplace hazards could happen. The formula of the critical value is;

$$Critical\ Value = \frac{RPN\ Total}{Number\ of\ Risks} \tag{2}$$

To assess the effectiveness of the measures taken to address the identified risks, the analysis of processing data is conducted. This involves examining the primary risks that could lead to potential hazards, prioritizing the order of these hazards, and determining the Risk Priority Number (RPN) for each. By analyzing the data, the research team can evaluate the effectiveness of the implemented measures in reducing the risks associated with each hazard. They can identify the primary risk factors and their corresponding RPN values, which indicate the level of priority for addressing these risks. The analysis also involves generating ideas and proposing solutions to mitigate the potential hazards based on the likelihood of their occurrence and the severity of their impact. These solutions aim to minimize the risks and prevent the occurrence of future hazards. By thoroughly examining the data and considering the RPN values, the research team can assess the effectiveness of the measures taken to address the identified risks. This allows them to make informed decisions on improving the process, implementing additional preventive measures, and optimizing the overall system performance. It's important to note that this analysis should be an iterative process, where the effectiveness of the solutions is continuously monitored and evaluated. Adjustments and

improvements may be made based on the findings to ensure ongoing risk management and enhance the overall safety and reliability of the production process (Baraçlı, 1998; Yılmaz, 2000; Bektaş, 2007; Canbolat, 2008).

4.3. Results and Discussion

By applying Failure Modes and Effect Analysis (FMEA) and considering sustainability aspects, the research aims to enhance the manufacturing process, minimize risks and failures, and contribute to sustainable practices in the food industry. The research incorporates FMEA as a preventative approach to analyze failure modes and identify relevant elements for controlling and avoiding potential failures and mistakes in operational production systems. It aims to provide a comprehensive understanding of failure types and their impact analysis within the enterprise context.

Table 2: RPN Scores for Food Packaging Department of this Business

Potential Failures	Severity (S)	Occurrence (O)	Detection (D)	R.P.N. After
The harmful effect while produce, use and packaging of the products	6	4	4	96
Probable Risk and Harm Effects	5	6	3	90
Emissions of Greenhouse Gases	5	5	5	125
Smooth Surface	4	5	4	80
Oil Strain	6	5	4	120
Parcel Labels and Products Numbers Must Match	5	4	5	100
Hygienic Product	4	4	4	64
Hand Washing and Hygiene Rules	4	5	5	100

Following acquiring the severity, occurrence, and detection values for the Food Packaging Department of this Business, the RPN computation is carried out with regard to multiplying the three variables in the FMEA method which have been achieved. Next, the procedure of arranging the RPN value is carried out to observe the sequence of the greatest potential risks for employees. This information is shown below in Table 2. This table likely presents the results of the RPN calculations and the corresponding risk prioritization for the identified failure modes. It provides a visual representation of the sequence of potential risks, with the failure modes with higher RPN values typically listed at the top. By analyzing and understanding the RPN values and the associated risks, the research team can allocate resources and prioritize their efforts in addressing and mitigating the most critical failure modes. This helps in improving the operational production systems, enhancing safety measures, and reducing the likelihood of failures and mistakes.

Here's an example of a calculation of the RPN value: 6*4*4=96

By considering the ordering of RPN values for each component which has the potential to cause damage to employees, the critical Value of RPN is determined to highlight which danger variables are over the critical value and must be assessed and addressed as soon as possible. According to Table 1, there are up to eight possible risks, with a total RPN value of 795; based on the total value can be determined critical value RPN with the calculation using the formula: Critical Value = (795/8) = 99

Depending on the RPN value findings in Table 2's sequence, from four factors (possible failures) along with corresponding values of 125, 120, and 100, correspondingly, have the potential to be dangerous during operation over the critical Value. In order to prevent workplace incidents, the four elements exceeding the critical Value must be addressed, and a preventative solution must be explored. The potential RPN for hazard in work over the critical Value is caused by four reasons (possible failures). These potential failures are presented as Table 2 which were signed with orange color.

Based on the RPN (Risk Priority Number) values in Table 2, it is identified that there are four factors (potential failures) that have the potential for danger in work above the critical value. These factors have RPN values of 125, 120, and 100 respectively, indicating a higher level of risk associated with them. To address these potential failures and mitigate the occurrence of accidents at work, it is crucial to prioritize and find solutions for these four factors. These factors are highlighted in Table 2, where they are marked with the color of orange to signify their significance. By focusing on these identified potential failures and taking appropriate preventive measures, the aim is to reduce the associated risks and ensure a safer work environment. It is

important to analyze and address these factors promptly to prevent accidents and maintain the overall safety and well-being of the workforce.

Table 3: Comprehensive Failure Mode and Effects Analysis for Calculation RPN Before and After FMEA

Firm Name	Assesment Food Industrial Sector in Turkey (ABC Comoany)							**FMEA**						
Product/Item :	Packaging Department in A Food Business								FMEA No :	125-1	Security Class ::			.
Model / vehicle :									Prepared By ::	FMEA Team				
Process Resp.:	A						Key Date :		FMEA Date :		Rev :			0
Core Team :	AE-Project Team Members													

| Proses / Steps / Function	Potential Failure Mode	Potential Effect(s) of Failure	Severity (S)	Potential Cause(s)/ Mechanism(s) of Failure	Occurence (O)	Current Process Control Prevention	Current Process Control Detection	Detection (D)	R.P.N	Recommended Action(s)	Responsibility &Target Completion Date	Action Taken	Severity	Occurence	Detection	R.P.N
1	the harmful effect while produce ,use and design packaging of the products	the influence of product lifetime of packaging raw material	7	manufacture from artificial and sentetic material etc.	4	improve the method for understanding environmental impact	*assessing materials for their sustainable content.	6	168	Focus on using Sustainable materials *Implement a program of detergent concentration.		*try to reduce the harmful impacts *Change the control schedule-plan	6	4	4	96
2	Probable Risk and Harm Effects	*cause harm to the unborn child *risk of impaired fertility *possible risk of irreversible effects	7	Heavy metals and formaldehyde in stripping and depigmentation	6	measuring the amount of waste created during the design and manufacturing phase	Researching technologies such that in the future, For garments are made using sustainable raw materials e.g. from plant and tree sources as well as reused materials	5	210	using environmentally preferred materials and by eliminating the use of toxins.		develop monitoring systems to measure impact of green factory initiatives	5	6	3	90
3	emissions of greenhouse gases	increasing carbon and water use and causing the increment of amount of waste in fibre and yarn production	6	Consumption Trends and Behaviour	5	Increasing Consumer awareness on clothing impacts and what they can do to reduce these on	selling a range of types of sustainable clothing (reused, remade, Fair Trade etc.	5	150	aimed at changing consumer perceptions and buying trends.		modelling decarbonisation in all life cycles stages	5	5	5	125
4	SMOOTH SURFACE	surface distortion	5	visual disturbance/non-adhesion of labels	6	inhomogeneity of the raw material mixture	one control per hour	4	120	input control		process control	4	5	4	80
5	Oil Strain	It is caused that Doing errors in the warping process	6	The oil flows(leakage) from the environment or from the machine	7	Doing regularly machinery maintenance	using detergent and organic solvent drying	5	210	Safety working area must be provided for employee and workers		Serious process control	6	5	4	120
6	PARCEL LABELS AND PRODUCT NUMBERS MUST MATCH	missing product, auxiliary material disorder	5	customer complaint	5	not adjusting the settings	check every hour	6	150	staff training		Cleaning plans and activity checks Swab controls Control before the use of cleaning materials	5	4	5	120
7	HYGIENIC PRODUCT	Contamination of foreign substances such as band-aids, gloves, etc. used by employees	4	physical contamination (dust, ...) from the point where the product comes out until it enters the pack	4	follow the instructions for maintenance and cleaning after maintenance	ON THE SUPERVISION AND CONTROL OF FOOD SAFETY AND QUALITY REGULATION	5	80	Employee training Employee Hygiene		Use of coloured plasters	4	4	4	64
8	HAND WASHING AND HYGIENE RULES	USE OF GLOVES AND CONTROL OF HYGIENE TRANSITIONS	5	taking swap from pallets, complying with warehouse cleaning instructions, providing personnel cleaning trainings	6	product, mould and machine equipment failure	hair-like burrs on product and pack edges	6	180	staff training		Turkish Food Codex Reference Hygiene Measures Company Experience	4	5	5	100

Calculation RPN Before and After FMEA: Table 3 provides comprehensive information regarding the analysis of potential risk factors and errors that can be identified during fundamental research applications. It also highlights the engineering measurements and calculations used in these studies, specifically employing the Failure Mode and Effects Analysis (FMEA) approach. Additionally, the table incorporates the expertise of experts to determine the Risk Priority Levels (RPL) through relevant tables. This analysis allows for a systematic assessment of risks and prioritization of actions to mitigate potential failures and improve overall performance.

Based on the available engineering evaluations and calculations, the Failure Mode and Effects Analysis (FMEA) method is employed to conduct these investigations. The purpose of using FMEA is to systematically analyze potential failure modes and their effects in order to prioritize and address risks. Expert experience is also utilized to develop Risk Priority Levels (RPL) tables, which help in assessing the severity, occurrence, and detectability of identified risks. By utilizing these tools and tables, a

thorough evaluation of potential risk variables and failures can be carried out during fundamental research applications, enabling effective risk management and mitigation strategies.

Risk Priority Number (RPN) Values for Before FMEA and After FMEA: According to the Failure Mode and Effects Analysis (FMEA) process, before conducting the FMEA, the system identified potential problems that were assigned high Risk Priority Numbers (RPN). However, after implementing the preventive measures based on the results of the second risk analysis, it has been observed that the high RPN levels of risk show a decreasing trend. This indicates that the actions taken to address and mitigate the identified failures have been effective in reducing the associated risks. By conducting FMEA and taking appropriate preventive measures, the system aims to minimize the likelihood and impact of potential failures, leading to improved overall performance and reduced risks.

Figure 2: Before and After the FMEA Critical Risk Values (Risk Priority Numbers RPN-ROS) Graphical Representation
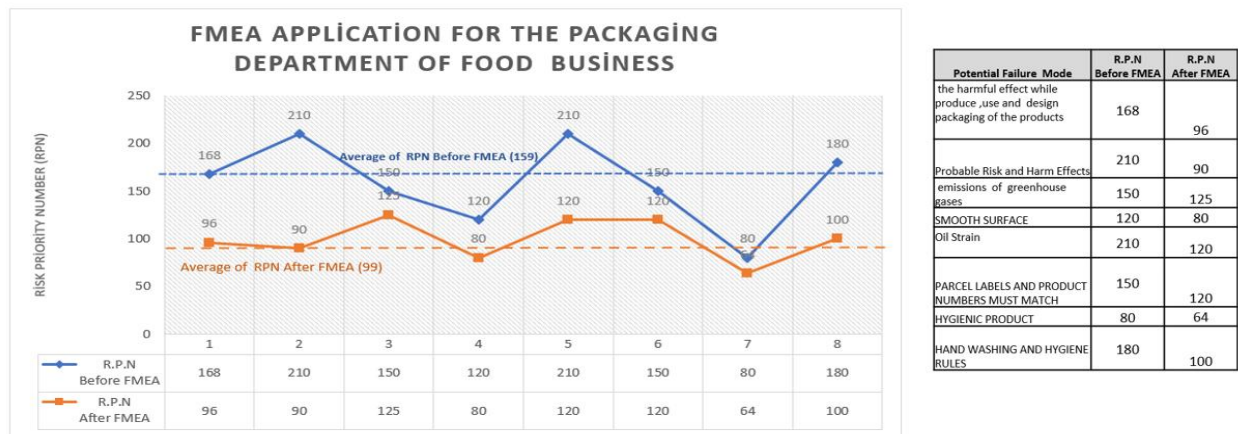
The Risk Priority Number (RPN) values of the detected possible errors in the system were initially found to be high before the FMEA process. However, as per the FMEA process, precautionary measures were evaluated and implemented for each failure, leading to a reduction in the RPN risk levels. This trend of reduction in RPN values after taking action is presented in Figure 2. The FMEA analysis and the subsequent implementation of preventive measures resulted in a decrease in the RPN values. The average RPN value before conducting the FMEA analysis was 159, indicating a relatively high-risk level. However, after the FMEA analysis was conducted and the necessary actions were taken to prevent potential errors, the average RPN value decreased to 99. This decrease in RPN values signifies a significant reduction in the error rate and indicates that the risk has been effectively mitigated through the FMEA process.

The findings suggest that the application of FMEA and the implementation of recommended actions have positively impacted the risk levels associated with potential errors in the system. This demonstrates the effectiveness of the FMEA approach in identifying and addressing risks, resulting in improved system reliability and reduced chances of failures occurring.

5. CONCLUSIONS AND SUGGESTIONS

The Failure Mode and Effects Analysis (FMEA) approach, which uses three variables—severity, occurrence, detection, and calculation of the critical risk level (RPN)—was used to identify eight potential risks in the food packing department operation. These hazards are given preference for remediation. The sequence of RPN values from the greatest Value to the lowest Value indicates what the processing of data has yielded as a result. 193 was the great value gathered, and the employees ran the risk of becoming overheated and dehydrated. At the same time, the smallest value of 64 with the potential danger of Hygienic Product due to application for the packaging department of Food Business. After obtaining the RPN value sequence, then determined the critical value of four potential hazard factors. The critical Value obtained is 109, which indicates four factors of potential hazards above the critical value.

Therefore, changes must be implemented in the structure of solutions to go past the seven potential risks. Rearranging the architecture of the machines so that employees don't feel hot while working and placing the things in a more ergonomic way so that employees don't quickly become fatigued while picking up products are two possible solutions to the potential risks. To avoid slipping while producing, employees ought to devote consideration to the state of the manufacturing site's flooring. Future investigation into determining possible dangers can include techniques other than the FMEA method, it is advised. In order to provide the risks to be based on the priority order of relevance and for the improvement works, FMEA analysis is crucial in the sustainability of manufacturing structures, particularly during the design stage of initiatives.

Risk Priority Number (RPN) values, which are discovered for the study and assessment of FMEA, perform a significant role in industry investigations and provide valuable expert advice. The Sustainable Products and Alternatives program at the Center for Responsible Business is concentrated on decreasing emissions (air, water and land); determining the ecological impact of packaging; generating bio-based materials and starting materials for plastics; sustainable market-driven packaging remedies; observing the lifecycle ecological impacts throughout a supply chain; and considering the effects of environmentally conscious options for policymakers. Due to the Results of FMEA for this sector; these analysis systems, which are generally used in the production and service sector, have the effect of regulating the system in the enterprise and reducing costs when used correctly and actively. In addition, while maximizing buyer satisfaction, it minimizes the possibility of error, and thanks to the developing technology and increasing experiences and accumulated data, error types and effects analysis can be performed more accurately, and their application areas are being expanded day by day. Failure modes and effects analysis (FMEA) identifies all possible errors in the system and offers suggestions and solutions, which is why FMEA is important for every sector. It is of great importance not only for companies but also for human life. When a problem occurs in a product or process that is not properly controlled, it can even harm human life when an error occurs. I will not extend my words further, if I say my own assessment, after doing my research on this subject and then starting to write, I realized that this analysis, which has a serious place in our lives, should not be underestimated, I can say that it is a system that saves lives and sometimes takes lives. A correctly applied FMEA saves businesses.

In this perspective, it seems that reducing packaging or switching to renewable resources in place of oil-based resources will result in less food and packaging waste. Sustainable packaging for food enhances its positive use benefit, which is the decrease of loss of food and waste, in along with reducing the negative load of managing packaging materials and trash. To do this, food needs must be largely met throughout the whole supply chain, with a focus on the distribution and consumption phases. Thus, in order to maximize the sustainability of food/packaging combinations as entirety, the good and its packaging must be seen as a single system. Any decision-making procedure designed to discover tactics to increase package sustainability must include Life Cycle Assessment (LCA) modeling. It examines the whole life cycle of the product and gives the profiling of the environmental consequences across a variety of parameters. For implementation of the SPA description to sustainable packaging (SPA), LCA data is required. However, in locations where LCA competence is restricted, the results of LCA modeling must be interpreted in a sophisticated manner and integrated with qualitative data. The LCA modeling must be paired with knowledge of many other complicated concerns, such as functioning and end-of-life effects that are not described by LCA. Environmental effects frequently differ throughout impact categories, and outcomes might be very dependent on consumer behavior and real waste management techniques. The concerns of different stakeholders can be taken into account, the critical elements needed to guarantee that the potential environmental benefits are achieved, and the potential benefits associated with creativity or supply chain enhancements may be determined through incorporating sensitivity analysis into the modeling. Following that, the findings may be applied to create a shared knowledge of the general ecological impacts of the various solutions. Achieving the advantages of their introduction consequently requires methods to guarantee reuse happens in application. All corporate sectors are becoming more and more concerned about the environment. Both the European Council demands that businesses change their packaging strategies and customer requests for more ecologically friendly packaging are on the rise. Before food enters the customer, supply chain losses are a problem for nations that are developing. Here, proper packaging may aid in safeguarding the food and extending its lifespan so that it gets to these families securely. Because of wasteful habits, food appears to be wasted more at the family level in industrialized nations. Due to improper container proportions and packaging that is challenging to empty, packaging might be one of the factors there. The protecting function of packaging is sometimes overlooked when talking about sustainability issues, which solely concern the kind and quantity of materials used in manufacturing. The paper discusses the causes, problems, and effects of packaging-related waste and loss of food (FLW) as well as its consequences for life cycle assessments (LCA) application. (European Council, 1994; Wohner et al., 2019).

When it comes to packaging for food, there is often a trade-off between source reduction and convenience. Features like individual packaging, dispensability, and microwave ability, which enhance convenience, typically require more packaging material, which goes against the goal of source reduction. Similarly, tamper detection features can contribute to increased waste generation. Ultimately, the industry responds to customer demands as long as it remains profitable. Customers have the power to influence what is produced through their purchasing choices. Therefore, customers need to evaluate whether the convenience and increased safety provided by certain packaging features justify the associated increase in material cost. If customers are willing to sacrifice convenience and adjust their buying behaviors accordingly, the reduction of sources can be accelerated. However, it is important to remember that the primary goals of packaging for food should be the preservation of safety, healthfulness, and quality. By carefully selecting materials, adhering to regulations set by environmental authorities such as the Environmental Protection Agency (EPA), and considering the environmental impact of packaging requirements, the negative impact of wasteful packaging on the environment can be minimized (European Council, 1994; Wohner et al., 2019).

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