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Department of Marketing and Management

Exploring Technological Disruption and Job Design in the Telecommunication Industry in Bahrain

A Thesis Submitted for the MSc Science in Human Resources Management

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☒ Without making any changes to the thesis.

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Abstract

Technological disruption has become a defining factor in reshaping business environments, notably influencing job design, skill requirements, and strategic approaches across industries. This research, *Exploring Technological Disruption and Job Design in the Telecommunication Industry of Bahrain*, investigates how these disruptions have altered job roles, skill demands, and organizational strategies within Bahrain's telecommunications sector. The study adopts a qualitative approach, utilizing in-depth interviews complemented by secondary data from authoritative sources, including the Skills Bahrain 2023 Telecommunication Skills Report and reports from the Telecommunications Regulatory Authority (TRA), Information & eGovernment Authority (IGA), and key industry operators.

Findings indicate that Bahrain's telecommunications sector operates under a global framework, where international standards are in effect, and global shifts promptly impact the region. Additionally, it reveals that technological disruption has led to a redefinition of job roles, emphasizing the integration of analytical skills and adaptability as core competencies. The study highlights Bahrain's solid infrastructural foundation, which enables effective adaptation to sector requirements. Furthermore, it reveals the convergence of ICT and telecommunications, underlining the necessity for continuous skill development. While organizations provide substantial resources for employee adaptation, the research underscores that personal attributes such as mindset, personality, and individual drive are vital to successful adaptability. These intrinsic factors often determine how effectively employees navigate technological changes, emphasizing the importance of resilience and a proactive approach.

This research offers critical insights for policymakers, industry leaders, and practitioners by examining the intersection of technology, job design, and human adaptability. It advocates for strategies that align technological advancements with workforce capabilities, fostering resilience and ensuring the sector's readiness to meet ongoing and future challenges.

ملخص البحث

لقد بات الإحلال التقني (Technological Disruption) عاملاً حاسماً في إعادة تشكيل عالم الأعمال، لا سيما تأثيره على تصميم الوظائف وتحديد المهارات المطلوبة والمنهجيات الاستراتيجية في مختلف القطاعات. ويتناول هذا البحث المعنون "الإحلال التقني وأثره على تصميم الوظائف في قطاع الاتصالات بمملكة البحرين" كيف أسهم هذا الإحلال في تعديل المهام الوظيفية والمهارات المطلوبة والاستراتيجيات التنظيمية على صعيد قطاع الاتصالات في مملكة البحرين. إذ تتبنى الدراسة نهجاً نوعياً بإجراء مقابلات متعمقة مدعومة ببيانات ثانوية من مصادر موثوقة، بما في ذلك الدراسة البحثية لمهارات قطاع الاتصالات 2023 التي أجراها فريق "مهارات البحرين"، والتقارير الصادرة عن هيئة تنظيم الاتصالات وهيئة المعلومات والحكومة الإلكترونية وتقارير المشغلين الرئيسيين في القطاع.

وتشير النتائج إلى أن قطاع الاتصالات في مملكة البحرين يعمل ضمن إطار عالمي، حيث تطبق فيه المعايير الدولية، وتؤثر التحولات العالمية على المنطقة بشكل سريع. بالإضافة إلى ذلك، تكشف الدراسة إلى أن الإحلال التقني أدى إلى إعادة صياغة المهام الوظيفية، مع التشديد على دمج المهارات التحليلية والقدرة على التكيف باعتبارها كفاءات أساسية. وتسلط الدراسة الضوء على الأساس المتين للبنية التحتية في مملكة البحرين، والذي يتيح التكيف الفعال مع متطلبات القطاع. وعلاوة على ذلك، تكشف الدراسة عن أوجه الالتقاء بين قطاع تكنولوجيا المعلومات والاتصالات، وقطاع الاتصال، مما يؤكد ضرورة مواصلة تطوير المهارات. وفي حين تستثمر المؤسسات موارد هائلة لتكييف موظفيها، فإن البحث يؤكد على أن السمات الشخصية مثل طريقة التفكير، والشخصية، والدوافع الفردية، تعد عوامل جوهرية لتحقيق التكيف الناجح. وغالباً ما تحدد هذه العوامل الجوهرية مدى فعالية الموظفين في التعامل مع المتغيرات التكنولوجية، مما يؤكد على أهمية المرونة والنهج الاستباقي.

ويقدم البحث رؤية مهمة لصانعي السياسات وقادة القطاع والمختصين من خلال دراسة التداخل بين التكنولوجيا وتصميم الوظائف والقدرات البشرية على التكيف. ويدعو هذا البحث إلى وضع استراتيجيات توفق بين التطورات التكنولوجية وتعزيز قدرات القوى العاملة، مما يدعم المرونة ويضمن قدرة القطاع على مواجهة التحديات الحالية والمستقبلية.

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Declaration

I, Yusra Al Hussaini, declare that this thesis, titled '**Exploring Technological Disruption and Job Design in the Telecommunication Industry in Bahrain**', is my original work and has not been submitted previously for any degree or qualification. All sources of information, quotations, and ideas that are not my own have been cited per the University of Bahrain guidelines.

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Chapter One

Chapter 1: Introduction

1.1. Topic Overview

Technology is a powerful catalyst for change and innovation in the current business landscape, fundamentally reshaping enterprise operations and redefining job structures. The rapid introduction of emerging technologies such as artificial intelligence (AI), automation, the Internet of Things (IoT), blockchain, augmented reality (AR), virtual reality (VR), biotechnology, and sustainable technologies underscores transformative implications for work and employment (World Economic Forum, 2023). These advancements promise enhanced operational efficiency, optimized processes, and significant cost savings. However, they also introduce challenges, including job displacement and the necessity for continuous skill development (Berkers et al., 2023; Joshi et al., 2022).

The transformative impact of these technologies extends beyond industry-specific changes, influencing global economic cycles and consumer behavior (Prabha & Naaz, 2023). Companies must adapt their strategic and structural approaches to maintain competitiveness in an era defined by rapid digitization and technological disruptions (Padfield et al., 2023). This adaptation often involves rethinking traditional management and operational models to incorporate new tools that facilitate human-machine interaction, ultimately reshaping the workplace landscape (Leimeister & Blohm, 2022). The focus on maintaining flexibility and promoting continuous learning has become crucial for organizational survival (Kaur, 2021).

The telecommunication sector provides a particularly compelling context for studying technological disruption's impact on job design due to its intrinsic connection to digital transformation and global communication. This sector supports connectivity across various regions

and industries and plays a fundamental role in driving technological adoption and integration (Furr & Shipilov, 2019). Its fast-paced nature and reliance on cutting-edge technologies position it as an essential field for examining how roles, responsibilities, and required skills evolve due to technological disruption.

Moreover, the sector's reach extends to millions worldwide, and its influence is amplified by ongoing regulatory adjustments and technological advancements (Sengupta et al., 2021). The continuous need to upskill employees reflects broader industry trends emphasizing adaptability, continuous learning, and strategic alignment in the face of technological shifts (Kaur, 2021). The dual impact of domestic and global technological trends on the telecommunication sector in Bahrain presents unique opportunities for exploring the relationship between technology and job design.

The intersection of Information and Communication Technology (ICT) and the telecommunication sector represents a crucial area of exploration, particularly in understanding how these fields increasingly converge to form a unified industry. ICT encompasses a broad range of technologies that facilitate communication, manage information, and drive business operations, including cloud computing, big data, IoT, and AI. These elements align seamlessly with the telecommunication sector's core functions of enabling connectivity and data transmission across the globe.

The rapid integration of ICT within the telecommunications sector has fundamentally altered job roles, skill requirements, and organizational strategies. This convergence has created a new landscape where telecommunication services are no longer limited to basic voice and data transfer but now include complex ICT services that support enterprise solutions and drive digital innovation (Leimeister & Blohm, 2022). For

instance, the incorporation of big data analytics and cloud technologies has enhanced the sector's capabilities, promoting more efficient resource management and faster decision-making processes (Prabha & Naaz, 2023).

The dual nature of this alignment—where telecommunications act as the backbone supporting ICT technologies—makes the sector an essential player in enabling modern digital economies. This relationship underscores the critical need for continual employee training and skill development. The fusion of ICT and telecommunications has accelerated the pace of job transformation, necessitating that workers acquire new competencies, such as data management, cybersecurity, and digital systems operation (Maršíková & Mazurchenko, 2019). The need for lifelong learning has become a defining characteristic of the workforce, ensuring that employees can adapt to the swift changes brought about by digital tools and solutions (Kaur, 2021).

In Bahrain, this intersection is particularly significant given the country's aspirations for economic diversification and its status as a regional telecommunications hub. The shift towards an integrated ICT-telecom sector reflects global trends and highlights the local emphasis on enhancing the workforce's technological capabilities to remain competitive. This convergence is driven by technological advances, strategic regulatory policies, and the influx of a new generation of tech-savvy employees who influence workplace culture and job design (Skills Bahrain, 2023). The intersection of ICT and telecommunications represents a broader shift towards a digitally interconnected economy. This integration impacts job design by demanding updated roles, more versatile skill sets, and introducing continuous innovation into traditional job functions.

This study explores how such changes manifest in Bahrain's telecommunications sector, providing insights into how organizations align their workforce strategies to navigate and capitalize on these technological intersections.

1.2. Research Objectives

The overview of this research established the profound impact of technological disruption on job design, particularly within Bahrain's telecommunications sector. As organizations increasingly adopted AI, IoT, cloud computing, and automation, job structures, required skills, and workforce strategies underwent significant transformations. While global studies have explored these changes, limited research has been conducted within Bahrain's context, highlighting a crucial research gap in understanding the sector's response to these disruptions. Recognizing this gap, the study first established its objectives before formulating research questions. The research questions were formulated later narrowing down the objectives into specific inquiries that guide data collection and analysis. In this study, the objectives has set the foundation for investigating how job roles and workforce strategies adapted to technological advancements in Bahrain's telecommunications sector.

This study aimed to:

1. **Examine** how Bahrain's telecommunications sector had responded to technological disruption.
2. **Investigate** changes in job roles and responsibilities due to emerging technologies.
3. **Identify** the new skills and competencies required in the evolving telecom landscape.

4. **Explore** employees' and managers' perceptions of these changes and how they adapted to them.

1.3. Research Questions

This study aims to address the following research questions:

1. How have organizations in Bahrain's telecommunication sector responded to recent technological disruption?
2. To what extent have job roles and responsibilities been affected by technological disruption in the telecommunication sector in Bahrain?
3. What new responsibilities, required skills, and competencies have emerged due to technological disruption in the sector?
4. How have employees and managers perceived and adapted to technological disruption in Bahrain's telecommunication sector?

The primary objective is to explore the organizational and individual adaptations to technological disruption, focusing on job design and skill requirements. This research provides a detailed analysis of how the telecommunications sector navigates these rapid changes and the strategies used to align workforce competencies with new technologies.

1.4. Thesis Gap, significance, and Contributions

This research contributes significantly to the body of knowledge surrounding technological disruption and job design, particularly within the context of Bahrain. While extensive research had been conducted globally on the impact of technological advancements on job design, there was a noticeable gap in studies focusing on Bahrain. Existing literature primarily explored Western and Asian markets (Schwarzmüller et al., 2018; Maršíková & Mazurchenko, 2019), leaving a limited understanding of how job roles and workforce structures in Bahrain's telecommunications sector

evolved in response to rapid technological disruption. This study addresses this gap by examining sector-specific responses to emerging technologies such as AI, IoT, and automation, as well as their implications for workforce strategies and job design.

This research is particularly relevant to Bahrain, as the country has been actively working toward digital transformation under its Economic Vision 2030. The telecommunications sector played a crucial role in driving this transformation, making it essential to understand how job roles, required skills, and workforce strategies shifted to accommodate technological advancements. By integrating primary data from industry professionals with secondary reports from regulatory bodies and major telecom operators, this study provided actionable insights for policymakers, HR professionals, and business leaders. The findings contributed to workforce planning, helped organizations develop adaptive job design strategies, and ensured that employees remained competitive in an era of continuous technological evolution.

This research clarifies the dynamic interaction between technology and job design by integrating empirical data from interviews with secondary data from published documents and academic literature. The findings guide future workforce plans emphasizing human-centered methodologies while integrating technological advancements.

1.5. Thesis Structure

The thesis is organized into the following chapters:

Chapter 1: Introduction

This chapter provides an overview of the research topic, articulating the research questions and objectives. It outlines the anticipated contributions of the study and explains the thesis structure.

Chapter 2: Literature Review

This chapter examines existing academic and industry literature on the intersection of technological disruption, job design, and skill development in the business environment. It will discuss global and regional trends and analyze relevant theoretical frameworks related to technology-centered and human-centric job design. The chapter will also address the broader implications of technological advancements for workforce strategies, referencing critical literature and reports to illustrate the link between ICT job design and the telecommunications sector.

Chapter 3: Research Methodology

Chapter three outlines the research methodology, detailing the qualitative approach employed through interviews to collect data. It first describes the research context and sector, followed by the research design, participant selection criteria, data collection methods, and analytical tools to interpret the data.

Chapter 4: Findings and Discussion

This chapter presents the research's key findings, identifying major themes related to changes in job design, the emergence of new skills, and adaptive strategies employed by telecommunications organizations in Bahrain. The discussion synthesizes these findings with existing scholarly literature, highlighting how they align with global technological trends and unique regional factors, including telecommunications regulatory reforms, open market dynamics, and economic policy initiatives. Additionally, practical implications for industry leaders managing digital transformation have been addressed.

Chapter 5: Conclusion and Recommendations

The final chapter summarizes the research findings, emphasizing the main points regarding the effects of technological disruption on job design. It provides strategic recommendations for businesses and policymakers to support workforce adaptability and realign job structures with technological advancements. The chapter also proposes future research directions to deepen understanding of the evolving relationship between technology, job design, and employee well-being within the regional context.

This research delivers valuable insights that support strategic workforce planning and enhance resilience and competitiveness in an era of rapid technological change. It focuses on the interplay between technology and job design in Bahrain's telecommunications sector.

Chapter Two

Chapter 2: Literature Review

2.1. Introduction

This chapter provides a detailed overview of the literature on technological development, its disruptive nature, and its impact on job design within Bahrain's telecommunications industry. It is organized into four sections: The first explores various theories and approaches to job design, setting the theoretical foundation. The second section delves into the historical evolution of information and communication technology (ICT), examining the multigenerational workforce in high-tech environments and the broader implications of technological disruption in telecommunications. The third section focuses on Bahrain's telecommunications sector, offering specific insights. Finally, the fourth section analyzes the intersection of job design and technological disruption, discussing studies investigating these developments' impact on job roles.

2.2. Job Design

This section aims to thoroughly examine the concept of job design, encompassing its various components, definition, scope, and critical significance for achieving organizational success. This section will provide an overview of terms related to job design, followed by a review of the main theories associated with job design. Then, various elements that may influence the requirement for work design, job redesign, and the new notion of proactive design and job crafting are highlighted.

Scholarly literature describes job design as the systematic arrangement and coordination of work, duties, and responsibilities inside an organization to attain specified goals while maintaining staff satisfaction and productivity. (Stepanek & Paul, 2023). It refers to the organized process of defining and structuring the tasks, duties, and obligations

employees assign. This primarily aims to streamline work processes to generate value and enhance performance. It is also a key part of rewarding valuable employment opportunities to workers and organizations. (CIPD, 2024).

While "work" and "job" are often used simultaneously in work-related literature, it is essential to note that a technical distinction exists between the two. The concept of work encompasses all the activities and tasks that an individual engages in. On the other hand, in organizational dynamics, a "job" signifies a structured set of tasks, duties, responsibilities, and roles performed by an individual within an organizational setting. In other words, a job refers to a specific occupation or role for which an employee receives compensation and is expected to demonstrate certain behaviors while carrying out their responsibilities (Siddiqui et al, 2022). Organizations strive to optimize productivity by implementing job design strategies incorporating non-monetary incentives, such as offering increased satisfaction derived from addressing more complex work tasks and assuming greater responsibility (Hosain, 2019). Within the context of this research, the term "job design" refers to the organizational framework that details the duties, skills, and responsibilities necessary for an employee to carry out their position daily in the context of a business or other organization.

Understanding job design is of great importance within Human Resources, as it entails strategically allocating tasks, duties, and relationships within a corporate framework to promote effectiveness, satisfaction, and productivity (Kapur, 2021). To gain a comprehensive understanding of its significance, it is essential to briefly review the principal phases that form the structure for its execution. Hence, it is

necessary to review the fundamental purpose of "job analysis," its significance, and its role in job design.

The job analysis process is critical in human resource management because it is the cornerstone for many other organizational duties and the foundation for various HR functions. The HR process relies on it as a map for essential tasks, including hiring, onboarding, training, performance reviews, and job design. Job analysis mainly entails determining and providing an overview of the various activities, functions, abilities, and qualifications necessary for a specific job. Furthermore, it aids in assessing the worth and significance of each position inside the organizational structure (Armstrong & Taylor, 2014; Kapur, 2021; Khtatbeh et al., 2020). Post analysis comes job design, which is referred to as the technique of creating the contents of the job in terms of tasks and responsibilities, technologies utilized for the execution of job duties, tools, systems and procedures, and terms and conditions between people within the organization (Kapur, 2021). As technological advancements reshape tasks and responsibilities, the need for human resources to strike a careful balance between the specific needs of employees and the growth objectives of organizations becomes increasingly crucial. An issue to consider is the complex relationship between organizational goals and structural elements in job design. This requires Organizations to consider establishing a strategic alignment between work structures and evolving organizational goals to adapt to technical interruptions and maintain long-term effectiveness (Siruri & Cheche, 2021).

Proactive job design and job crafting are two concepts that can be used to optimize the impact of technology on job design by ensuring that technology is used to enhance work and not replace it and by empowering employees to adapt to technological changes. Proactive job design involves

the deliberate process of developing job roles in a forward-thinking manner and anticipates forthcoming developments, including technological breakthroughs (Costantini et al., 2023). The process entails establishing employment opportunities with flexibility, adaptability, and the capacity for easy modification to address evolving requirements effectively. In contrast, job crafting refers to the active attempt of employees to modify their job roles to enhance the alignment between their competencies, personal interests, and core beliefs. This may involve altering the nature of tasks, redefining relationships, and reshaping job views. Both proactive job design and job crafting can be employed to optimize the influence of technology on work design. This can be achieved by ensuring that technology is utilized to augment work rather than supplant it and by empowering people to adapt to technological advancements. According to the literature, proactive job design and involvement in job crafting can increase job satisfaction, engagement, and performance (Daniels et al., 2017).

2.2.1. Job Design Theories

Job design theories strive to create jobs that motivate individuals, empower them, and enhance effectiveness and productivity. Job design theories are essential in understanding how work is organized and affects employees' well-being while meeting the organization's strategic objectives. Four main job design theories are commonly recognized: mechanical, motivational, biological, and perpetual job design (Gagné & Panaccio (2014); Parker et al., (2017). Mechanistic job design emphasizes task simplification and specialization for efficiency. Motivational job design focuses on autonomy and feedback to enhance motivation. Biological job design considers physical demands to minimize fatigue and health issues. Perpetual job design promotes continuous improvement and

job crafting (Dey, 2024). These theories, including the Job Characteristics Model (JCM) and Job Demands-Control (JDC) model, offer frameworks to understand and improve job design, shedding light on the complex relationship between job characteristics, employee motivation, and well-being (Sheppard, 2023).

Key motivational models and theories related to job design form the foundation for understanding how technological disruption affects job roles — a central focus of this study. It begins with examining Frederick Taylor's scientific management model from 1911 and moving towards socio-technical systems theory in the 1950s to the Job Characteristics Model (JCM), widely recognized as a significant and influential framework developed by Hackman and Oldham in 1976. These concepts offer the essential foundation for examining the progression of job design throughout time.

Job design development is primarily linked to enhancing the productivity and efficiency of job-related outputs. Fredrik Tylor, the pioneer of *the scientific management model*, established the fundamental principles for how work is executed. His approach was centered around scientifically analyzing tasks, implementing precise timing, and meticulously systematizing processes to enhance efficiency and productivity and expedite the achievement of desired outcomes (HandWiki, 2024). This scientific and mechanistic approach to job design involved breaking tasks into specialized components, minimizing skill variety, closely supervising workers to ensure adherence to prescribed methods, simplifying tasks into repetitive elements, and ultimately leading to increased turnover and reduced job satisfaction due to the monotonous nature of the work. The impact of scientific management in the early 20th century was powerful since it effectively reduced training time by

allocating people to specific and specialized tasks. This technique allowed lower-skilled workers to be employed and paid less. It simplified jobs into simple, repeated components to enable large-scale manufacturing and reduce the need for specialized expertise (Parker et. al, 2017; Trivedi, 2020).

Unlike the mechanical approach, the *Job Characteristics Model (JCM)* focuses on creating tasks that people will enjoy and find stimulating and rewarding. A lot of attention is paid to how skill variety, task identity, task significance, autonomy, and feedback can help develop work roles that make employees more engaged, productive, and satisfied with their jobs (Lucas, 2024). The Job Characteristics Model (JCM) is a theoretical framework for designing jobs, created by Richard Hackman and Greg Oldham in 1976. It recognizes the fundamental elements that make a job interesting, rewarding, and engaging for employees. According to the theory, five fundamental job characteristics play a role in an employee's feeling of meaningful work and job satisfaction (Vreede, 2024) Refer to Figure 1, which depicts Hackman and Oldham's five components of the job characteristics model and their expected outcome.

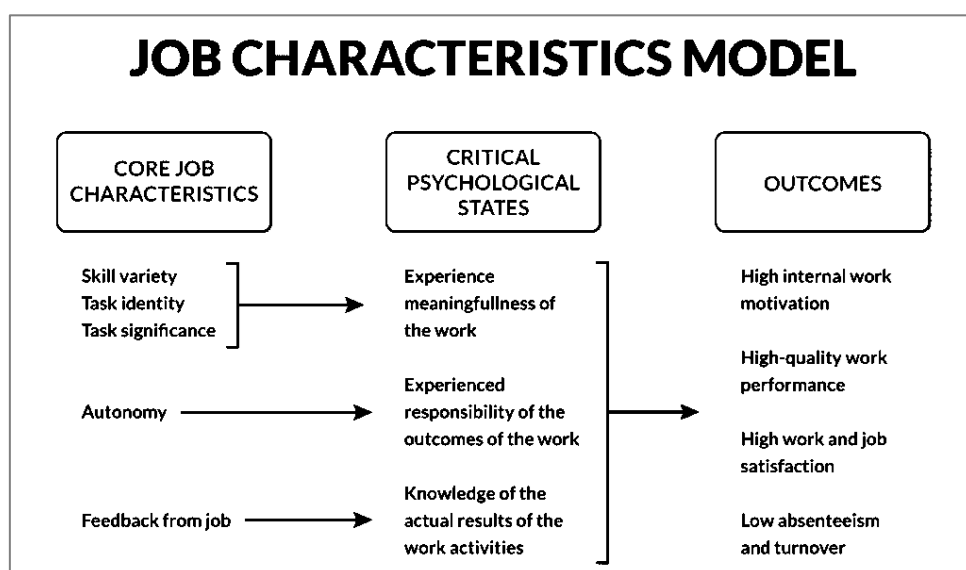


Figure 1 Job Characteristics Model from Hackman and Oldham 1980 (Lucas, 2024)

The theory of *socio-technical systems*, which is an organizational framework, emphasizes the interrelated nature of social and technological elements within complex systems. Originating in the 1950s at the Tavistock Institute in London, this theory has been widely spread worldwide by major figures such as Harold Leavitt, Albert Cherno, Ken Eason, Enid Mumford, and many more (Abbas & Michael, 2023). On the other hand, *the biological approach* emphasizes the physiological components of work, including the lowering of mechanical stress on employees, minimizing physical exhaustion, aches, and pains, as well as managing wellness issues (Shackleton, 2021). The biological and socio-technical systems approaches are separate but complementary ways of looking at how things work. In organizational theory, socio-technical systems emphasize the relationship between social and technological elements, while according to the biological perspective, genes and physique determine behavior. (Davis, 2019 & Soudunsaari, 2022).

As job design theories adapt to the evolving organizational and technological landscape, contemporary models prioritize sustaining employee motivation, enhancing performance, and promoting overall well-being. This research explores three relevant models to recognize the waves of technological disruption on job design: the Job Demands-Resources Model, the Sociotechnical Systems Model, and the Human-Technological Centric Model. The following section will briefly examine these models in literature and emphasize their significance in analyzing the relationship between technological disruption and job design in the telecommunications industry.

2.2.2. Job Design Models

The *Job Demands-Resources (JD-R)* model, termed by Bakker and Demerouti in 2007 as a well-known model of workplace stress that focuses

on how job characteristics affect workers' well-being and success. The model divides job characteristics into two main groups: job resources and job demand. Job demands are parts of the job that take long-term effort and come with physical and mental costs, like much work, tight deadlines, and role conflicts. On the other hand, job resources include elements like social support, autonomy, and feedback that help people reach their work-related goals, make their jobs more manageable, and encourage personal growth and development (Bakker & Demerouti, 2007). The idea behind the model is that each job has its unique working circumstances, which can be broken down into job demands and resources. These factors can be the same for all jobs, no matter what demands and resources are involved (Demerouti et al., 2001).

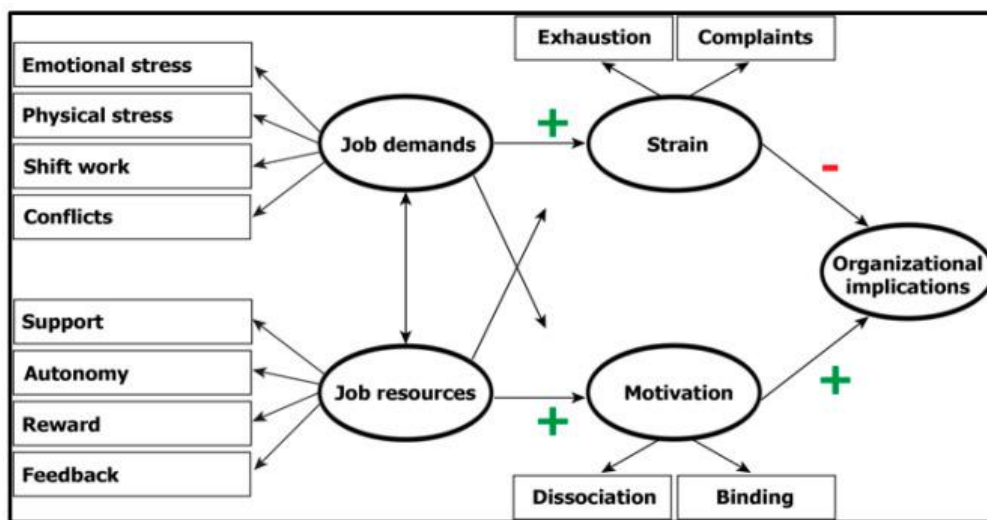


Figure 2 Job Demands-Resources Model from Scholze & Hecker, 2023

The Job Demands-Resources (JD-R) model can be applied to job design in the context of technological disruption by identifying the job demands and resources relevant to the changing technological landscape. In a study on digitization in the context of the JD-R model by Scholze & Hecker (2023), it is found that digital job demands and resources can be systematically captured using the model and that the model can be extended to provide a more comprehensive understanding of changes in

job demands and resources in the context of digitization (see figure 2). Moreover, concerning technology disruption and job design, the JD-R model implies that the growth of technology creates a greater demand for specific skill sets, thus leading to a rise in work responsibilities and stress levels. Nevertheless, the model also asserts that technology can serve as a valuable job resource, facilitating the achievement of work objectives and resulting in heightened job satisfaction and enhanced performance. According to scholarly research, companies can potentially minimize the negative impacts of technology on job design and maximize its benefits by adopting a human-centered approach. This strategy involves considering and incorporating employee work experiences into automated workflows and job design processes. Organizations can effectively sustain and improve employee well-being and motivation by prioritizing cultivating relevant job resources, such as autonomy and task variety, after digital transformations (Scholze & Hecker, 2023A; Demerouti, 2020; Peeters & Plomp, 2022). Moreover, Parker (2014) states that proactive consideration of job design must always be given when technological advances and methodologies are launched, but that this is typically not the case. The author refers to the job demands-control model as a practical, theoretical framework that discusses the impact of job characteristics on the mental state of employees. The relevance of technology in the workplace lies in its potential to alter the dynamics of work and the expectations placed on workers. A typical example of this phenomenon is automation and artificial intelligence (AI), which can cause modification in job duties and tasks. Thus, such changes may impact the extent of job control and support experienced by workers (Schmid & Dowling , 2020).

The review above indicates that the JD-R model provides a framework for designing jobs better suited to the changing technological landscape

and effectively understanding the many aspects and consequences of technological disruption in the workplace. The model identifies how technology-driven changes impact job design, emphasizing the rising need for specific skills and increased work responsibilities. This model showcases technology as both a stressor and an asset, suggesting a human-centered approach to optimize job resources after digital transformations, which is crucial for sustaining employee well-being and performance. In the context of this research that explores disruptive technology and job design in the telecommunication sector, The JD-R model can provide a relevant framework to analyze the complex interplay between evolving technology and jobs. It helps outline the impact of technological disruptions on job demands and resources, offering insights to optimize work conditions, enhance performance, and sustain employee well-being amid technological transformations.

The second model to emphasize is the *Sociotechnical Systems* Theory (STS), an organizational design framework that underscores the dynamic interplay between technology and individuals (Cuofano, 2023). In this model, an organization's components are a collection of interconnected subsystems: task, structure, people, and technology are linked components that form the foundation of job design in companies (see Figure 3).

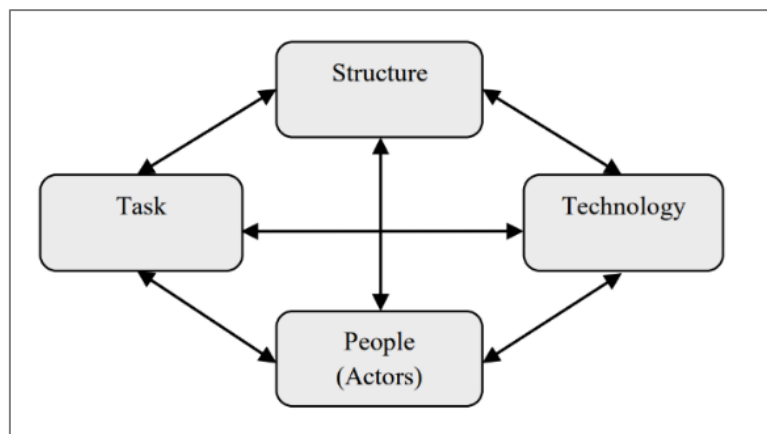


Figure 3 Socio-technical systems theory - Harold, J. Leavitt (1965) from (Jamali et al., 2011)

When designing and implementing a business improvement program, it is necessary to consider the complex connections that exist among these subsystems (Horrock , 2017). Tasks are the basics people engage in, which are shaped by the organizational structure that establishes roles, hierarchies, and communication channels. People through their expertise, knowledge, and social connections, represent a crucial element that impacts the execution of tasks and the adaptable nature of the system. Technology acts as a facilitator and booster, influencing the completion of tasks, modifying systems, and mediating human interactions. The Sociotechnical Systems Theory incorporates several variables that interact with each other to shape the design of jobs. It emphasizes the interaction of social and technical factors to optimize work processes and improve overall organizational effectiveness (Bednar & Welch, 2020) (Abbas & Michael, 2023).

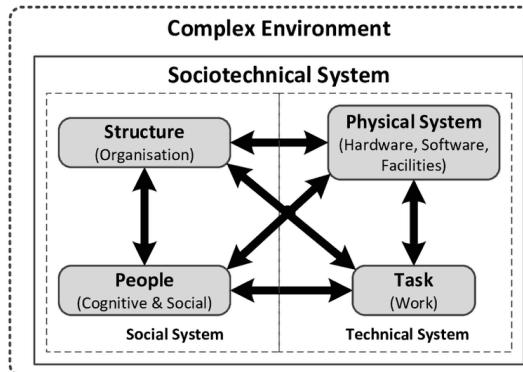


Figure 4 Sociotechnical System from Oosthuizen & Pretorius, 2016

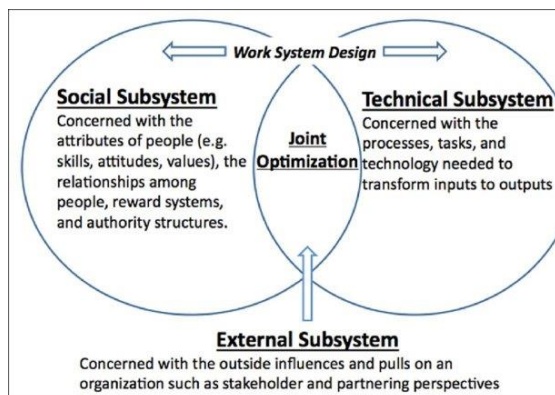


Figure 5 Sociotechnical Systems from Militello et al., 2013

According to research, The Sociotechnical Systems Theory (SST), demonstrated in figures 4 and 5, is an established framework for a technology-job design relationship that reflects both social and technical elements in an organizational setting (Pierce, 1984). Pierce's research found that workers in production-related jobs that used technology in systems designed with sociotechnical principles were content with their

jobs and less stressed than workers in jobs designed with traditional job design concepts. This mature paper provides evidence of the value of the sociotechnical systems viewpoint to job design and technology. Other recent papers also state that the design of jobs and the overall effectiveness of an organization are influenced by both its social and technical variables and examine how both aspects work together to improve operational systems inside the business (Abbas & Michael , 2023).

In the context of a working system, several elements, such as organizational structure, humans, technological resources, and tasks, coexist and engage in mutual interactions. The SST viewpoint highlights the significance of considering a system's social and technological dimensions throughout the job design process or introducing novel technologies (Savaget et al., 2019). The article titled "Employing the Sociotechnical System Theory of Job Design for Technostress Intervention: An Integration of Technological and Social Job Characteristics" examines the application of the Sociotechnical System Theory of Job Design in addressing technological stress through the integration of social job characteristics with technological innovations. The theory focuses on how a job's technological and social parts affect the well-being and satisfaction of people who do it. The study shows how companies can use this idea to create jobs that are good for workers' well-being and help them deal with technological stress (Okolo et al., 2019). This model is significant in this study as it provides an approach for assessing the impact of disruptive technology on job characteristics, organizational structures, and human interactions. It offers valuable perspective into boosting the balance between technological innovation and employee satisfaction in the evolving telecommunication sector (Davis, 2019).

2.2.3. Modern Approaches to Job Design in the Technology Era

Scholarly articles suggest two approaches to modern job design: technology-centered and human-centered. The technology-centered approach focuses on using technology to improve job design, while the human-centered approach emphasizes the needs and abilities of employees. The technology-centered approach can lead to dependency, the need for constant upgrades, negative impacts on workplace relationships, and job loss. On the other hand, the human-centered approach can lead to job satisfaction, increased productivity, and better workplace relationships. Human-centered design involves altering job roles and responsibilities to align with organizational goals and employee skills. It is essential to consider both approaches to job design to ensure that technology enhances work and not replace it (Berretta et al., 2023) ; (Franklin et al., 1992); (Kadir & Broberg, 2021). A technology-centered approach to job design can be balanced with a human-centered approach by considering the relationship between humans and technology in the workplace. Comprehensive links to the job characteristics model (JCM) and employees' needs and abilities are necessary to balance the technology-centered and human-centered approaches to job design.

The study by Tegtmeier et al. (2022) contributes to the modern approach of job design by highlighting the significance of incorporating human-centered principles and adapting to the evolving technological landscape. In today's rapidly changing work environment, where digital transformation is everywhere, organizations must prioritize the well-being and performance of their employees while leveraging technological advancements. By emphasizing the dynamic nature of job design criteria and the importance of considering digitization-sensitive factors, such as automation and remote work, the study underscores the need for a holistic

approach to job design. This approach recognizes the interconnectedness of various job elements within the broader context of work systems, ultimately enabling organizations to optimize employee well-being, health, and productivity in the digital age.

Theories continue to evolve, emphasizing the importance of improving job design. New factors frequently arise in a dynamic business environment, necessitating constant updates on roles, responsibilities, and workplace changes to ensure compliance with evolving circumstances. Examining many job design concepts, models, and methodologies offers an in-depth understanding of job structuring, motivation, and optimization for employee performance and satisfaction.

2.3. Technological Disruption

This section explores the concept of technological disruption, focusing on key terminologies related to information and communication technologies (ICT). It begins by reviewing the historical evolution of ICT, then highlights its influence on the multigenerational workforce, and finally emphasizes how technology has progressively integrated with and transformed the telecommunications sector. Given the variety of technology-related terms that have emerged throughout this research, it becomes essential to provide an overview of these specific terminologies, especially those frequently used in scholarly literature on work and organizations.

Several basic terms and concepts are used repeatedly in academic literature to characterize and make sense of the phenomena known as "technology disruption." These terms help explain how new technology can revolutionize industries, markets, and societies. The rapid advancement of technology has sparked a wave of transformation across industries, giving rise to technological disruption. "Disruption" was

described by Handayani (2023) as a condition of creative activity that causes significant adjustments to be made within an existing framework. The term "technology disruption" is widely used to refer to the extensive implementation of automated systems aimed at enhancing efficiency, standardizing procedures, and reducing reliance on human labor. Furthermore, the trend is distinguished by advancements' rapid and significant transformations, covering diverse signs such as digitalization, automation, and artificial intelligence. The phrase "disruptive technology" was created by Harvard Business School professor and innovation expert Clayton Christensen in a 1995 article for the Harvard Business Review (Bower & Christensen, 1995). It refers to technologies that offer the capacity to challenge conventional norms and accelerate advances in the field of technology. Examples include Big Data, the Internet of Things (IoT), Industry 4.0, Cloud computing, and digital manufacturing (Vaska et al., 2021). "Disruptive innovation" is a concept that describes an innovation that initially serves a niche market but eventually disrupts and reshapes an entire industry. Disruptive innovations often emerge from new technologies or business models and target underserved or overlooked markets, initially appearing less attractive to established companies and their existing stakeholders. Over time, disruptive and innovative firms may move up the value chain and consume a broader range of end-user categories, which could cause them to replace more established market players. According to Christensen in his later published book "The Innovator's Dilemma" (Christensen, 1997), a company's internal processes, structures, and cultures can make it hard to foster and support disruptive innovations, which may require a different management style and way of working. The complex interplay between technology disruption and organizational dynamics becomes evident here, whereby "digital transformation" is another significant trend for integrating digital

technologies into an organization's working processes (Vaska et al., 2021). Indeed, disruptive innovations frequently challenge established norms and require a distinctive management approach that nurtures flexibility, experimentation, and adaptability. The impact of disruptive technology on business models and market dynamics can be profound and irreversible. The trend has resulted in substantial changes across multiple sectors, disrupting established norms. New possibilities for innovation, growth, and competitive advantage may emerge because of disruptive technologies. Additionally, it can cause market uncertainty and volatility by putting pressure on companies to change their strategies or lose business rapidly. Besides the apparent effects on the economy, disruptive technologies can have far-reaching repercussions on society and the world.

This study plans to use the term "technology disruption" to encompass all technological resources that firms and industries can utilize within the contemporary work environment. This includes the use of big data analytics, Artificial intelligence (AI), Automation technologies, Digital communication devices, automated systems, and robots, the Internet of Things (IoT), and cloud computing (Dagny Dukach, 2022; Beer & Mulder, 2020; Nadkarni & Prügl, 2021)

2.3.1. Historical Development of ICT

When discussing technology, the concept of time cannot be overstated. Given the rate at which technology evolves, most assumptions and observations made to convey its reality may be outdated by the time it is publicized. So, what is valid or relevant today may be something other the next day. Therefore, any statement or analysis describing the current state of technology may be obsolete by the time it reaches the audience. This makes it challenging to communicate effectively and accurately about it. As a result, it is worth recognizing that the essence of technology disruption

requires an appreciation of its historical cycles since numerous industries have undergone transformative changes due to radical technologies throughout history, and gaining insight into the historical context of developments in technology proves essential for informing present and prospective technological progress.

Throughout the ages, humans have consistently engaged in the process of invention and creation to attain improved outcomes more efficiently, with three historical industrial revolutions initiated by significant technological advancements across three centuries. Transformations in industry have commonly been termed "industrial revolutions," denoting significant shifts in paradigms (Rana & Sharma, 2019). The advent of computer- machines marked Industry 1.0 in the 18th century, succeeded by electricity-driven Industry 2.0 in the 19th century, and computer and internet-enabled Industry 3.0 in the 20th century. In the 21st century, Industry 4.0 represents the advancement of intelligent, innovative business operations and the smart Internet of Things IOT (Sivathanu & Pillai, 2018; Rana & Sharma, 2019). Industry 5.0 has emerged as a current trend in the context of technological change, wherein the integration of human labor, cutting-edge technology, and intelligent robots is utilized to enhance the efficiency of corporate operations (Kolade & Owoseni, 2022; Adel, 2022). It is undeniable that technology is now fundamental to our modern way of life, but it also regularly presents us with new challenges.

The emergence of disruptive technologies is evident in previous innovative breakthroughs that have caused significant shifts in various industries. Examples of these innovations include the replacement of horse carriages with automobiles, the substitution of gas lighting with electricity, and the displacement of radios by televisions. Most recent examples of disruptive technologies include Several fast-evolving technologies like big

data, the Internet of Things (IoT), machine learning, artificial intelligence (AI), robots, 3D printing, biotechnology, nanotechnology, renewable energy technologies, and satellite and drone technologies (Sarker, 2021; Manyika, 2017; and Schmid & Dowling, 2020). These technologies are revolutionizing diverse industries and domains, including but not limited to media, climate action, healthcare, and other areas. They currently serve as facilitators, enabling machines to assume previously exclusive responsibilities to human operators and transforming the modern workplace (CNBC, 2022; Dagny Dukach, 2022).

2.3.2. Multigeneration Workforce within a High-Tech Landscape

In today's work landscape, which technological disruptions have driven, it is necessary to acknowledge the presence of a multigenerational workforce and the influence of generational diversity on the design of jobs. As Gen Z, Millennials, and other generations work together, a workplace environment that supports a range of work habits, expectations, and communication styles is required (Boatman, 2023) & (Ganesh, 2023). The workplace design across numerous industries has been profoundly influenced by digital technologies, shifting lifestyles, and organizational culture have profoundly influenced workplace design across numerous industries (Latkovikj & Popovska, 2020). Therefore, in the context of multigenerational collaboration among employees, it is vital to acknowledge the various levels of technology proficiency and preferences of individuals relating to different generations. The design of jobs is expected to adapt to support a multigenerational workforce, providing a flexible and inclusive environment that caters to each generation's diverse needs and expectations. Understanding and addressing generational technological and cultural differences is crucial for creating a cohesive and productive work environment. The importance of exploring redesigning

jobs in the context of technology disruption, keeping in mind the multigenerational workforce's expectations, skills, abilities, and needs, cannot be overstated.

Disrupted by technology, the modern work environment has seen the convergence of multiple generations collaborating within high-tech settings. Because technology is frequently identified as a critical factor in separating generations, Attaran et al. (2020) illustrate the staggering work a business has to go through to accommodate the varying needs of the many generation components in the workforce. The authors discuss workers' demographics, information overload, social media, the demand for speed, and the mobility of workplace features as key leads driving rapid change. The paper concludes that a tech-savvy generation that expects access to flexible work hours and user-friendly technological resources will dominate the global workforce and be more willing to embrace workplace technology. Another case study paper examining China's younger workforce highlights the importance of considering current job design patterns when developing job roles for young workers in China (Chen et. al, 2023). According to the findings, workers prefer workplaces where they can exercise power over their work, utilize a wide range of skills and knowledge, learn new things, contribute to the achievement of the company's goals, develop positive relationships with their coworkers, count on getting what they need when they need it, and be compensated fairly. Therefore, given the ongoing impact of technology on workplace dynamics, it has become essential to empower employees of all generations to make the most of technical resources to improve interaction and collaboration. Therefore, considering proactive and collaborative design and redesign of jobs can aid in planning for this expected outcome.

2.3.3. Technological Disruption and Telecommunication Sector

Numerous industries were driven to modify their business models in reaction to technological advances, affecting the dynamics of markets and the landscape of competition. Disruptive technologies have exhibited significant effects from technical progress, leading to transformative changes in various sectors like banking, retail, manufacturing, and healthcare. Nevertheless, the telecommunication sector distinguishes itself due to its notable rate of innovation. This industry is at the forefront of embracing and executing state-of-the-art innovations, frequently establishing the standard for other sectors (Bradley et al., 2015).

As a universal game changer, the telecommunication sector is one of the most significant engines of economic growth. Research shows that the telecommunication industry rapidly changed after 1980, with the introduction of several new technologies, including 1G and 2G mobile telephony, digital switching, and ISDN (Friedl & Lakomaa, 2022). It is leading the way in terms of technical improvements, exemplified by the emergence of 5G networks, the Internet of Things (IoT), and artificial intelligence (AI) (Khan, 2021). The telecommunication field has continuously evolved, driven by the emergence of technologies like 5G and cloud-hosted VoIP. These advancements profoundly impact communication and global engagement, improving connectivity and opening new possibilities for mobile applications and services. (Picincu, 2020).

From a business perspective, there have been significant, far-reaching global technological shifts in the telecommunications sector, particularly with the move from 3G and 4G networks to faster 5G networks. The business community started following the Bring Your Own Devices

(BYOD) trend, which lets employees use the same devices for work and personal communications (Barlette et al., 2021). Artificial intelligence (AI) has also been utilized to enhance networks, automate client service, and develop new products (Sembiring et al., 2023). The Internet of Things (IoT) has similarly changed the way businesses work by making it possible for data to be sent easily between many devices (Jabeen & Ishaq, 2022). Further, costs have been reduced, and efficiencies increased owing to cloud computing, allowing for improvements in areas like customer service and data storage (Ouyang, et al., 2022). A wide range of technologies are consistently being developed and modified to improve the efficacy of data communication and ensure its ability to meet human expectations (Sembiring et al., 2021).

Rapid transformation is driven by technological breakthroughs in the telecommunications business, especially in artificial intelligence and cloud computing. This has profound impacts on consumer services and employment needs. Automating tasks like network administration, billing, and customer assistance is one way these advances improve service delivery efficiency and quality, reducing costs and increasing service satisfaction (MCUBE, 2024). In addition, by utilizing data to customize offerings, services, and products and predict and solve issues before they become more serious, AI and cloud computing enable engaging clients proactively and personally. In addition to opening new possibilities, such as cloud-based solutions and Internet of Things (IoT) applications, self-service alternatives empower consumers through user-friendly interfaces (Amar et al., 2022) (Utilities One, 2023).

Overall, breakthroughs in emerging technologies such as 5G, IoT, AI, and blockchain significantly impact the telecommunication sector. Due to evolving technological disruptions, telecommunication sector jobs are

expected to experience substantial transformations. Functions focused on traditional network maintenance and operations may transition to specialized areas like 5G deployment, IoT management, AI integration, and blockchain implementation. Furthermore, there can be a growing need for experts proficient in data analytics, cybersecurity, software development, and emerging technologies to aid the changing environment of the telecommunications industry. To be competitive in the job market, experts in data science, cybersecurity, artificial intelligence, and cloud computing must remain agile to keep up with the telecommunications industry's ever-shifting technical landscape and secure their place in the highly competitive job market. (Utilities One, 2023).

2.4. Telecommunication Sector in Bahrain

The telecommunication sector in the Kingdom of Bahrain has expanded significantly over the last ten years, primarily influenced by a growing population, heightened communication demands, and extensive utilization of smartphone technologies (Global Monitor, 2020). In Bahrain, the telecommunications industry has shifted from a monopoly to an oligopoly, with major companies such as Bahrain Telecommunication Company (Batelco), Zain Bahrain, and STC Bahrain dominating the market (De Rosbo, , 2021). The market is projected to achieve a Compound Annual Growth Rate (CAGR) of 6% from 2021 to 2026, propelled by technology improvements and digital transformation efforts (Mordor Intelligence, 2024).

Bahrain has emerged as a leading force in technology developments, market innovations, and regulatory reforms. The telecommunications industry in Bahrain has witnessed substantial expansion and advancement, establishing the nation as a leader in the Gulf Cooperation Council (GCC) region and one of the thirty most developed ICT economies globally. The

presence of essential operators, open markets, and the framework of regulation have contributed to the growth and rise of telecommunications in Bahrain (Al-Alawi & Al-Bassam, 2019). The sector's development has been actively guided by the government, specifically through the Kingdom of Bahrain Telecommunications Regulatory Authority (TRA) (Mordor Intelligence, 2018). The sector in the Gulf Cooperation Council (GCC) region has achieved a mature and well-established position characterized by a significant level of mobile coverage (Oxford Business Group, 2015). The expansion of the business has been significantly driven by high connectivity and content offerings, mainly through the provision of value-added services. This integration makes it an exciting field to examine the effects of technological disruptions on job design.

2.5. Job Design and Technology Disruption: exploring results of previous studies

This section explores the intersection of job design and technological disruption, drawing on prior research to outline key themes and findings. The influence of technology on job design has received substantial scholarly attention in recent years, with numerous studies offering valuable insights into the impacts of digital transformation, the future of work, and evolving job structures. This section provides an in-depth review of these studies, organizing their contributions to highlight how technology-driven changes are reshaping the workforce. The section is divided into several parts: the first examines the emergence of new skill requirements, the second analyzes shifts in job roles and responsibilities, and the third explores changes in organizational structures, emphasizing flatter hierarchies and cross-functional collaboration. It also discusses the formation of cross-functional teams and the importance of maintaining employee well-being and job satisfaction amidst new challenges and

pressures. Literature categorizes these shifts into challenges and opportunities, such as resistance to change, potential job displacement, retraining needs, leveraging technology for flexible work arrangements, and creating new roles due to technological capabilities. This section aims to provide a cohesive understanding of how technological advancements transform job design within contemporary organizations.

2.5.1. Changes in Requirements and Recognition of New Skill Sets

Recent technological advancements have led to significant shifts in job skills and responsibilities (Montobbio et al., 2022). CNBC's documentary, "How Work is Changing," provides insight into these changes, particularly emphasizing the anticipated automation of various industries by robots and AI. The documentary highlights the importance of job designs that enable employees to utilize diverse skills, perform various tasks, make independent decisions, and continuously enhance their skill sets to improve well-being and performance. However, it also warns that over 80% of jobs may face automation, underscoring the necessity for adaptability in the rapidly evolving job landscape (CNBC, 2022). In a recent paper titled "Technological Progress and the Future of Work," Schilirò (2023) explores the impact of emerging technologies on jobs, specifically in relation to new digital technologies and their effects on occupational structures and skill sets. The author delves into how technology influences tasks, required skills, and employment allocation among sectors, highlighting the transformative nature of job forms and skill requirements when workers engage with emerging technology.

Moreover, Molhova and Ivanov (2023) address the challenges posed by disruptive technologies, emphasizing the importance of developing skills to navigate assigned tasks and role changes resulting from technological

disruptions. They advocate for an adaptable workforce capable of handling shifts in employment structures and effectively managing crises induced by disruptive technology (Molhova & Ivanov, 2023). These discussions underscore the critical role of skill adaptation and workforce flexibility in navigating the impact of technology on job design and organizational resilience.

2.5.2. Changes in Job Roles and Responsibilities

In the context of the smart industry era, identifying roles and responsibilities through job design holds significant importance (Bosch, 2016). Even traditionally stable roles such as those in supply chain and marketing are susceptible to technological advancements, as highlighted in the 2016 report by the World Economic Forum. Wang (2021) study also delves into the concept of a dynamic work environment, characterized by rapid, unplanned, and unpredictable changes. It unveils that such an environment significantly enhances employees' ability to innovate. Additionally, Wang explores the role of employees in job crafting and voicing opinions within this dynamic context. Job crafting involves proactive adjustments employees make to their job demands and resources, while voicing behavior entails speaking up with suggestions, ideas, or concerns. The study demonstrates that both job crafting and voicing behavior act as effective mechanisms through which the dynamic work environment influences innovative performance. This underscores the importance of empowering employees to shape their job roles and tasks and fostering a culture where they feel encouraged to express their thoughts, thereby enhancing their innovative contributions.

The World Economic Forum (WEF) underscores the profound impact of technology on job design, emphasizing the necessity of empowering technology, retraining, skill development, and fostering supportive systems

to facilitate workforce transformation. Through various articles, WEF explores how technology shapes the evolution of jobs. In 2018, projections suggested that by 2025, machines would surpass humans in the number of labor tasks performed, compared to the current scenario, where humans account for 71% of these tasks (Cann, 2018). In the recent “Future of Jobs Report 2023,” WEF highlights the anticipated impact of technological progress, including the widespread adoption of novel technologies and enhanced internet-based accessibility, on job transformation (World Economic Forum, 2023).

The interconnectedness between job design, technological disruption, and employee empowerment underscores the need for organizations to adapt to dynamic work environments to foster innovation and maintain competitiveness.

2.5.3. Organizational Structure Changes & Cross-Functional Collaboration

Many established organizational structures have been altered due to technology platforms and the drive to improve efficiency and adaptability. The nature of work evolves towards a more scattered, flexible, and autonomous structure (Leimeister & Blohm, 2022). Organizational adaptations, driven by changes in an organization's vision or mission due to industry shifts, often necessitate adjustments in structure, potentially resulting in hierarchical flattening and reshaped job roles. This highlights the importance of reassessing job design practices. Research has identified Job design being influenced by three key factors: organizational, environmental, and behavioral (Lamovšek et al., 2023). Organizational factors, such as task characteristics and workflow, significantly shape job design, while environmental factors prioritize creating conducive work environments aligned with organizational goals. Behavioral factors

emphasize aligning human needs with job performance through effective communication and skill utilization, thereby enhancing productivity and job satisfaction. These factors integrate job structure with human capabilities and foster conducive working environments (Geek Tonight, 2023; Chand, 2023). Fleming et al. (2019) argue that technology disrupts labor demand and organizational structure, influencing job shifts and field jobs. Technology's "composition effect" alters labor demand within sectors, sometimes replacing humans with machines, known as the "substitution effect". This underscores the intricate interplay between technological disruption, organizational structural change, and job design adaptation in contemporary workplaces.

The 2021 Global Human Capital Trends study by Deloitte emphasizes the complementing potential of collaboration between humans and technology, asserting that their combined capabilities exceed what each entity can do independently (Langsett, 2021). Achieving a harmonious integration of a technology-focused approach and a human-focused approach to job design necessitates careful consideration of the interplay between humans and technology within the work environment. This entails leveraging technology to foster collaboration with human counterparts, facilitating team dynamics and knowledge exchange through technological means, and ensuring that the technology design is centered around human needs and preferences (Nguyen et al., 2021) (Fine & Kanter, 2022). Gagné et al. (2022) also explore how technology influences job design and its effects on worker motivation. They discuss three instances in which technology alters labor structure and organization: remote work, virtual teams, and algorithmic management. This highlights the need for structural support and intrinsic adaptability as technology redefines job design and workforce dynamics.

2.5.4. Job Satisfaction and Well-being Upon Technological Change

An ongoing topic of discussion in the academic literature is the connection between employee satisfaction, stress and well-being, and the use of technology in the workplace. One of the earliest research articles that examine the relationship between job design and technology is titled "Technology and the Structuring of Jobs: Employee Satisfaction, Performance, and Influence." (Brass, 1985). This article investigated the link between technology and job design and their impact on employee satisfaction and performance. The findings indicated that a sufficient alignment between technology and job design can have positive implications for employees, including higher levels of job satisfaction and improved performance.

Parker et al. (2017) underscored this connection in their review of job design research, highlighting how technology has continuously reshaped task execution over time. They argue that as technology evolves, workforce strategies must prioritize the well-being of employees. This sentiment is echoed by Janssen & Mark (2019), who observed that the rise of automation and computerization, coupled with flexible work arrangements enabled by technology, has blurred the boundaries between work and personal life, resulting in heightened stress levels for workers. Building on this, Laschke et al. (2020) proposed a well-being-centric approach to designing work-related technology. They advocate for collaboration among HRM professionals, business leaders, and technology developers to identify and integrate practices that enhance employee well-being into the design of technology used in the workplace. Collaboration across disciplines is essential for improving employee well-being in the face of quick technological changes that are reshaping current workplaces.

Additionally, challenges posed by unforeseen crises, such as the COVID-19 pandemic or the outbreak of war, have, without a doubt, significant effects on the well-being and productivity of employees. Viewing crises through a job design lens, as suggested by Demerouti & Bakker (2023), offers valuable insights into these effects. The pandemic, since 2020, has not only accelerated technological innovation but also transformed communication methods and business practices globally, posing unprecedented challenges for management and employees (Alam, 2020; Jain et al., 2022). This crisis propelled the widespread adoption of technology and necessitated rapid adjustments to work models on a global scale, highlighting the significance of digitalization across workplace systems (Leimeister & Blohm, 2022). Remote work became essential for safeguarding employee well-being and ensuring business continuity, facilitated by advancements like video conferencing and cloud computing. Consequently, organizations were compelled to reassess their work and job design to adapt to these evolving circumstances (CNBC, 2022). Moreover, the pandemic heightened businesses' interest in automation, emphasizing the need for a proactive approach in understanding technology's implications (Endresen, 2020). While the pandemic's long-term impact on jobs remains uncertain, the pivotal role of technology in facilitating this paradigm shift underscores its enduring influence on the trajectory of job design (Ancillo et al., 2020; Hodder, 2020; Nagele-Piazza, 2020). Despite its adaptability, technology's constant accessibility can increase job pressure and decrease social well-being (Wright & Lepinteur, 2022). Technology and employee expectations are transforming the workplace, so companies must adapt their job design and practices. The COVID-19 pandemic has emphasized job design in human resource management frameworks, promoting proactive approaches. Technology and modern communication methods are examined to improve employee well-being

and job satisfaction. Thus, organizations must foster cultures that value job dynamics and employee well-being.

Maintaining employee satisfaction amid technological changes involves several critical strategies, as highlighted in the literature. Online training platforms support continuous learning, helping employees adapt and grow their skills, which enhances satisfaction and productivity (Marson, 2020). Additionally, digital tools offer employees greater autonomy, positively impacting job performance and workplace experience (Knight & Parker, 2021). Fostering collaboration through technology improves communication, and implementing efficient self-service systems enhances accessibility, saving time, and bolstering satisfaction (Liu et al., 2022). Creating a supportive environment focused on learning, empowerment, collaboration, and streamlined technology use can significantly enhance employee satisfaction. Liu, Huang, and Zhang (2018) propose integrating job design with gamification, which may boost morale and productivity in industrial settings. Drawing from the Job Characteristic Model (JCM) and game element hierarchy, their framework suggests using smartphone-based gamified job designs to enhance motivation, satisfaction, and performance. The study also highlights the importance of recognizing individual differences and obtaining employee consent for gamification. As technology evolves, gamification in job design shows potential to improve employee engagement and satisfaction, underscoring the need for innovative approaches in managing technological disruptions.

In the digital era, job design that enhances employee satisfaction is paramount. Parker and Grote (2022) argue for reevaluating job design concepts and sociotechnical perspectives on digital technology. They propose integrating technology with Hackman and Oldham's (1976) job

characteristics model, emphasizing autonomy, skill utilization, feedback, relational features, and work-related demands. This integration significantly impacts employees' well-being, health, and productivity. The authors advocate for a shift towards proactive strategies that align job design with human-centered technologies, challenging the notion of passive adaptation to technology demands. They stress the need for human-centered technology development and proactive job design strategies during technology implementation. Additionally, it underscores the importance of macro-level policies and providing education and training in job design for all employees involved. This holistic approach aims to ensure reliable and meaningful job designs in the face of technological disruption.

2.6. Challenges Associated with Technological Disruption

Technological disruption drives significant shifts in organizations and jobs, creating exciting possibilities and presenting many challenges. Employees may perceive new technologies as a threat, and resistance to change is a typical obstacle during the implementation of technological initiatives. (Scholkmann, 2021). Additionally, Job displacement is a difficulty that arises due to technological disruption, specifically, job loss caused by replacing human workers with technological tools (Chang et al., 2022). While technological advancements are generally associated with positive results like increased productivity and economic growth, they can also have negative consequences like technological job displacement, which is the loss of jobs caused by machines taking over previously human-occupied tasks. There may be some displaced people who are unable to find another job, and estimates indicate that over half of the workforce is in jobs that may be automated (Manyika, et al., 2017). Therefore, it is essential to consider how technological developments are

displacing people from their jobs and how to deal with the effects on workers' well-being, security, and health.

A matching perspective from Burgess and Connell (2020) affirms that new technologies modifying workplace design and work habits are causing job displacement, talent shortages, and increased work strain. Therefore, there is a need for a comprehensive approach that considers the interaction between technology, work practices, and employee well-being. The authors argue that, in response to the difficulties brought by technology, jobs should prioritize the empowerment of workers, the enrichment of their professional and social lives, and the promotion of the concept of collaboration (Burgess & Connell, 2020). Moreover, as Gibbs and Bazylik (2022) determine, technology and changing jobs affect pay inequality. Technology allows repetitious tasks to be automated, dividing the labor market into two extremes and reducing the number of intermediate-level jobs. Additionally, The New York Times discusses worries from workers and officials over potential job displacement due to artificial intelligence. It emphasizes the importance of legislators and leaders directing efforts toward protecting workers and providing retraining opportunities (Goldberg, 2023).

Developments promise productivity and prosperity but cause job loss and income disparity. Burgess and Connell (2020) recommend a holistic approach that enhances worker empowerment and well-being in changing workplaces. Gibbs & Bazylik (2022) emphasize the necessity for policy solutions to automation-induced labor market polarization. Goldberg (2023) underscores the need for legislation to protect workers and provide retraining in the face of AI-driven transformations. All of these perspectives stress the importance of comprehensive policies on technological disruption, which should strike a balance between innovation

and regulation of the rate of automation, as well as initiatives to aid those who have lost their jobs through education and training, with an emphasis on worker protection and social well-being.

2.7. Opportunities Associated with Technology Disruption

In today's ever-evolving work environment, technology and job design present promising opportunities to enhance employee well-being, productivity, and adaptability, particularly as organizations leverage technology to create flexible work arrangements. As companies transition to hybrid work models, they must strategically utilize technology capabilities to create flexible work arrangements that empower employees and drive organizational success. For example, El Hajal (2022) notes that current technology and AI have changed workplace expectations and practices, particularly in the hotel industry's remote working. According to the report, organizational support, effective ICT infrastructure, and employee alignment are crucial to HRM's participation in this shift. Job crafting, where HRM strategically adjusts job roles and schedules to allow remote work, improves employee well-being and organizational success.

Janssen and Merk (2019) explore the significant impact of technological innovations on contemporary work design, emphasizing the need for businesses to adapt to remain competitive and support employee well-being. Digital technologies offer flexibility, automate tasks, and affect consumer demands and productivity but may also introduce stressors linked to flexible work arrangements. The Society for Human Resources Management (2022) highlights improved work-life balance, productivity, recruitment, and retention benefits. However, challenges include aligning worker preferences with company needs, managing disagreements, and maintaining legal standards. Hybrid schedules like flextime and

compressed workweeks, increasingly popular post-pandemic, present unique challenges in managing flexibility (SHRM, 2022).

Most jobs are being transformed by technology in the rapidly evolving modern workplace. Technology's influence is undeniable, regardless of whether one works at an office or on a production line. The World Economic Forum's Future of Jobs Report 2023 suggests that in the next five years, most technologies will contribute to job creation as new roles are developed to leverage these technological advancements. However, about 25% of jobs will see significant shifts owing to various variables, including the transition to more environmentally friendly practices (Willige & Markovitz, 2023). Technology is creating green jobs in sustainability, green energy generation, and renewable energy. There is also more expansion in jobs for vocational education and agricultural equipment operators, graders, and sorters. Many of the new professions generated represent the increased need for sustainable practices, education, and agricultural technology. The WEF research also discusses the impact of AI and Big Data on job profiles, demonstrating a shift toward technological literacy across industries. Siddiqui et al. (2022) emphasize incorporating technology into job design to produce sustainable, ecologically responsible jobs that benefit employees, companies, and society. Job design's trend toward sustainability is examined, concentrating on fair labor and environmental responsibility. It emphasizes the need for organizational and national policy measures to address equitable salaries, ethical workplaces, and sustainable chances for employment. The study advises designing modern jobs with a sustainable focus, merging health, technology, engineering, and economic disciplines. It also underlines the significance of new techniques to broaden how jobs are structured and addresses the eighth SDG of ethical labor and economic growth via future job redesign.

In an article that discusses the challenges and opportunities in the workforce and workplace ecosystem in the age of digital transformation and the Fourth Industrial Revolution, Gorski et. al, (2022) emphasized the need for a connected workplace where people and technology work in synergy and the importance of communication and collaboration in a hybrid space - physical and digital. Artificial intelligence (AI), smart robotics, and intelligent automation are causing significant disruptive transformations in the labor market, workforce, and workplace ecosystems. These changes are altering the methods of work, productivity levels, and the number and type of job opportunities. These findings indicate that incorporating technology into job design fundamentally alters the nature of a job and the competencies demanded in the labor market.

The advent of Industry 4.0 introduces a significant shift towards increased digitalization, fostering extensive human-robot interaction. This transformative landscape encompasses check-in, check-out kiosks, and online food ordering and presents a distinct challenge in delivering customers an immersive and tailored service experience. (Yadav, 2020). This changing dynamic highlights a complex combination of technological changes and human-centered service design, emphasizing the importance of addressing these changes in job design.

2.8. Summary

This chapter offered a comprehensive literature review on job design and its interaction with technological disruption, specifically within Bahrain's telecommunications sector. It began by defining job design and outlining key theories and models that shape its significance. The chapter highlighted modern approaches that enhance productivity and employee satisfaction in response to technological advancements (Stepanek & Paul, 2023). It also examined the historical development of information and

communication technologies (ICT) and their implications for a multigenerational workforce. The transformative impact of technological disruption on job roles and evolving skill requirements was emphasized (Siddiqui et al., 2022; Siruri & Cheche, 2021). The need for organizational structure shifts and cross-functional collaboration was also discussed to address new challenges and opportunities. The review advocated for flexible job design strategies prioritizing employee well-being and engagement amid the complexities of technological change. It underscored organizations' need to integrate these strategies with technological innovations to foster resilience and enhance productivity in the rapidly evolving telecom industry. Ultimately, the review emphasized the interconnectedness of job design, technology, and employee well-being, advocating for human-centric approaches and macro-level policies to support collaborative work environments while addressing concerns about job displacement and skill shortages.

The next chapter details the study's methodology. It covers theme analysis, participant selection criteria, data collection techniques, ethical considerations, and the selected qualitative research methodology. With reference to the telecom industry review, the next chapter provides a thorough grasp of the study's methodology and applicability.

Chapter Three

Chapter 3: Methodology of Research

3.1. Introduction

This chapter explores the research method used for this study, outlining how it aligns with the research objectives. Moreover, it elaborates on the careful procedure used to select the specific group of participants, ensuring its relevance in discovering research results relevant to the study's goals and objectives. This comprehensive approach emphasizes the strategic relevance of the sector and the thorough approach that supports the research.

3.2. Research Design

This study examines the implications of technological disruptions on job design within Bahrain's telecoms sector. The analysis emphasizes essential elements of job design, such as work roles, duties, business strategies, resources, and the skills and abilities required to fulfill job demands and adapt to changing organizational plans due to technology disruption. The research employs interpretive qualitative methods to explore telecom employees' diverse observations and points of view. This technique uses thorough interviews and thematic analysis to understand how technology interferes with job roles, skill needs, and organizational dynamics. This process allows the creation of a rich, in-depth story representing the participants' experiences. The analysis presents a complete picture of the sector's growth by exploring these individuals' subjective meanings and related perceptions. This interpretive perspective improves research-based knowledge of technological disruption and aids practitioners in adapting. This strategy is essential for connecting academic knowledge to practical application in the telecommunications industry.

This study adopted a phenomenological approach to explore the lived experiences of professionals in Bahrain's telecommunications sector as

they navigated technological disruption. The phenomenological view focuses on understanding and making sense of people's real-life experiences (Neubauer, et al., 2019). Phenomenology focuses on understanding how individuals perceive, interpret, and make sense of their experiences within a specific context. Various research highlights that phenomenological research approaches are beneficial for offering deeper insights into human experiences, bridging the gap between theory and practice, establishing reliable and trustworthy qualitative research, and being relevant across many disciplines (Greening, 2019; Barsoum, 2022).

Applying a phenomenological approach to studying individuals' experiences in the telecommunication industry adds significant value to this research. Focusing on the lived experiences and subjective perspectives of individuals within the industry allows for a deeper understanding of how they perceive and interact with technological advancements in their work environment. Through qualitative methods, namely in-depth interviews and open-ended discussions, the research aims to uncover rich insights into the complexities of job design, the challenges posed by technological disruptions, and the opportunities they present. This study can provide valuable insights based on real-world experiences, giving priority to the opinions of individuals directly engaged in the field to help better grasp the complex dynamics at work in the telecommunications sector and allow for an in-depth exploration of technology's impact on job roles and organizational dynamics, ensuring that the study's findings are grounded in the authentic experiences of industry professionals.

3.3. Research Context

This research is conducted within Bahrain's dynamic telecommunications sector, which has undergone significant

transformation over the past two decades. Initially dominated by the state-owned Batelco, the sector has evolved due to increased competition, regulatory reforms, and substantial government investments to modernize infrastructure (Skills Bahrain, 2023; Avisys, 2023). The introduction of advanced technologies, including 3G, 4G, and the recent rollout of 5G, has enhanced service delivery and connectivity options, reflecting Bahrain's commitment to becoming a regional leader in digital innovation (Global Monitor, 2020; Zain, 2022). The Telecommunications Regulatory Authority (TRA) has played a pivotal role in facilitating this transition, fostering an environment conducive to technological advancements and competitive practices (Mordor Intelligence, 2018).

Aligned with Bahrain's Economic Vision 2030, the telecommunications industry supports broader national goals of sustainability, competitiveness, and equity through initiatives like the Digital Government Strategy 2022, which aims to leverage technology for improved public services (Go-Globe, 2023; IGA, 2023). This sector's growth has been fueled by increasing population demands, higher communication needs, and the widespread adoption of smartphones (Global Monitor, 2020). However, the industry faces challenges, particularly after the COVID-19 pandemic, which disrupted global supply chains and altered consumer behaviors (Rebbeck, 2020) (Taga, Pankert, & Sethi, 2020). In this rapidly evolving environment, the research will examine the interplay between job design and technological disruption, exploring how organizations can adapt to enhance employee engagement and performance amidst these changes. This study intends to contribute to a better understanding of how Bahrain's telecommunications sector can navigate the challenges presented by technological breakthroughs and changing market dynamics while expanding staff resilience and flexibility.

3.4. Data Collection Rationale, Tools, and Procedures

Data for this research was collected from both primary and secondary sources. This section will first outline the secondary sources utilized before moving on to the primary sources.

3.4.1. Secondary Data

The secondary data for this research included industry reports and case studies collected primarily from official company sites, government websites, and validated online sources. To ensure the reliability and intellectual accuracy of the data, an organized search strategy was employed, focusing on reputable sources known for their accuracy and relevance to the telecommunications sector in Bahrain. A document analysis approach was used to examine industry reports, regulatory documents, and corporate publications. This method involved systematically reviewing and cross-referencing secondary data with primary interview findings to ensure triangulation. Cross-referencing data from interviews, documents, and observations, ensured that the conclusions drawn about technological disruption reshaping the telecommunications sector were well-supported and reliable.

Key documents utilized in this study included the Skills Bahrain report published in 2023, which highlighted the skills landscape within the sector, providing essential insights into workforce development needs. The TRA Annual Reports from 2018 to 2023 offered valuable insights into regulatory developments and market performance, shedding light on the evolving regulatory environment. The Zain Annual Report (Zain, 2022) contributed important information on corporate strategies and financial outcomes, enabling a comprehensive understanding of the company's positioning within the market. The TRA's Sixth National Plan Report (TRA, 2023) also outlined strategic priorities for industry growth, emphasizing the

government's vision for enhancing telecommunications infrastructure and services. This comprehensive method of collecting secondary data aimed to ensure that the findings were based on reputable sources, strengthening the study's learning significance and relevance.

The primary research gathered through interviews with telecom professionals was analyzed alongside these secondary sources to identify consistencies, gaps, and real-world applications. For instance, while reports emphasized the need for AI and data analytics skills, interviews revealed whether employees and managers felt adequately prepared or faced challenges in adapting to these changes. This triangulation of data strengthened the research findings, ensuring that conclusions were not solely based on institutional narratives but were also informed by the lived experiences of professionals within the sector.

3.4.2. Participants

The sample for this research consisted of 17 professionals from Bahrain's telecommunications sector, selected through convenience sampling, relying on professional connections and referrals. This approach ensured a diverse representation of roles, experience levels, and expertise. Participants were drawn from various managerial levels, including mid-level managers, technical specialists, and senior executives, providing a comprehensive understanding of how technological disruption influences job roles, required skills, and organizational structures. The sample included professionals with 2 to 25 years of industry experience, ensuring both seasoned insights and fresh perspectives.

The sample for this research was selected to capture a wide range of roles and experiences from 2 to 25 years of telecommunications experience to capture perspectives on the impact of technological disruption on job design in Bahrain's telecommunications sector. By including participants

with varying levels of experience and age groups, the study aims to recognize and track the adjustments triggered by technological changes across different workforce segments. This varied combination guarantees a complete representation of roles and experiences within the industry, enabling an underlying grasp of how technology shapes job duties. Furthermore, this approach helps identify how each participant perceives their role in the industry and the influence of technology on their responsibilities, both currently and in the past. This diversity in the sample experience levels enhances the richness of the data, providing valuable insights into the evolving nature of job design in response to technological advancements.

The sample for this research was deliberately recruited by utilizing professional networks, LinkedIn connections, and referrals to guarantee a varied and inclusive set of interviewees. Participants were presented with a brief overview of the study's objective, highlighting the significance of their perspectives in comprehending the implications of technological disruption on their jobs within Bahrain's telecommunications sector. This method allowed for the participation of employees who voluntarily chose to participate, either on their initiative or through company nominations.

Participants for this study were also selected based on their diverse and extensive experience within the telecommunications sector. Well-known telecommunication companies in Bahrain, such as Batelco, BNET, Zain, STC, Kalam Telecom, NueTel, Beyon, Infonas, Ericsson, and the Telecommunication Regulatory Authority (TRA), were all included. Participants held various positions in their respective companies, including talent acquisition, employee relations, people management, HR specialists, technology managers, research strategists, IT auditors, and experts in strategy and growth, financial reporting, and market intelligence. This selection also included insights from professionals directly involved in the

national telecommunications sector skills survey conducted by “Skills Bahrain” and published in 2023. Moreover, the study benefited from the expertise of industry professionals with over 25 years of experience. Among them were a retired CEO who now manages a telecom consulting firm and a consultancy director who played a crucial role in developing the national telecommunications plan at the Ministry of Transportation and Telecommunications in the Kingdom of Bahrain. This diverse pool of participants ensures a comprehensive understanding of the impact of technological disruption on job design, incorporating perspectives from various roles and levels within the industry and insights from those who have contributed significantly to national telecom strategies.

Table 1 Interview Participants

Interview ID	Specialty	Telecom Exp / Years	Company	Role In Telecom
Interview 1	ICT	6	STC	Technology Audit
Interview 2	Data Science	6	BNET	Market Intelligence
Interview 3	ICT Networking	10	Ericsson	Domain Expert
Interview 4	Accounting & Finance	2	BNET	Financial Planning & Reporting
Interview 5	Business Management	15	BNET	Strategy and growth
Interview 6	Telecom Engineering	25	Batelco	Director (Engineer)
Interview 7	ICT	6	Batelco	IT Dev specialist
Interview 8	Business Management	5	NeuTel & Batelco	HR Management
Interview 9	ICT	9	Kalam Telecom	IP & Networking
Interview 10	Engineering & Management	23	Zain & Batelco	CEO / CTO
Interview 11	ICT	4	Infonas	IT & Cloud Infrastructure
Interview 12	Researcher	13	Skills Bahrain	Associate Director
Interview 13	Business Management	4	Beyon	Customer experience & research strategy
Interview 14	Engineering IT	18	TRA	Tech & Industry digitalization
Interview 15	Business Management	3	TRA	HR Specialist

Interview ID	Specialty	Telecom Exp / Years	Company	Role In Telecom
Interview 16	Business Management	14 years	STC	People & Organization Excellence
Interview 17	Business Management	18 years	Zain	Talent Acquisition & Employee Relations

3.4.3. Ethical Consideration

The study placed great importance on ethical considerations, ensuring privacy and anonymity. The informed consent method was carefully planned to ensure that participants fully understood the research objectives before participating. They received a full document outlining the study's objectives, procedures, questions, and potential outcomes, confirming consent over email and WhatsApp. The participants knew the interviews would be recorded and transcribed on Microsoft Teams. They were informed that only authorized people would access the recordings, and the transcriptions would be carefully edited to protect personal information. Participation was optional, allowing individuals to withdraw at any moment without facing any consequences. To maintain anonymity and confidentiality, interviews were conducted using Microsoft Teams, a secure platform that includes an integrated transcription tool to ensure efficient data acquisition. Identities and other potentially identifiable information were made anonymous throughout transcription. Only individuals with permission could access the encrypted data storage. When presenting the results, identities such as participant in "Interview 1" and participant in "Interview 2" were utilized instead of actual names, as well as including company name and the number of experiences in the industry, (*interview number, company, experience in telecommunications industry*), and any specific personal data was excluded or made broader. These steps maintained the anonymity of participants with diligence and created a positive space for fruitful discussion.

The study aimed to build trust and integrity among participants by carefully adhering to ethical principles and rules of confidentiality. This technique further upheld ethical research standards and helped enhance the credibility and dependability of its findings.

3.4.4. Interview Guide and Question Classification

The interview guide is structured around three key themes to help explore the impact of technological disruption on job design in Bahrain's telecommunications sector. The interview consists of twelve questions to extract detailed participant insights about their roles and experiences in Bahrain's telecommunications sector. The first set of questions aimed to gather a brief description of the participant's role, setting the stage for subsequent inquiries into the effects of technological disruption on job roles. The interview guide is structured and classified around three key themes:

1. **The Role of Technology in Telecommunications:** Questions 1, 2, 3,4, and 10 focus on understanding how technological advancements have reshaped job roles, skills, and organizational structures. This theme explores how technological advancements influence job roles and organizational structures. Questions focus on specific examples of technology that have reshaped the sector, and the evolving skill sets employees need to succeed in this new environment.
2. **Challenges Associated with Technology:** questions 5, 6, 8, and 9 address the obstacles employees and organizations face due to technological changes, including adaptation difficulties, workforce disruptions, and shifts in job satisfaction. This theme of questions addresses the difficulties organizations and employees face when adapting to new technologies. It aims to examine obstacles encountered during technological transitions, such as resistance to

change, the need for retraining, and the necessity for resources and leadership support. Questions also investigate the impact of technology on organizational strategies to facilitate adaptation to evolving job requirements.

3. **Opportunities Presented by Technology:** questions 7, 11, and 12 explore how organizations and employees are leveraging technological changes for growth, skill enhancement, and improved job design. This theme examines technology's potential benefits to the telecommunications sector. Questions seek to understand the long-term implications of technology for job design and workforce management, capturing participants' expectations for future dynamics within the sector.

This classification ensures a structured approach to analyzing responses, aligning them with the study's objectives to understand how technological disruption influences job design, workforce strategies, and industry dynamics.

Overall, this structured yet flexible approach ensures valuable insights into the dynamic interplay between technology and job roles within the sector.

3.5. Data Analysis

3.5.1. Method of Collection

The interviews were conducted online using Microsoft Teams between April 20, 2024, and May 19, 2024. This method enabled smooth communication and fit the study's emphasis on the use of technology in the telecommunications sector. The consent of each participant was obtained through email or WhatsApp before the interviews were recorded, ensuring ethical compliance and transparency. The interviews were 35 to 50 minutes each and were conducted primarily in English, with occasional use of Arabic. The transcription tool integrated into Microsoft Teams was used to

provide precise transcripts of the conversations. This approach facilitated a thorough review of the gathered data, effectively capturing all details and valuable perspectives provided by the participants. The research method was made more efficient and effective using these technical tools, corresponding to the study's core objective.

3.5.2. Sample representation

17 participants (11 male and 6 female) have voluntarily agreed to participate or decided after being nominated by their respective companies. These 17 professionals from Bahrain's telecommunications sector were determined to be representative based on data saturation principles. According to Hennink and Kaiser (2022) in their study on "Sample sizes for saturation in qualitative research", qualitative research can achieve saturation with sample sizes ranging between 9 and 17 participants, irrespective of the approaches used to assess saturations. In this research, repeated patterns, themes, and insights emerged consistently across interviews, indicating that additional data collection would likely yield minimal new information.

The sample included participants from diverse managerial and technical roles across leading telecom organizations such as Batelco, BNET, Zain, STC, and TRA. This ensured a broad representation of expertise, spanning from human resource specialists and strategy managers to technology experts and regulatory professionals. The variation in experience levels, ranging from 2 to 25 years, further enhanced the reliability of insights, capturing perspectives from both experienced and emerging professionals in the industry. The sample consisted of 3 participants from Batelco and 3 from BNET, 2 participants each from Zain, 2 from STC, and 2 the Telecommunications Regulatory Authority (TRA), and 1 participant each from Kalam Telecom, NeuTel & Batelco, Infonias, Ericsson, Beyon, and

Skills Bahrain. This distribution covered a variety of roles, managerial levels, and specializations, providing a well-rounded perspective on workforce adaptation, evolving job roles, and industry strategies in response to emerging technologies.

The combination of achieving data saturation and ensuring diversity in roles, companies, and experience levels supports the representativeness of the 17 interviews in reflecting key workforce dynamics and job design transformations in Bahrain's telecommunications sector.

3.5.3. Analysis procedure

This study employs thematic analysis to fully understand how technological disruption shapes job design in Bahrain's telecommunications sector. Braun and Clarke (2006) assert that thematic analysis offers significant flexibility without compromising reliability (Braun & Clarke, 2006). Thematic analysis is a prevalent and beneficial technique in qualitative research, particularly suitable for examining technical and broad topics like technology. Furthermore, as the study centered on Bahrain's context, Riger and Sigurvinsdottir (2016) underline the need for qualitative techniques like thematic analysis to comprehend the subjective meanings people link to their experiences, which are typically context-specific (Riger & Sigurvinsdottir, 2016). This is particularly relevant in Bahrain's telecoms sector, where industry-particular conditions and experiences must be considered. These qualitative research techniques are utilized to thoroughly understand the implications of technological disruption on job design in Bahrain's telecommunications industry. It employs inductive methods, an exploratory approach that enables obtaining deeper understandings of diverse situations through analyzing information without any existing classifications or ideas (Delve & Limpaecher, 2023). This approach aims

to naturally reveal data patterns and themes, linking findings to participants' experiences and viewpoints. It identifies recurring trends and develops broad predictions through a thorough review of collected data. Unstructured interviews offer the freedom to customize questions, uncovering unexpected yet relevant data and capturing a broad scope of experiences and views. This qualitative approach provides a holistic perspective, considering varied interactions within the larger organizational and sector context.

3.5.3.1. Selection of Thematic analysis

Thematic analysis was selected due to its ability to capture the richness and complexity of participants' experiences, making it well-suited for exploring the degrees of job design changes in response to technological disruption. Unlike quantitative approaches, which may overlook subjective perspectives, thematic analysis allowed for a deep exploration of employees' and managers' lived experiences, organizational strategies, and workforce transformations. Additionally, the flexibility of this method ensured that both anticipated and unexpected themes could emerge organically, allowing for a comprehensive understanding of the phenomenon under study. Furthermore, thematic analysis facilitated the triangulation of findings by enabling comparisons with secondary data sources, reinforcing the validity and reliability of the research conclusions.

One of the key advantages of thematic analysis is its ability to capture rich and detailed insights by providing an in-depth understanding of how individuals experience and interpret technological disruption. It allows researchers to identify patterns and relationships within qualitative data, making it particularly useful for studying complex organizational and social phenomena. Additionally, thematic analysis provided a flexible approach without being confined to a specific theoretical framework.

Unlike highly structured analytical methods, it allowed for an adaptive exploration of themes that emerged organically from participant narratives. Moreover, by not requiring specialized software, thematic analysis ensured a deep engagement with data, during the manual coding and interpreting participants responses.

3.5.3.2. Steps in Thematic Analysis

The analysis of qualitative data in this study followed a multi-phase approach. It began with transcribing 17 interviews conducted with participants. Next, repeated information was highlighted and organized into searchable codes identified as key themes. These themes were then refined to represent the participants' unique experiences distinctly. The analysis followed Braun and Clarke's (2006) six-step framework to ensure a structured and precise process:

1. **Familiarization with Data** – All interview transcripts were reviewed multiple times to gain a deep understanding of participants' responses. Key ideas, phrases, and repeated patterns were noted.
2. **Generating Initial Codes** – Relevant data segments were assigned labels (codes) based on recurring terms and concepts related to job design, technological disruption, and workforce dynamics. Codes were derived both from the interview questions and from emerging patterns in responses.
3. **Searching for Themes** – The codes were grouped into broader themes that captured significant aspects of the research, such as workforce adaptation, leadership strategies, skill development, and job or role change.

4. **Reviewing Themes** – The identified themes were refined by comparing them against the data to ensure consistency and coherence. Some themes were merged, split, or redefined for clarity.
5. **Defining and Naming Themes** – Each theme was clearly defined to capture its significance, with supporting examples from the data. Themes were aligned with the research objectives to ensure relevance.
6. **Writing the Report** – The final step involved integrating the themes into the study's findings and discussion sections, supported by direct quotes from participants to illustrate key points.

Given the study's focus on understanding how technological disruption impacts job design in Bahrain's telecommunications sector, thematic analysis provided a structured yet flexible method for uncovering key themes related to workforce adaptation, leadership strategies, skill development, and job role transformation.

3.5.3.3. Analysis Approach

The analysis of interview data followed a structured qualitative methodology, employing thematic analysis to identify key patterns, concepts, and themes emerging from participant responses. This approach was chosen for its ability to provide in-depth insights into how technological disruption has influenced job design in Bahrain's telecommunications sector.

The data was manually analyzed without the use of software. Instead, a reiterative process was employed, where interview transcripts were reviewed multiple times to identify recurring terms, phrases, and ideas. Initial coding was guided by the research questions, focusing on critical aspects such as skills, strategies, technology tools, and changes in job roles and responsibilities. These codes were then grouped into broader themes that aligned with both the theoretical framework and findings from the literature review.

The key themes that emerged included:

- 1 **Data Management:** The growing reliance on AI-driven decision-making and the restructuring of jobs around data analytics.
- 2 **Lifelong Learning:** The emphasis on continuous upskilling, where organizational training programs exist, but individual initiative remains a driving factor.
- 3 **Workforce Dynamics:** The role of generational shifts, with younger professionals driving adaptability while resistance to change remains a challenge.
- 4 **Strategic Alignment and Leadership:** The importance of agile structures, international benchmarking, and leadership adaptability in fostering competitiveness.

5 **Human-Centered Approaches:** The balance between technology-driven efficiency and employee well-being, promoting engagement and retention.

This manual thematic analysis ensured a deep understanding of participants' experiences, allowing for a nuanced interpretation of how job roles, skill requirements, and organizational structures are evolving in response to technological disruption. By following a systematic coding and theme development process, the study ensured rigorous and credible findings that contribute to both academic discourse and industry practices.

3.6. Summary

This chapter highlighted the significance of the telecommunications sector in Bahrain, emphasizing its critical role in enabling technological advancements across various industries. The sector's importance to this study lies in its dynamic nature, where rapid technological changes influence job design. Job design in this context involves aligning a company's strategy with job roles, responsibilities, and resources and affects employees' relationship with their jobs, job satisfaction, and the overall work culture. The unique interplay between job design and technology within Bahrain's telecommunications sector presents a compelling area for investigation, especially given the sector's evolution and its impact on organizational structures and workforce dynamics.

The chapter also outlined the qualitative research method employed in the study, chosen for its ability to capture rich, detailed insights through unstructured interviews. Participants were carefully selected and recruited based on their experiences and roles within the telecommunications sector, ensuring a comprehensive understanding of the impact of technological disruptions. The process of obtaining informed consent, the use of digital tools for conducting and recording interviews, and measures to protect

participants' confidentiality were thoroughly detailed, underscoring the study's commitment to ethical research practices. This combination of qualitative methods and a focus on the telecommunications sector's technological landscape underscores the study's aim to explore and understand the link between technology and job design in Bahrain.

Chapter Four

Chapter 4: Result and Discussion

4.1. Introduction

This chapter analyzes primary data to investigate the implications of technological disruption on Bahrain's telecommunications sector, which aligns with the research objectives of interpreting the sector's response to these developments. The initial section draws from secondary data from published reports about the telecommunication sector in Bahrain, highlighting significant shifts within the industry and emphasizing its emerging role as a vital enabler for other sectors and the regulatory transformations that have shaped its path. It also addresses the challenges and opportunities associated with integrating new technologies into Bahrain's economic strategy, thereby setting the stage for the subsequent analysis.

The second section derives insights from interviews with 17 participants in the telecommunications sector, providing a comprehensive overview of how technological disruptions have enhanced data management practices, the influence of the personalities of the new generation entering the field, and the critical significance of lifelong learning within the sector. This is ultimately connected to shifting job roles, the essential skills for success, and implications for company operations and leadership within the sector. This exploration directly addresses the research questions:

- How have Bahrain's telecommunications sector organizations responded to recent technological disruption?
- To what extent have job roles and responsibilities been affected by technological disruption in the telecommunications sector in Bahrain?

- What new responsibilities, required skills, and competencies have emerged because of technological disruption in the telecommunications sector in Bahrain?
- How have employees and managers perceived and adapted to technological disruption in Bahrain's telecommunications sector?

This chapter addresses these research questions to analyze the intricate relationship between technological disruption and job design within Bahrain's telecommunications sector. It aims to clarify how emerging technologies reshape companies' operational structures and redefine employees' roles and responsibilities. By exploring the challenges and opportunities arising from technological disruption, the chapter reveals how the sector adapts to these changes and the implications for workforce development and management practices.

This section will analyze and describe the findings derived from secondary data collected on the telecommunications sector in the Kingdom of Bahrain, thereby establishing the context before delving into the responses obtained from participants in the primary data analysis.

4.2. Milestones in Bahrain's Telecommunications Sector

Over the past two decades, Bahrain's telecommunications industry has seen remarkable transformations. Initially dominated by the government-owned BATELCO, which offered limited services, the sector experienced a significant shift in the early 2000s. Increased competition and the introduction of mobile and internet services were pivotal. Government policies in the mid-2000s encouraged investment and modernized infrastructure, introducing technologies like 3G and broadband. The late 2000s and 2010s saw the arrival of 4G/LTE services, underscoring the industry's commitment to digital innovation. Today, Bahrain continues to attract investment in digital infrastructure, diversify services, and adopt

advanced technologies such as 5G, IoT, and cloud services, reflecting a transition from a monopolistic to a competitive market environment driven by regulatory changes, technological advancements, and rising demand for digital connectivity (Skills Bahrain, 2023; Avisys, 2023). The sector's growth has been boosted by the increase in the population, higher communication demands, and widespread smartphone use (Global Monitor, 2020). Through the Telecommunications Regulatory Authority (TRA), the government has positioned Bahrain as a leader in technological, consumer, and regulatory reforms (Mordor Intelligence, 2018). The GCC region's telecommunications sector is characterized by high mobile coverage and value-added services driven by high connectivity and content offerings (Oxford Business Group, 2015). Bahrain was the first Gulf nation to liberalize its telecommunications sector, leading to economic evolution. Its solid infrastructure and continuous improvement of government services through innovative technology and AI have paved its position as a regional ICT leader (IGA, 2023; EDB, 2022; TRA, 2023).

4.2.1. Key Technologies in Bahrain's Telecommunication Sector

Digital transformation is central to Bahrain's Economic Vision 2030, which aims to achieve sustainability, competitiveness, and equity. The Digital Government Strategy 2022 underscores the commitment to leveraging advanced technology to improve citizens' services and lives. Bahrain leads the GCC in setting IoT connectivity standards and supporting the International Telecommunication Union's plan to standardize IMT bandwidth for IoT applications. The Information & eGovernment Authority (iGA) has allocated frequency bands to government agencies, aligning with Vision 2030 for smart cities and IoT (IGA, 2023). Bahrain's telecommunications industry has embraced significant technologies such as 5G, which offers low latency, ultra-fast speeds, and high bandwidth.

Edge computing is gaining traction, moving data processing closer to the network edge for quicker response times. The IoT is crucial for advancements in autonomous vehicles and industrial applications. Additionally, AI is transforming telecommunications through network automation and machine learning. Cloud services, VR, and AR are being utilized to enhance digital services and the customer experience. These technologies collectively drive expansion, efficiency, and innovation in Bahrain's telecommunications sector (Skills Bahrain, 2023; Zain, 2022; iGA (information & eGovernment Authority), 2022).

4.2.2. Regulatory Changes and Emergence of Telecom Companies

In Bahrain, the telecommunications sector is regulated primarily by government-owned monopolies, while other markets exhibit varying levels of competition and independent regulation (Cambini, Ezzat, & Staropoli, 2017). The transition from natural monopolies to competitive models, facilitated by critical technologies, has positioned ICT as a crucial driver of economic growth. The network-based infrastructure supports service-based competition and accelerates returns on investment, significantly impacting market operations and regulatory enforcement. These advancements have contributed to the overall growth of the telecommunications sector in the MENA region, underscoring the importance of innovative concepts and robust infrastructure (TRA, 2018).

Aligned with its Economic Vision 2030, Bahrain is enhancing its telecommunications sector to drive digital transformation across government services, healthcare, commerce, and banking (Go-Globe, 2023). Major telecommunications companies like Batelco, STC Bahrain, and Zain Bahrain receive substantial support from government and regulatory bodies to improve their services and infrastructure. This backing

has facilitated widespread 5G service accessibility since its launch in 2020. Additionally, BNET, the national broadband network operator, was separated financially from Batelco in 2021 to serve as an impartial wholesale access provider. The Fourth National Telecommunications Plan, initiated in 2016, focuses on expanding fiber-optic infrastructure and ensuring affordable high-speed internet services (Mills, 2024).

4.2.3. Enabling Businesses through Connectivity and IoT

According to the Bahrain telecommunications sector skills report and IGA publications, the telecommunications sector significantly supports other industries through enhanced connectivity and IoT technology. The sector's shift from a government monopoly to a competitive market has facilitated the adoption of advanced technologies like 3G, 4G/LTE, and 5G, providing high-speed internet crucial for healthcare, education, and financial sectors. The government's proactive investment in digital infrastructure and supportive regulatory frameworks have promoted IoT integration, driving smart city initiatives, innovative manufacturing, and improved service delivery. This connection enhances the national economy, accelerates technological innovation, and improves operational capabilities across various industries in Bahrain, demonstrating the sector's pivotal role in national growth and development (Skills Bahrain, 2023; IGA, 2023).

4.2.4. Recent Changes Affecting Telecommunications

The COVID-19 pandemic has significantly impacted global supply chains, manufacturing processes, and the telecommunications industry (Rebbeck, 2020). This disruption complicated the manufacture of mobile devices, the acquisition of network operator equipment, and infrastructure upgrades (Taga & Pankert, 2020). Concurrently, internet usage surged as people relied more on it for work, education, socializing, and entertainment

(Heponiemi, et al., 2024). These changes prompted the telecommunications industry to reassess long-term forecasts and adapt to new challenges. Governments and telecom companies have implemented subsidy schemes and advocated for telehealth and tele-education solutions (De Rosbo, 2024). These efforts highlight the sector's dynamic nature and continuous evolution in response to technological advancements and global challenges.

The following section will present an in-depth analysis of the primary data collection, focusing on insights gathered through 17 interviews conducted with professionals in Bahrain's telecommunications sector. This analysis aims to capture firsthand experiences and perspectives on how technological disruption has influenced job roles, skill requirements, and organizational strategies within the industry.

From the above data extracted from reports, it is evident that the transformation of Bahrain's telecommunications sector from a government-controlled monopoly to a competitive, technology-driven industry has significantly influenced workforce dynamics, skill demands, and organizational structures. The liberalization of the market and the introduction of advanced technologies have not only enhanced connectivity but also reshaped job roles, requiring employees to develop expertise in emerging fields like data analytics, cybersecurity, and cloud computing. As digital infrastructure expanded, companies adapted by restructuring job functions, shifting from traditional roles to more specialized positions in AI-driven automation, IoT deployment, and network security. Furthermore, regulatory frameworks set by the Telecommunications Regulatory Authority (TRA) have played a pivotal role in fostering a competitive labor market, compelling organizations to prioritize continuous learning and upskilling initiatives to align with global ICT standards. This evolution underscores the sector's transition towards

agile workforce strategies, where adaptability, lifelong learning, and cross-functional expertise are essential for sustaining competitiveness in an increasingly digital landscape.

4.3. Findings and Analysis

The 17 interviews conducted for this research provided valuable insights into the implications of technological disruption within the telecommunications industry, aligning closely with the study's objective of exploring the many-sided effects of this phenomenon. The findings identified several key factors contributing to changes in various aspects of work within the sector, with technology emerging as a critical driver. Additionally, the interviews shed light on disruptions stemming from generational shifts, evolving personality traits, and mindsets, all influencing adaptability, work processes, and the intensity of technological integration in daily operations.

4.3.1. Addressing the Research Questions

This research aimed to explore the impact of technological disruption on job design within Bahrain's telecommunications sector. Through a combination of primary data from qualitative interviews and secondary data from industry reports and strategic documents, the study identified key trends and responses shaping the sector. The findings provide comprehensive answers to the research questions, revealing how organizations, job roles, skills, and perceptions have evolved in response to rapid technological advancements.

1. How have Bahrain's telecommunications sector organizations responded to recent technological disruption?

The findings indicate that organizations have actively embraced emerging technologies such as AI, IoT, 5G, and cloud computing to

enhance operational efficiency. Structural changes have been implemented, including flatter hierarchies, increased outsourcing, and agile teams to adapt to dynamic technological advancements. Additionally, strategic alignment with Bahrain's Economic Vision 2030 and regulatory contributions from TRA have played a crucial role in ensuring a competitive and innovative telecom sector. Workforce strategies, such as training programs and initiatives to foster lifelong learning, have also been central to equipping employees with the necessary skills to navigate disruption.

2. To what extent have job roles and responsibilities been affected by technological disruption in the telecommunications sector in Bahrain?

The study revealed that jobs within the sector have undergone significant transformation due to technological advancements. Traditional roles have been redefined, with the emergence of new positions such as data governance officers and cybersecurity experts. Skills realignment has become essential, with an increasing emphasis on data analytics, AI, and digital transformation competencies. Furthermore, many technical roles have been outsourced, leading to a shift in in-house responsibilities that now focus on managing and integrating advanced technologies rather than performing routine technical tasks.

3. What new responsibilities, required skills, and competencies have emerged because of technological disruption in the telecommunications sector in Bahrain?

Technological disruption has led to a demand for advanced digital skills, particularly in areas such as cybersecurity, cloud computing, AI applications, and data management. Employees are now required to

possess analytical and problem-solving abilities to interpret complex technological changes effectively. Soft skills, including adaptability, innovation, and digital leadership, have also gained importance in ensuring smooth transitions to new technological landscapes. These findings align with industry reports highlighting the necessity of continuous reskilling and upskilling to maintain workforce competitiveness.

4. How have employees and managers perceived and adapted to technological disruption in Bahrain's telecommunications sector?

The study found that while many employees and managers acknowledge the benefits of technology-driven efficiency, they also recognize challenges such as job displacement and resistance to change. The ability to adapt has largely depended on both organizational support and individual mindset. Managers have played a critical role in guiding workforce adaptation by fostering an innovation-driven culture and promoting learning opportunities. Employees who have proactively engaged in continuous learning and skill development have found it easier to transition into new roles, whereas those resistant to change have faced greater difficulties.

The answers to these research questions offer a high-level overview of how technological disruption has influenced job design in Bahrain's telecom sector. To provide a deeper understanding, the following sections present an in-depth analysis of the main themes identified in the primary data. These themes include data management practices and resources, generational traits and workforce mindsets, the widespread adoption of lifelong learning, and the impact of global trends on business strategies, leadership, and workplace cultures. By incorporating direct extracts and

quotes from interview participants, the discussion further illustrates the realities of technological transformation within the sector, offering a more nuanced perspective on how organizations and individuals are adapting to change.

4.3.2. Data Management in Bahrain's Telecom Sector

Insights collected from interviews in this research on technology and job design in the telecommunications sector in Bahrain reveal that technology plays a crucial role in enabling data-driven practices, transforming how telecommunication firms operate and make decisions. 15 of 17 interviewees highlighted data, analytics, and intelligence management, showcasing significant organizational strategies, roles, outsourcing practices, company structures, and business decision-making changes. The advent of big data and advanced data management techniques in telecommunications has introduced numerous changes, challenges, and opportunities. As one participant stated, "*Data is our real goal. We need to make decisions based on the data; we are building our portfolio based on the data. If we don't have the right data in place, we cannot make the right decisions*" (Interview 1, STC, 6 years).

The outcomes of interviews that underline the role of technology and the massive amount of data it offers can be viewed via three lenses: Technology resources, Human resources (employee roles, skills, and competencies), and financial resources.

4.3.2.1. Data Management and Technology Resources

From a technological perspective, participants emphasized the need for robust data management systems focused on data regulation, security control, data privacy, and storage. The participant in interview 14 noted, "*We are now in a phase where economies are shifting to an intelligence-based economy*" (interview 14, TRA, 18 years). This rapid influx of data

necessitates advanced technological solutions to ensure data is handled securely and efficiently. Another interviewee stated, *"Telecommunication is not just mobile and landlines; it's mainly data... we rely on data only because everyone can speak to each other using data"* (Interview 11, Infonias, 4 years). Managing this data requires significant architectural changes, impacting jobs and necessitating new technology. A participant explained, *"The calls go through data instead of the circuit-switched networks, which requires a whole architecture change... that means changing all the devices or equipment we work with starting from scratch"* (Interview 3, Ericsson, 10 years). So, the integration of new tools and technologies proves to be critical for maintaining data integrity and confidentiality; *"We have introduced a new data governance program... and there has been a significant security strategy shift because of these digital disruptions,"* said a participant from (Interview 1, STC, 6 years). The same participant emphasized the need for constant updates to security protocols, *"We had to align our security tools based on the new technologies"*. He also mention the need to introduce new tools because of *"security flaws"* associated with AI and generative intelligence and the challenge of the huge *"data that is being compressed"* and stored in the servers. Furthermore, this statement confirms the insights of another interviewee regarding technology and data storage as he highlights that physical constraints bind our existence, and to achieve faster speeds and greater bandwidth, we must allocate more space for the transfer of waves. Therefore, it is necessary to provide additional storage capacity to accommodate the new technology, *"we live in a physical world where there is a physical limitation for things, so if we want higher speeds, more bandwidth ... we need more space for the waves. So now you need to free some space so you may put in the new technology"* (Interview 3, Ericsson, 10 years). Adding to that, the volume of data has introduced new tasks,

including *"data classification, categorizing information based on sensitivity... in addition to asset evaluation and disposal"* (Interview 1, STC , 6 years)). So, companies must ensure they have *"the right set of tools"* to handle these tasks effectively. Addressing data management from a regulatory standpoint will guarantee both security and data privacy. As one participant pointed out, *"In terms of data and adoption, we're in a green stage... there will be a spike."* She added, *"The 6th National Telecommunication Plan highlights the importance of AI and IoT, which is a national direction. So, there will be a regulatory framework for artificial intelligence and the telecom sector on the home data center regulatory framework"* (Interview 5, BNET, 15 years).

4.3.2.2. Data Management and Human Resources

When examining data management from the human resources standpoint, interviews offered insights into how a surge of data affects changes in job responsibilities, the need for skill development, and training requirements. These insights underscore the necessity of equipping the workforce with data analysis skills and fostering a data-driven mindset to meet industry demands. According to interview 16, the participant stressed the importance of understanding the meaning indicated by the data and how to combine different elements to create an overall narrative before making decisions, *" I am actually looking at a huge amount of data as a director of HR, I can't make a decision until and unless I understand what this data is trying to tell me and how to bring different components of this data together to create the story"* (interview 16, STC, 14 years).

The evolution of data management has underscored the necessity for a workforce equipped with data analysis skills. The industry now demands professionals with a data-driven mindset to navigate the complexities introduced by technological advancements. A participant describes how

staff have actively addressed the demanding technical environment. She noted, *"I've seen the team pay a lot of attention to advancing their skills, not only because of their personal intentions but also because of the company's needs."* (Interview 13, Beyon, 4 years). Then again, a participant observed, *"The market needs data analysts and data scientists"* (Interview 12, Skills Bahrain, 13 years). This corresponds with another participant's experience of how her role was transformed by technology: *"My job has shifted from secondary research to primary research-focused due to data"* (Interview 13, Beyon, 4 years). Now, employees must be capable of collecting, interpreting, leveraging, and utilizing data intelligence to drive business decisions. As an interviewee indicated, *"Data analyst can be a marketer, can be financial, can be accountant, all of that because with technology we can manage all of these"* (Interview 2, BNET, 6 years). The same interviewee, who has pursued postgraduate education in data science, shared *"Telecom is the main generator of the data, and my employer needed to ensure that we can handle big data, analyze it, benefit from it, and sell it"*. The interviewee explained that in her six years' experience in telecommunications, her role developed to find ways to use *"machine learning... predict or forecast what will happen, how to use the next chatbots, how to respond, how to enhance, how to serve customers efficiently and effectively"* (Interview 2, BNET, 6 years). In another interview, a senior human resources telecom professional outlined the precise need for employees with skills needed to deal with data, *"this skill set is important because a lot of data flows on these platforms ... a lot of facts and figures are exchanged."*, indicating the need for employees who *"understand analytics and how to capture data, look at data, and interpret data. On top of it sits some of the business intelligence platforms, Power BI, how to represent data"* (Interview 16, STC, 14 years). Moreover, during Interview 7, the participant stresses the need for analytical skills to work in

a data-driven work environment: *“Hard skills will benefit me for the short term; what will stay with me for the long term is my analytical skills”*. She further talks about how these skills go beyond the roles and job description and explains how analytical skills are about *“noticing and creating patterns; it’s not about the job description.”*. Additionally, she emphasized the significance of data and the utilization of technology to leverage data for improving customer experience: *“We have a vast amount of data. We know user usage. We just need to utilize AI tools to do a little bit of analysis, and the client's experience is enhanced and customized”* (Interview 7, Batelco, 6 years).

Another interviewee working in financial reporting indicated that with technology managing data, it is now expected that *“there would be another utilization of the staff's capability in interpreting the numbers, making meaning out of them and strategizing”* (Interview 4, BNET, 2 years). The discussion further highlighted the importance of data analytics skills; she explains the *“need for people who are more in data analytics, more analyzing data rather than inputting data and looking at the meaning.”* This perspective was echoed by both participants in Interview 8 and interview 10, who confirmed the need for staff with *“more data analysis”* skills and the ability to *“shift from an admin mindset”* and that employees should not be doers only and be more analytical (Interview 8, NeuTel & Batelco, 5 years), *“we don't want doers. We want people to think, we want thinkers and problem solvers”* (interview 10, Zain & Batelco, 23 years).

Another significant concept highlighted by the interviewees is the change in consumers' behavior. According to the Skills Bahrain study and interviewee 12, consumers' behavior influences how things operate and impacts employers' perspectives. The interviewee observes that the age group of consumers and their demands for services are transforming. She

noted that customers are now more knowledgeable, well-informed, and have easy access to all relevant information, *“the way the consumer is behaving is changing the way things are working, and they're changing the perspective of employers as well...the customer is aware, very well read and has access to all information as it is all there available”* (interview 12, Skills Bahrain, 13 years). This is consistent with the perspective of another interviewee, who emphasized that customers have become more analytical and inquisitive, seeking information and questioning. They possess a clear understanding of their needs, which logically entails the presence of well-prepared staff with both technical and analytical abilities. The interviewee stated that the work has not only undergone a change in its minor duties, but also the customer's expectations for additional services alongside the leading service have changed, *“They know what they want, ...So not only has the job changed its small task, but also the requirements from the customer side for the add-on services over the main service have changed”* (Interview 9, Kalam Telecom, 9 years). In another example, a market researcher working as a telecom operator in Bahrain discussed the change of skills and how the required abilities for a business researcher role have changed because of advances in technology and the growing need for data management. The interviewee explained that the need to handle data has influenced her set of skills, *“It completely shifted my skills from writing surveys based on our intention, what we feel is right, to writing or designing surveys based on what we can see from the data”* (Interview 13, Batelco, 4 years). In interview 2, the participant recounted her experience of switching to her position responsibilities over six years in the sector, shifting from business to technology due to Data impacting strategic changes within the company: *“From product manager, with a business background, I am suddenly handling big data.”* The interviewee explained how her core tasks and responsibilities in the job shifted due to technology

tools: *"Two years back, we started automating... So, less operation is being involved... I have more time to think, to brainstorm, to communicate, to socialize... now it is more efficient than before. What used to take 2 to 3 hours to develop, now I generate it in 10 minutes"* (Interview 2, BNET, 6 years).

To make the most of technological advances, it becomes essential for telecom companies to invest heavily in educating and training the workforce. A participant exemplified how companies take the initiative to invest in data by educating and preparing the workforce: *"Our company believes that technology is a skill that needs to be mastered at every level"* (Interview 13, Beyon, 4 years). An example was also shared in interview 2, who describes how the telecom companies they work in continue to invest in enriching data analysis skills in the workforce; the participant indicates, *"Our organization first hired two analysts and also sent four of our employees to study for a master's in big data analytics. The year after that, they sent another four, and this year, they are still sending people every year just to study for a master's in big data analytics"* (Interview 2, BNET, 6 years). This ongoing commitment to training and investing in the education of human capital in data sciences and managing intelligence in telecommunication underscores the importance of investing in the workforce to stay competitive in the sector.

4.3.2.3. Data Management and Financial Resources

On the other hand, the financial aspect of data management highlights the significant monetary investments required to support the infrastructure for securely and efficiently handling big data. The financial implications of managing vast amounts of data exert significant pressure on companies to allocate substantial budgets. One participant noted, *"There is a lot of reliance on vendors these days... in terms of technology, deployment,*

support, security, and data" (Interview 1, STC, 6 years). This reliance on third parties necessitates having the right technology to secure information, which incurs enormous costs with *"contracts worth millions"* and pressures management to continue assessing ways to utilize resources effectively. Outsourcing tasks, services, and staff is a strategy most telecom companies use to reduce ongoing costs. A participant in Interview 10, who spent 23 years in telecom, stated, *"Our strategy was at the technology area that we should always outsource the complex job. We always outsource the complex jobs which takes a lot of time from us."* In contrast, another in interview 6, 25 years in telecom, confirmed that due to technology, telecommunication companies started a trend of *"outsourcing of staff. They would either acquire outsourced staff on a contract basis, so not anymore permanent jobs because they want to lower the cost and lower the commitments on the organization,"* in addition to *"outsourcing of services, service provision or subcontracting."* Moreover, the same interviewee also highlights the cost pressure on management that heavily impacts taking new risks, specifically with *"value-added services"* and a quote shared from a management response to allocating budget for new technology saying, *"you can do anything if you have the money. You need changing hardware... adding some software..."* (interview, Batelco, 25 years). This emphasizes the financial strain management consistently experiences while addressing the rapid technological advancements necessary for business operations in the sector.

The participant in interview 16 also highlighted the significant cost implications of data management, emphasizing the necessity for substantial financial investment, *"A lot of investment in tools, technology, and people"* is required to handle data effectively. Investments in *"data servers, AI tools, and data centers"* are indispensable for managing and

analyzing the vast amounts of data generated within the telecommunications sector. Another participant added, "*We are investing heavily in technology and data management tools*" (Interview 1, STC, 6 years), which includes implementing advanced data analytics platforms and upskilling staff to interpret and leverage the data. As described by a participant in Interview 16 described, "*These all-need platforms, and they all need investment. We face a lot of challenges in investing in these, as they are very cost-intensive programs and platforms.*" This financial strain underscores the need for strategic financial planning to support data management initiatives effectively.

4.3.3. Generational Traits and Adaptability in Bahrain's Telecom Sector

The interviews revealed the theme of personality and generational differences in adapting to technological disruption, which highlights critical insights relevant to the impact of technology on job design in the telecommunications sector. The findings showed several critical insights, particularly emphasizing the significance of new generations, age, personality, and mindset in adapting to technological changes. 13 out of 17 interviews have underlined the noticeable impact of new generations entering the workforce, remarking how their fresh perspectives and skills drive innovation and adaptability within the sector. For example, in interview 2, a market intelligence manager with six years' experience shared how her company embraced a new generation approach: "*We were the young people ... fresh blood ... we don't mind trying things because we do not have anything to hold back to... our company started adopting a new generation approach and pushed us to come up with new ideas ... they gave us freedom and empowerment*" (Interview 2, BNET, 6 years). This personal experience underscores how integrating younger employees can catalyze a

cultural shift towards improvement and flexibility. Skills Bahrain researcher also reinforced this point by stating that generational trends significantly impact skills in the telecommunications sector. In interview 12, the participant was a researcher who was directly involved in the Skills Bahrain telecommunications survey. She noted that “*Generations are one of the influences that are impacting the way we all work*” (Interview 12, Skills Bahrain, 13 years), indicating that younger generations are more accepting of change, which is critical for technological adaptation. This perspective is supported by a “Domain expert” who worked in the telecom sector for ten years and emphasized the need to break the ice with new generations: “*We need to put more effort into breaking the ice with new gen ... every generation comes with their behavior and set of skills ... the key here is mindset and personality.*”(Interview 3, Ericsson, 10 years). These insights illustrate how the integration of younger employees drives a cultural shift toward innovation and openness to change within the sector. The younger generation's willingness to embrace new ideas and adapt to evolving technologies significantly influences work culture, as companies recognize the importance of fostering an environment that encourages fresh perspectives.

4.3.3.1. Composition of the Workforce

One conclusion from the Skills Bahrain telecommunications report is that the sector has evolved beyond communication and telephonic usage and transformed into a technology sector (Skills Bahrain, 2023). This reality is also evident in the composition of the workforce, its generation trends, and the outcomes of individual employees. In interview four, a Finance and accounting employee highlighted the rapid adaptability of younger individuals in technology-driven environments: “*I think the younger generation is more likely to use technology and prefers the use of AI to solve their problems because they see the benefits of it... they grew*

up with it” (Interview 4, BNET, 2 years). Moreover, the same idea was confirmed in interview 8, as the interviewee worked in an HR capacity in 2 different companies in the telecom sector. He emphasized that having a high-tech environment that matches the new generation is vital: *“They will not be able to adapt to an environment that is very backdated”* (Interview 8, NueTel, five years). This viewpoint is echoed in interview 6; the interviewee was a telecom engineer with 25 years in telecom, who noted the shift towards a younger workforce that prioritizes task-oriented skills: *“The new generation is more in terms of employability in the telecom sector... the ability to comprehend, understand, self-learn ...”*. The same interviewee also recognized that since the sector was driven by technology, the younger generation *“became driving forces in the telecom sector since it depended a lot on new technology capabilities and not the complexity that was bearing before with the experienced older generation”* (Interview 6, Batelco, 25 years). These insights emphasize the new generation's comfort with technology and AI, which positions them as vital contributors to the rapidly evolving telecom sector. This adaptability is a central theme in understanding how technological disruption reshaping requirements for jobs in the telecommunications sector, as younger workers are increasingly seen as *“driving forces”* due to their ability to learn and apply new technologies quickly.

4.3.3.2. Mindset and Adaptability

The significance of personality, mentality, adaptability, and intergenerational diversity in technology adoption is considered vital. The interviews revealed that personality and mindset sometimes override age when it comes to technological adaptation. IP and networking expert in interview 9 stated, *“Different age groups mean different mindsets and the love of technology will gather them all in one room”* (Interview 9, Kalaam Telecom, 9 years). This sentiment is echoed by the participant in interview

5, who works in strategy and growth capacity and notes the positive impact of mixed-age teams: *“The younger generation picks it up faster ..., the older generation learns from the younger generation ... the impact is good”* (Interview 5, BNET, 15 years). Additionally, in interview 7, an IT development professional emphasized the benefits of generational diversity and its relation to technological disruptions: *“It is good to mix generations in one place, and it can help with adapting to the technology... the new generation, with their new perspectives and fresh mindsets, are more energetic and more open to new things”* (Interview 7, Batelco, six years). This perspective was supported by a participant working in customer experience and research capacity who noted the positivity of injecting new and fresh mindsets into the workforce, particularly after COVID-19: *“The entrance of new people has helped change the mindset faster”* (Interview 13, Beyon, 4 years). This reveals the need for a diverse workforce that combines the experience and stability of older employees with the innovation and agility of younger ones in dealing with technology disruptions in the workplace.

Moreover, an interviewee provided an insightful viewpoint on the role of mindset in adapting to new technologies: *“It is not about the age; it's more about the mindset... the attitude ... the important ability I want are personal, motivation, and attitude”* (Interview 9, Kalam telecom, 9 years). This sentiment reflects a broader recognition within the industry that mental frameworks, rather than age, are crucial in navigating technological advancements. This indicates that an individual's willingness to engage with new technologies and their proactive attitude could be more significant determinants of adaptability than age alone. This exciting view was also highlighted by another interviewee who compared two employees in the same context: *“...the younger one is very flexible and interested in new things, while the older one needs to be encouraged to work on new*

things”(Interview 14, TRA, 18 years). The interviewee described it as *"fantastic,"* underlining the advantages of a work environment that embraces all generations and personalities, leading to a culture that promotes learning and change.

An intriguing viewpoint on personality and mindset was also emphasized with respect to duties and responsibilities, considering that younger employees no longer conform strictly to job descriptions. An interviewee stated that individuals can exceed the expectations of their job description if they possess a strong passion and interest in their work *“A person can do much beyond the job description if he has the passion and interest for it”* (Interview 7, Batelco, 6 years). This viewpoint was further supported in the Skills Bahrain Research and emphasized in interview 12, where the participant expressed that employers in telecom no longer adhere to definite job descriptions. This is because the nature of jobs has undergone transformation, and the tasks required today are subject to change based on the influence of technological advancements and market trends. Consequently, employers no longer provide detailed job descriptions as they did in the past: *“employer's do not stick to a very detailed job description because the nature of jobs had encounter transformation and tasks required today are changing compared to yesterday based on the impact of technology trends or market trends”* (Interview 12, Skills Bahrain, 13 years). Also, in interview 10, a retired CEO now running a telecommunications consultancy emphasized the importance of personality and mindset in the sector: *“With the mindsets, skills, and abilities, it is easier for them to take technology to the next level.”* The interviewee also highlighted the necessity of injecting fresh employees into organizations: *“We always need to have new blood in the organization... they are going to teach us as well because they are the new generation”* (Interview 10, Zain & Batelco, 23 years).

4.3.4. Lifelong Learning in Bahrain's Telecom Sector

The third theme emphasizes lifelong learning, continuous skill development, and the proactive efforts of both individuals and organizations in the telecommunications industry to adapt to technological changes. Most participants (14 out of 17) reflect the ongoing commitment to personal growth, foundational learning, and the industry's role in driving professional development. For example, a participant with six years of telecom experience highlighted the necessity for ongoing certifications and learning to remain relevant amidst rapid technological changes: *"I have to take up certifications... I have to learn more so that I can be the right fit for my company to help them, to support them"*(Interview 1, STC, 6 years). The participant further emphasized that a company cannot expect great results *"If they're hiring somebody five years back and expect to work in the same way!!"* indicating the essential nature of continuous skill development, as one *"would have to scale up continuously"* to cope with the overwhelming changes in the sector due to technology, *"because of the technology disruptions, we don't have the right capacity and we need a lot of requirements"*. This statement is in line with insights provided in interview 11, affirming that an employee has to self-respond to technology changes to stay relevant, *"If any technology is coming, you should adapt to it as an employee, if you lag behind it means that you are outdated"* (Interview 11, Infonas, 4 years).

The notion of growth, an evolving mindset, and the ability to adapt to disruption have become embedded in many industries. However, it is especially evident and prominent in the telecommunications sector. This was indicated in an interview with a researcher who actively participated in the telecommunication skills report and emphasized the significance of adaptability in the telecom sector. The participants highlighted the need to

quickly adjust to constant changes, such as new circumstances, working environments (e.g., remote work), and sudden shifts in strategy. According to the participant, not everyone is willing or accepts to adapt to these changes. While some individuals may resist change, in this context, they need to possess resilience in the face of change.

“When it comes to the core skills, it’s important across all sectors, but what we found in telecom is the need to be able to adapt to these constant changes; adaptability skill is very important to be able to adapt to new circumstances, new working environment, working from home for example, remotely, changes in the strategy overnight, one has to be able to adapt to that change immediately, and this acceptance or willingness is not in everyone. Others may resist change, but here, they must be resilient to change, and must be adaptable as well.” (interview 12, Skills Bahrain, 13 years).

4.3.4.1. Organizational Support and Professional Development

Interview insights further underscore the significance of organizational support, particularly telecom companies' efforts in providing learning resources and fostering employee self-improvement. In Interview 1, the participant highlighted the company's dedication to staying informed about market trends, stating, *"Our training and development team has always been on top"* (Interview 1, STC, 6 years). Similarly, the participant from Interview 2 remarked, *"We always will enter a course and will get to know one more piece of information ... So, we need to continue to train and learn,"* emphasizing the necessity of continuous education. Reinforcing this point, the participant from Interview 3 noted, *"In the telecom industry, we are in a race, either that you learn the upcoming technology, or you will be someone from the past."* This statement highlights the importance of leveraging available learning resources and maintaining a lifelong learning mindset to navigate technological changes effectively: *"How we take learning, how we perceive learning, the flexibility, the agility, a continuous*

learning mindset... coping and moving along with the change needs the learning mindset." Additionally, he emphasized that while companies play a role, there is a crucial need for self-driven learning: *"It is all about the employee who should take the opportunity or push himself or herself to learn."*(Interview 3, Ericsson, 10 years).

The interviews also reveal that telecommunication companies in Bahrain emphasize professional development and make learning resources readily accessible, strategically pushing for skilling, upskilling, and reskilling employees. One participant mentioned, *"They always give you the chance to take a new course"* (interview 9, Kalam Telecom, 9 years). An interviewee from human capital development noted, *"We started with LinkedIn Learning, one platform that the organization relies heavily on for training for all employees"* (interview 17, Zain, 18 years), underscoring the investment in continuous learning tools to ensure that employees are equipped to handle new technologies. Furthermore, a participant pointed out that learning is an ongoing process in the sector, emphasizing that *"you do not learn during implementations."* of new initiatives; employees must continuously acquire new knowledge so that *"once the implementation comes with the new technology, this is the time they will stop learning and start testing"*(Interview 3, Ericsson, 10 years). In the same learning context, the participant in interview 5 describes how learning progresses in phases, like a child's development. She stated, *"Workers are like young children; you slowly equip them, skill them ... upskill them to reach that certain maturity for them to adopt, for them to innovate, for them to reach that potential."* highlighting the necessity of gradual skill development. Moreover, the same interviewee emphasized that effective learning must be self-driven and not solely dependent on management initiatives: *"An*

important issue for staff in telecom is to have the ability for self-learning ... and self-develop ”(interview 5, BNET, 15 years).

As technology disrupts traditional job roles, the integration of continuous learning becomes essential. Participant in interview 7 shared that ongoing learning significantly impacted her six years of experience in the telecommunications industry. The participant remarked, *“I learned a lot, and that shaped my personality. It sharpened it, sharpened my skills further.”* This underscores the industry's need for individuals committed to continuous learning and self-improvement. A further elaboration from the same participant emphasizes that the industry requires employees who are *“interested to learn,”* supported by a work culture that fosters and encourages such growth. The participant added, *“The culture empowers you to do things and gives you the ground to actually be creative and do new things best”* (Interview 7, Batelco, 6 years). Additionally, Participant in interview 13 reflected on how learning new technology enhanced her role in business research strategy in the telecom sector, noting that it involves *“exploring new ways to get insights.”* She highlighted the dynamic nature of technology, which can render current skills obsolete: *“Your skills may disappear when you introduce new technology. You must learn new ways to visualize, to interpret, to put more effort”*. The COVID-19 pandemic was an example of change shared during the same interview, indicating how it has *“forced everyone to become tech-savvy and to continue running that business at the time, it closed the gap between those who resist technology and those who really admire it,”*(interview 13, Beyon, 4 years). This emphasizes the importance of adaptability and the continuous acquisition of new skills to stay relevant in an ever-evolving technological landscape. The ability to embrace change and proactively seek new learning opportunities is crucial for telecom professionals.

Change is unavoidable in the telecommunications business, as interviews have revealed. As an illustration, an interviewee states that not engaging in learning within such an environment ultimately results in becoming extinct, like “dinosaurs”. The participant stressed the importance of adapting to change implying that employees resisting changes will become outdated. Therefore, it is vital for individuals to demonstrate adaptability and open-mindedness continually, *"It stems from within ... Any person who will not adapt to the change will be finished like dinosaurs ...they will be a legacy"* (interview 10, Zain & Batelco, 23 years).

4.3.4.2. Education Institutes and Foundational Learning

The role of educational institutions in foundational learning has also emerged in the interviews as critical in shaping the future workforce of the telecommunications sector, especially in the context of lifelong learning and technological disruption. Participant in interview 10, with 23 years of experience in key roles in telecom, emphasized the critical role of educational institutions in fostering a passion for learning among the youth and promoting ongoing learning as a career development tool. The participant stated that it is essential *"to prepare the people before being graduated to give them the tools."* Drawing from his experience at the executive level in various telecommunications industries, he asserted that learning should be *"injected as basic skills that are required for employees to join and, of course, thrive in the telecom industry"* (interview 10, Zain & Batelco, 23 years). According to another interviewee, the core abilities that are essential for preparing the next generation to cope with technological advancements are rooted in the education system, *"The fundamental ground is the education system... They must start working on STEM methodology, which is science, technology, engineering, and mathematics together"* (interview 16, STC, 14 years). The significance of academic institutions in the foundational learning process was also

highlighted in interview 14. The interviewee emphasized ongoing collaborations between the telecommunication Regularity authority, where he works, and entities like Tamkeen (Labor Fund), vocational training centers, and higher education institutions to align educational programs with industry needs, *"We are actively engaged in many projects to improve the academic programs offered by these institutions... we further talk about concepts to get people ready for the AI revolution."* (Interview 14, TRA, 18 years). This aligns with the focus on how technology is driving the need for a workforce that is not only well-educated but also capable of immediately impacting job design and industry evolution. *"Our goal is to ensure that when we admit new students, they are truly prepared,"* he stated, stressing the importance of developing skills directly applicable to the rapidly evolving telecom sector.

The same perspective is reinforced by the participant in interview 11, who, as a department head, also underscored the fundamental importance of learning. He remarked, *"I'm going back to the basics. I want my staff to be smart, quick learners to pivot quickly if I shift the way of work"* (Interview 11, Infonas, 4 years). This was echoed in interview 7 as the interviewee emphasized the importance of the foundational learning attitude, *"we need someone who can evolve and be agile along with the needs."* (interview 7, Batelco, 6 years). This highlights the necessity for employees to possess foundational learning skills that enable them to adapt swiftly to changes and new challenges within the industry. According to another interviewee's perspective, when technology progresses, individuals must also improve their ability to manage it, as technology does not operate independently, it will require someone to oversee it. Therefore, it is fundamental that people engage in self-practice learning as technology will increasingly rely on human skills, *"technology won't work itself. It will*

need someone to manage it. So, we need to train our self-practice because technology will need us. But again, if we can't cope, it would run without us" (interview 2, BNET, 6 years). Such a focus on foundational and continuous learning ensures that employees are not only equipped to handle current demands but are also prepared for future advancements, thus contributing to the overall resilience and competitiveness of the telecommunications sector.

4.3.4.3. Expansion in Multidisciplinary Roles

Job roles increasingly require a multidisciplinary understanding and the ability to adapt quickly to new technologies. Participants in interview 14 underscored the significance of learning in a technology-driven environment, asserting the necessity for employees to possess *"a broad understanding, be multidisciplinary, and have a keen interest in always expanding their knowledge."* The participant underlined the dynamic nature of artificial intelligence, describing it as *"a model constantly growing,"* which necessitates lifelong learning to effectively adapt to new solutions (Interview 14, TRA, 18 years). This highlights how the dynamic nature of technology, particularly artificial intelligence, necessitates a job design incorporating ongoing innovation and adaptability as core components. According to the participant's experience in the Telecommunications Regulatory Authority (TRA) for over ten years, the telecommunications sector provides a framework that encourages experimentation and testing. The participant emphasized, *"We never want to hold back innovation"* and stressed the importance of *"constantly learning, adapting, and maintaining a never-ending relationship with education"*. This sentiment is confirmed by the participant in interview 16, who highlights continuous learning as essential in the sector. The interviewee explains that this requirement scales up to the organizational level, stating, *"it's not only a one-sided story where we talk about*

employees; it's about how it's very favorable for an organization to have that learning curve inside the organization.” (interview 16, STC, 14 years). This holistic learning approach ensures that employees and the organization remain agile and competitive in the fast-paced telecommunications industry. These insights imply that foundational learning and a culture of continuous professional development ensure that employees are prepared for current demands and future advancements.

The telecommunications sector's emphasis on a learning-oriented culture positions it as a professional development and innovation leader. During an interview, a participant highlighted this commitment, emphasizing the sector's advanced technological infrastructure and dedication to comprehensive training, *“I would consider telecommunication very advanced in the technology set up ... Our CHRO mentioned that this year, they will spend more budget and technology-driven training and data-driven training not only for the technology team but also for the entire organization”* (Interview 13, Beyon, 4 years). This statement indicates a sector-wide emphasis on training, reflecting a strategic investment in human capital. According to interview 12, a researcher involved in the Skills Bahrain study on telecommunications industry skills, the theme of learning is not only crucial as a skill but also pivotal within the business climate. The researcher noted that *“the continuation of learning is enabled by the telecommunications sector,”* emphasizing that employees must *“embrace lifelong learning and open up to nano-learning methods.”* These methods consist of short training sessions that address small, specific learning elements, allowing for continuous skill enhancement without disrupting workplace productivity. This approach aligns with strategies that promote upskilling in a seamless manner. The researcher from Skills Bahrain also highlighted *“active*

lifelong learning” as an essential soft skill. Measuring the continuity and sustainability of these skills within the sector is challenging. However, the telecommunications industry is “*uniquely responsive to changing trends ... they are embracing lifelong learning and following strategies that enable upskilling employees in a process without disrupting the workplace or the business workflow*” (interview 12, Skills Bahrain, 13 years). This aligns with the statement made by the participant in interview 13, who compares their experience in the telecommunication sector with other sectors. The participant asserts that the telecom industry is exceptionally receptive to technological advancements in comparison to other industries she worked in and further describes how the sector prioritizes technology by emphasizing its importance in roles, job descriptions, and even training and development, “*they are paying huge attention to technology in terms of roles, job descriptions, and even training and development*” (interview 13, Beyon, 4 years). According to Skills Bahrain's telecommunications report, the sector is recognized for its awareness of the necessity of adapting to new developments, making it a leader in fostering a learning-oriented culture. As the telecommunications industry influences other businesses, it reflects this by consistently investing in employee education. The researcher from Skills Bahrain explained that the Skills Bahrain research underscored that the telecom sector is “*always willing to invest in their employees to learn the new stuff,*” demonstrating a solid commitment to continuous professional development (interview 12, Skills Bahrain, 13 years).

4.3.5. Global Dynamics: Competition, Strategy, and Work Culture

The extensive interviews have correspondingly highlighted the profound impact of technological advancements on organization design strategies, work culture, and competitive adaptability within the

telecommunications sector in Bahrain in the context of global competition and the need for continual adaptation. 13 out of 17 interviews have highlighted examples demonstrating regular evaluation and adjustment of strategies, work structures and functions in response to the evolving technology landscape, to meet market demands and global standards.

From the interview insights, the three key areas of focus in relation to global competition are:

1. International Standards & Strategic Partnerships
2. Business Strategy and Evolving Work Structures
3. Cultural Adaptability: Youth Influence and Resistance

Each area provides insight into how telecom companies navigate the increasingly interconnected and competitive global market.

4.3.5.1. Business Strategy and Evolving Work Structures

Many insights emphasized work structure changes, including remote work, using agile operational work approaches, and the impact of technology on business strategies, as well as examples highlighting the significance of cultural adaptation in response to industry changes. The restructuring of the telecom industry in Bahrain, as described in Interview 6, highlights the shift from a monopolistic environment to one that fosters competition, following national-level strategies, *“we had the major project, which is the restructuring the telecom sector in Bahrain, also led by His Highness the Crown Prince. The purpose was to introduce competition in providing services in Bahrain. So, it broke the monopoly of Batelco”*. As a result of this transformation, organizational structures have been modified to separate policy and regulations from operations *“it separated the policy and regulations making, so separating the government from the operations”*. This restructuring allowed companies to focus on commercial activities like marketing and sales while outsourcing core network

management to international vendors, which required different skill sets and competencies, *“this had a high impact on technology and the cost of all the investment levels in telecom, the skills required and the different sections like in the marketing, product management, the presales in the field sales and operations also were segregated. For example, many of the competitors started to outsource the managing the core network to the vendors from international”*. Moreover, the adoption of agile strategies has been crucial in this new environment. As companies face the pressures of cost management and technological change, they are increasingly focusing on downsizing and outsourcing, leading to flatter management structures, *“downsizing is one big impact and outsourcing as and also to have a flat management structure. It's not anymore like many sections, a lot of divisions, and contract-based recruitment to avoid any risks with fixed costs while the business cycle or the business level is changing or there is no clear outlook for the telecom market. So, companies would go for a contract base to save on cost”* (Interview 6, Batelco, 25 years). In addition to that, the participant describes how technological convergence, particularly the merging of telecom and IT into Info Communications Technologies (ICT), has further complicated the landscape. As the intelligence of telecom operations shifts from hardware to software, companies had to adapt their strategies to accommodate these changes, *“there was a convergence that happened between the telecom and IT and a new sector emerged called Info Communications Technologies ... and the emergence of software managing the hardware. The intensity of software is more than the hardware, so the intelligence is in the software more than in the hardware”*. This shift affects not only the technical aspects of telecom operations but also the competencies required at various levels of the organization. This indicates how the traditional job roles started

evolving, and companies reassessing the core value and compensation associated with many roles to stay competitive in the global market.

In another corresponding view, participant in interview 3 highlighted the necessity of regularly adapting plans to align with emerging technologies and the telecom sector's business cycle. Given the industry's strong dependence on technological advancements, corporate strategies are frequently adjusted, leading to workforce restructuring and the upgrading or replacement of equipment. The participant noted that the telecom sector's reliance on new technologies drives a continuous business cycle, necessitating the hiring of employees skilled in these innovations, while those unable or unwilling to adapt may be displaced.

“The industry is driven by the new generations (referring to technologies) So it is kind of a business cycle, and this cycle will be always there. It will be driven by the new technology, driven by the new generations of people who joined the industry, and driven by the new tools and technologies that will be introduced as well. -The job reductions and the increased chances for employees in the telecom industry. It's all driven by business. So, if there is a technology shift, this is where the telecom companies will start employing people to accommodate the new technology -and they will have to get rid of the people who are or the employees who are reluctant to go to move to the new technology” (interview 3, Ericsson, 10 years)

Another participant emphasized that the fact that the sector is deeply intertwined with technology is driving strategy and operations and industry trends leading to adaptations in corporate structures and work strategy, *“There has been a structural change based on this.... we used to work on simple, procurement, finance, HR, IT, and all this stuff.”* (interview 1, STC, 6 years). This supports Participant 11's comments about the company's agile operation techniques, which discusses using *“Dev Ops tools”* as a *“work philosophy, methodology, and mindset.”* Explaining that DevOps

combines “*development and operations.*” Once a firm adopts DevOps, it starts from scratch and aims for excellence, “Once an organization adapts to the DevOps mindset, we start from the basics and go even to the deepest level that they can have.” (Interview 11, Infonas, 4 years). In addition, comments addressed how specific duties were transferred to different business units, resulting in modifications to their roles and responsibilities, “IT development was handled by IT, but now because of the need of the business, it has been shifted to business and consumer. Now the consumer sector is handling the development, and IT is just doing the quality assurance. This is a really big change” (interview 1, STC, 6 years). The participant emphasized the profound influence of technologies, the COVID-19 epidemic, and the transition to remote work in empowering people to identify opportunities and effectively utilize technology to assist the business and apply their skill sets to ensure its sustainable operation, “technology urged companies to change their working structure. Post COVID, we started working remotely. I mean, we have understood our capabilities to support the organization from every corner of the world. I believe the industry has seen this as an opportunity to learn and to create a new work structure.”

Interviews show that strategic adaptation, organizational restructuring, and innovation are key to success in the fast-changing telecom industry. Companies are restructuring, adopting agile work methods, and integrating technology. The gathered information shows that the sector's shift toward ICT has changed job responsibilities, skill demands, and organizational structures. As Bahraini firms respond to these challenges, they are reshaping their workforce, adopting agile methods, and focusing on jobs that match emerging technologies. It demonstrates how technological

advances affect the design of jobs, underlining the need for constant adaptation to stay competitive in the telecom industry.

4.3.5.2. Cultural Adaptability: Youth Influence and Resistance

Cultural adaptability on a global scale has emerged as a critical issue in the sector, particularly with the dominance of younger employees who are reshaping organizational structures and work practices. Interview findings indicate that the telecom sector worldwide is undergoing notable transformations in job responsibilities and designations, influenced by the entrance of the younger generation into the labor market. As noted in Interview 6, the organizational structure within telecom companies is evolving, with traditional job roles and titles giving way to new terminology and frameworks better suited to a younger, tech-savvy workforce, *“The organization structure within telecom started to change, and the terminology used for job titles started to change. older, more experienced generations started to get away and new people started to get in dealing with the cultural changes within the company itself”* (interview 6, Batelco, 25 years). This generational shift is not only driving innovation but also necessitating the empowerment of employees to adapt to these evolving roles.

Younger employees, who are more in tune with technological advancements, prioritize flexibility, personalized work experiences, and a sense of autonomy. Their influence is reshaping the work culture within the telecom sector. As observed in Interview 2, *“The Freedom, the Empowerments that were given to the young, new people started refreshing the organization more and more”* (Interview 2, BNET, 6 years). This sentiment is echoed in Interview 14, where the personality of a younger employee was described as someone who *“doesn't want to be dealing with conventional routine-based work. She is very interested in new things. She's*

very flexible." (interview 14, TRA, 18 years). These preferences align well with the telecom industry's operational model, particularly regarding remote work and screen-based tasks. As noted in Interview 3, *"The work culture fits a lot with new gen: In the telecom industry, remote work and work behind screens all go hand in hand with Gen Z preferences to work behind screens and text. And they get their preferences because they work on their own terms most of the time because we know that the new generation want to do things their own way and telecom seems to match that"* (interview 3, BNET, 2 years).

This alignment between the work culture and the preference of the younger workforce enhances their sense of recognition and motivation, leading to management adopting policies that foster open communication and celebrate achievements. For instance, initiatives like the *"CEO policy of open door from 8:00 to 9:00"* and the *"Hall of Fame wall"* of achievers reward high performers and reinforce a culture of empowerment. As emphasized in Interview 5, *"I can work anywhere, so it's like disruption comes with flexibility, with innovation, with empowerment, with trust, with a mindset."* (interview 5, BNET, 15 years). This indicates that policies that value adaptability, creativity, and employee empowerment are shaped by a cultural shift fueled by the younger generation's tech-savvy mindset.

However, alongside this shift toward cultural adaptability, resistance to change remains a persistent challenge within the telecom sector. Many employees, mainly those accustomed to traditional work methods, resist embracing new technologies and practices. As mentioned in Interview 4, employees often ask, *"Why do you want to change it now?"* and as further elaborated in Interview 5, *"Some people just don't want to admit that they don't know how to do something, and instead of admitting they'll just keep on defending it. Resisting the change..."* This resistance is particularly

evident when employees are introduced to new technologies that challenge their established routines, with some being described as *"so used to the old system and doesn't want the change"* (Interview 5, BNET, 15 years). Additionally, as noted in Interview 3, *"Employees who lost their job were reluctant to learn something new,"* (interview3, Ericsson, 10 years), highlighting the deep-seated reluctance to adapt to new methods and tools.

To effectively address this resistance, a human-centered approach to strategy is essential. One that considers the demographic makeup of the workforce and aligns changes with the diverse needs and experiences of employees. As stated in Interview 5, *"Technology is a change that creeps in to our houses before it creeps into the work environment."* (interview 5, BNET, 15 years). So, dealing with it is unavoidable, but adopting a more human-centered strategic approach may boost its impact in the workplace, *"It's very important to humanize strategy, and humanizing a strategy makes it successful, meaning you always have the human factor in mind."* This approach involves not only demonstrating the benefits of new tools and practices but also fostering an inclusive culture that reduces fear and resistance, *"We'd rather sit with the staff and explain why strategy is important. It's a big process that should be very smooth. It may not be forced"*. As the participant in interview 13 said, when change is imposed and innovative ideas are introduced, it becomes challenging to get a favorable response from people, *"It was very difficult for them to quickly shift their minds to a new thing."* (interview 13, Beyon, 4 years). By addressing employees' concerns and communicating in terms that relate to them, organizations can create a more responsive and adaptable culture that facilitates smoother transitions during periods of change.

Ultimately, findings emphasize the significance of ongoing innovation, strategy integration, and cultural adaptability for telecommunications

operations as they adapt to technology and navigate the complexities of a swiftly evolving global environment. The interview revealed that organizations may thrive in the ever-growing competitive market by cultivating a culture of adaptability, embracing modern technology, and complying with international standards.

4.3.5.3. Leadership's Role

A significant and recurring theme in the interviews is the crucial role of leadership in successfully navigating technological transitions. Most participants emphasized the importance of leadership, particularly the influence of line managers and the company's strategic direction, underscoring the necessity for adaptive leadership.

Leaders in the telecommunications industry are key in guiding organizations through technological changes. They influence how technology is adopted and integrated into workflows, directly affecting job design. Effective leadership ensures that employees are equipped with the necessary tools and the skills and mindset needed to adapt to new technologies. This is particularly important in a sector where rapid technological advancements can render existing skills obsolete. Of the 17 participants, 14 underscored the pivotal role of leadership in driving technological change. For instance, in interview 5 the participant stated that *“Buy-in is very important for me to transition from one thing to another ... Leadership plays a big role in embedding this culture in the work environment. Our CEO is well aware of the disruption of technology and pushing those initiatives to us”* (interview 5, BNET, 15 years). This sentiment was echoed by participants in interview 2, who noted, *“Leadership plays a big role, whether it's from the upper management and definitely from the line management... Line management can affect how things go and how you cope, the culture of work, your response to the needs, and you're taking initiative”* (interview 2, BNET, 6 years).

Additionally, commitment from management is crucial as it is essential for maintaining competitiveness and ensuring that job roles evolve in response to technological changes. Participant in Interview 1 emphasized: *“It is management commitment. If management is committed ... you can do wonders”* (interview 11, Infonas, 4 years). Similarly, the participant in interview 3 highlighted the role of decision-makers during challenging times: *“The decision-makers play a big role during the times when the business goes down”* (interview 3, Ericsson, 10 years).

The influence of leadership extends to the promotion and support of new technologies. Leaders who support and promote advanced technologies, such as artificial intelligence, help redefine job functions and create opportunities for employees to engage in more complex and value-added tasks. The participant in interview 4 remarked, *“We have a great push from management to use more of AI in everything”* (interview 4, BNET, 2 years). This support was echoed by another participant, (interview 7, Batelco, 6 years), who described her line manager as a *“role model”* and a *“number one supporter”* in adopting new technologies, which significantly empowered her in her job.

Furthermore, leadership's role in fostering a supportive environment is highlighted by the participant in interview 8, *“The management supports ... they offer the support that provides the things you need to do your job the best way possible.”* (interview 7, Batelco, 6 years). This supportive culture is essential, as also noted by the participant in interview 7, *“If the board or the executive management are willing to change their mindset, then the employees will do so ... ultimately, management is the one injecting the capital for any change.”* (interview 8, NeuTel and Batelco, 6 years).

The need for flexible and tailored management approaches is also crucial, as pointed out in interview 14, *“You need flexible leadership and a*

tailored way of management” (interview 14, TRA, 18 years). The participant in interview 11, with 4 years working in the telecommunications sector, expresses a viewpoint that aligns with this, emphasizing that flexible leadership fosters trust among employees at various levels. The participant stated, *“flexibility builds trust and trust between employees is very important.”* (interview 11, Infonas, 4 years). This highlighted the emphasis on tailored and flexible management approaches, underlining the need for adaptive job designs that accommodate employees' diverse skills and learning paces. This adaptability in leadership is critical for mentoring and knowledge transfer, especially to newer generations. The participant in interview 12, who has 13 years of field experience and directly collaborated on the Skills Bahrain telecommunications report, emphasized that while conducting the research with telecommunications firms, it was evident that line managers *“need to learn how to be mentors. They need to know how to teach, share, and transfer the knowledge to the new generation”* (interview 12, Skills Bahrain, 13 years). This indicates that by fostering a supportive culture and promoting ongoing knowledge transfer, leaders ensure that job roles are dynamic and can adapt to new technological requirements.

4.3.6. International Standards & Partnerships

Global competition in the telecommunications industry is driven by the need to adapt to international standards, form strategic partnerships, and navigate the impacts of globalization. Interviews have revealed that companies in the industry are benchmarking against trends and adjusting their strategies to remain competitive. Telecom professionals emphasize that the competition in the industry has expanded beyond local markets and is now on a larger scale. They point out that previously, the competition was focused on prepaid services and who held the majority market share.

However, the current situation is distinct as per the participant in interview 8, *“Before the competition was on prepaid and who has most share in the market. now, it is a different story.”* (interview 8, NeuTel and Batelco, 5 years). As also stated by the participant in interview 6, globalization has had a significant impact on the industry. This impact has affected competition and pricing, making cost saving a major concern, *“Globalization has highly impacted the telecom sector, so it affected competition and affected pricing and cost saving became a prime issue”*. The same participant explains that the liberalization of the telecom sector in Bahrain, along with progress in technology that have increased global connectivity, has resulted in a variance in the quality of services provided. Additionally, the hunt for cheaper talents to boost profitability has been driven by the focus on cutting costs, which in turn has affected the sought-after employee capabilities, *“It affects the quality of the service to be offered. So, ... salaries are lower, so companies are not necessarily requiring skilled staff as they used to, packages offered are lower. Also, the liberalization of the telecom market, it was not anymore monopolies, it's the competitive advantage of any company that would stand”* (interview 6, Batelco, 25 years). Considering this, telecommunications firms need not only adapt to but also foresee developments in technological standards and trends on a global scale, as indicated by the participant in interview 2, *“We look internationally, what's happening in the region ...and look into local responses and investigate how our operators are coping with the technology, how they are performing, where there's a gap, we try to support them”* (interview 2, BNET, 6 years).

The telecommunications industry is undergoing significant transformation due to the rapid advancement of technology on a global scale, resulting in a highly competitive market. Participant in interview 8

emphasizes the importance of being prepared to handle the competitive nature of the telecom industry, *“It is very fast-moving and very competitive, if you want to survive in the market and not only survive but thrive. you must grow”* (interview 8, NeuTel & Batelco, 5 years). Interview insights suggest that organizations should do job assessments and adopt a flexible approach in doing so. Many interviews emphasize the rapid pace of the industry, stating that the telecom sector is very dynamic and fiercely competitive. An example was provided about Batelco, the first telecom company in the country, adapting to local and global changes in the telecommunications and technology industries, *“Batelco, the oldest telecom player in the market here, has evolved. Telecom is a technology-driven service”* (interview 8, NeuTel & Batelco, 5 years). The rise of telecommunications as a technology sector and the expansion of various business models have also influenced the evolution of skills. In fact, as stated in interview 6, *“globalization impacted recruitment strategy”* and companies had to reevaluate their priorities and the skills they could afford to hire. The same participant emphasizes the significance of employees' qualifications being recognized worldwide and the competition between local employees and adaptable global talent, *“Now staff need to have globally recognized certifications, and they are more mobile and there are no assurances, there is no job security as such as in the old days”* (interview 6, Batelco, 25 years). In response to the global skills competition, Skills Bahrain strives to assess and build frameworks for skills, enabling firms to maintain competitiveness on an international level, rather than just locally. Skills Bahrain researcher in interview 12 indicates that those working in the telecom business in Bahrain should possess a specific level of competency that is internationally benchmarked, *“if someone is working in the telecom sector in Bahrain, they should be at a*

certain level of proficiency that is benchmarked internationally" (interview 12, Skills Bahrain, 13 years).

Nevertheless, the primary difficulty lies in the rapid pace at which change occurs, without any established regulations in place to effectively oversee and manage it, as stated by participant in interview 14. The participant clarifies how this change is accompanied by significant pressure, particularly in terms of regulatory compliance and the overall business environment in Bahrain, *"If we are looking at it from global perspective then there is a constant change every second, but then as fast as it can and there is a lot of pressure on regulatory into the Bahrain environment."* (interview 14, TRA, 18 years). The Participant in interview 5 expressed a similar sentiment on the rapid adoption of technology, stating that it is causing companies to feel intimidated even though technology give telecom industry competitive edge, *"technology-driven and data-driven strategies gives us the advantage..., the only restriction now is the regulatory restrictions, we can find risks and aspects. So, I expect that this is what scaring other companies from adopting technology so fast."* (Interview 5 , BNET, 15 years)

The interview insights additionally emphasized the growth of partnerships among businesses and other key stakeholders, both locally and internationally. The emphasis on strategic partnerships underlines the significance of collaboration in response to restricted markets and escalating global competition. Telecom firms strategically utilize partnerships, shared resources, technology, and industry knowledge to sustain or improve their competitive advantage on a global level, *"... having strategic partnerships became the way forward ... a strategy by lot of key players now, be it telecom or other industry"* (interview 6, Batelco, 25 years). Recognizing the importance of their global competitive edge,

the same participant highlights that essential stakeholders are developing partnerships because of the contracting market, as described in this view, *“The big players are partnering because the market is shrinking, and their globalized competitive edge is important. So, if you can't beat them, join them”*. This was further demonstrated by a testimonial shared by a participant in interview 7, who described a case of partnership and collaboration between industries to gain an edge over competitors. They stated, *“last year we collaborated with BMW and created a SIM specifically for BMW to enhance the connectivity built-in within the car”*(interview 7, Batelco, 6 years). These insights indicate that strategic partnerships are crucial in the highly competitive telecommunications industry globally, since they allow enterprises to broaden their scope, accelerate innovation, and adapt more efficiently to market shifts.

In the context of global competition and strategic partnerships, aligning with global benchmarks is vital for telecom companies to stay competitive, enabling them to adopt best practices, implement advanced technologies, and meet global service standards. Interviews highlight that adapting to international standards and forming strategic partnerships are crucial for expanding reach, accelerating innovation, and effectively responding to market changes. These interconnected factors are essential for enhancing competitive advantage in a rapidly evolving global market.

4.4. Discussion

The findings from the primary research conducted through 17 interviews have shown many aspects that correlate directly with the research areas, revealing organizational response and individual adaptations to technological disruption. A notable theme from the interviews was the demographic shift towards a younger workforce, characterized by their adaptability and tech-savvy nature. This new

generation brings fresh mindsets that shape work culture and redefine job roles, aligning with global reports identifying telecommunications as an integral component of information technology crucial for supporting varied business models. Participants in the interviews have indicated that this youthful, dynamic workforce was pivotal in fostering a culture of innovation and ensuring that organizations could swiftly adapt to technological advancements, as confirmed by the literature on workforce trends (Tegtmeier et al., 2022).

Furthermore, continuous learning emerged as a sector-wide coping strategy driven by the rapid pace of technological and strategic shifts. Interviewees noted that ongoing professional development and organizational support are essential to maintain competitiveness and mitigate skill obsolescence risk. This emphasis on lifelong learning corresponds with research that underscores the importance of adapting job roles and skills to the changing technological landscape (Tan, 2023). The discussions revealed that employees struggle to meet evolving job demands without a commitment to continuous learning, mirroring industry publications' findings highlighting the necessity of self-directed learning and adaptability for sustainable success.

Global dynamics also emerged as a significant influence on Bahrain's telecommunications sector, reinforcing that the sector is shaped by domestic changes and highly responsive to international developments. This aligns with scholarly perspectives emphasizing global telecom markets' interconnected nature and susceptibility to external technological shifts (Wavetec, 2024). The literature and interview findings underscore that the telecommunication sector has evolved beyond national borders, becoming an essential enabler of business operations across sectors and regions.

- **Data Management**

Interview data highlighted that the surge in data-driven processes has necessitated robust data management practices, incorporating technical, human capital, and financial dimensions. This trend echoes the literature, which emphasizes the critical role of data management in modern job design and its link to broader business success (Berretta et al., 2023; Kadir & Broberg, 2021). Also, the findings on data management reveal that technological disruptions in Bahrain's telecommunications sector have underscored the need for robust data management practices to ensure integrity, security, and efficient storage. The interviews highlighted the creation of specialized roles, such as data governance officers and cybersecurity experts, as a direct result of the shift towards more complex data-handling needs. This correlates with existing literature that underscores the pivotal role of data management in driving decision-making and operational efficiency (Williams, 2024); Khong et al., 2023). Furthermore, participants described an increased emphasis on continuous training and professional development to meet evolving skill requirements, a finding supported by recent studies emphasizing the data-driven nature of modern business operations (Nagar, 2023; Deloitte, 2022b).

The research indicated that financial pressures lead companies to invest in sophisticated tools and outsourcing services for managing large-scale data. This, in turn, has influenced job structures, resulting in fewer permanent roles and a growth in temporary contracts. These findings align with the literature that affirms that data management has become a fundamental driver for job design changes within the telecom sector, ensuring adaptability and cost-efficiency (Riordan, 2023; Wan & Xu, 2024).

- **Lifelong Learning and Mindset**

Lifelong learning emerged as a critical theme, reinforcing the need for employees in Bahrain's telecom sector to engage in continuous skill enhancement and maintain an adaptive mindset. Interviews highlighted the willingness to learn and integrate new technologies was pivotal for individual and organizational success. Participants noted that employees risk obsolescence in a fast-paced, technology-driven environment without a proactive approach to learning. This resonates with research by Tan (2023) and NimbleWise (2024), which emphasizes that continuous skill development is crucial for staying relevant amid technological changes. The literature supports the idea that organizations fostering learning-rich environments experience improved job design, employee engagement, and resilience (Clark, 2024).

The study found that while organizations provide support through training and development programs, individuals' self-initiative to embrace change was the most significant driver. This underscores the importance of personal commitment to lifelong learning, aligning with broader research that stresses the transformative power of ongoing professional development for job sustainability and productivity (Deloitte, 2022a; Kacarevic, 2023).

- **Business Strategy and Work Culture**

The impact of global dynamics on business strategy and work culture in the telecommunications sector is well-documented. The interview findings supported this, showing that companies are compelled to reassess their strategies and structures to remain competitive. Participants in the interviews acknowledged that technological advancements have led to structural shifts and new role creations, consistent with the literature

emphasizing the need for strategic flexibility and cultural adaptability (Deloitte Global, 2024; Wakounig et al., 2021). The Internet of Things (IoT) influence was particularly noted as a driver for change, reinforcing telecommunications as a central enabler of connectivity for various sectors (Wavetec, 2024). Interviewees noted that adapting to these changes requires a cultural shift that values innovation and agility. This cultural adaptability was often influenced by the younger workforce, which brought fresh perspectives and presented challenges in bridging generational gaps. The research literature similarly acknowledges that successful adaptation to technological change is contingent upon a culture that promotes openness, flexibility, and the integration of diverse generational viewpoints (Arscott, 2023; PwC, 2023).

- **Human-centered Approach**

Balancing technology-centered and human-centered approaches is essential for effective job design in Bahrain's telecommunications sector. The literature emphasizes that while technology-centered methods enhance job performance, they can lead to job dependency and workplace strain (Berretta et al., 2023; Kadir & Broberg, 2021). In contrast, a human-centered approach prioritizes employee well-being and productivity, advocating for adapting job roles to align with workers' skills and needs (Franklin et al., 1992; Tegtmeier et al., 2022). Interview findings in this study reinforce the same ideas, with participants stressing the importance of integrating human-focused strategies. As a participant from Interview 5 noted, "*Technology is a change that creeps into our homes before it reaches the workplace*," illustrating the inevitable nature of technological adoption and the need for human-centered adaptation. Humanizing strategies, such as inclusive communication and gradual implementation, are critical for reducing resistance to change. Participant in interview 5 shared, "*We would*

rather sit with the staff and explain why strategy is important... it may not be forced" (Interview 5, BNET, 15 years). This aligns with Tegtmeier et al. (2022), who highlight that job design must account for employees' needs alongside technological changes to maintain motivation and adaptability, ensuring a balanced, resilient workforce.

- **Leadership Role**

The role of leadership emerged as a crucial factor in guiding organizations through technological disruption. Interview insights underscored that influential leaders plan strategically and motivate their teams, fostering an environment where innovation can thrive. This finding aligns with the research by HM and Abidin (2023), which argues that leadership must extend beyond implementing new technologies to orchestrating cultural and strategic changes that encourage adaptability and creativity. Participants highlighted that leadership in Bahrain's telecom sector has ensured employees remain engaged and responsive to changes, aligning job roles with technological advancements. This supports the notion that leadership's influence on job design and adaptation to technological disruption is paramount for long-term sector resilience. Literature concurs that leaders are pivotal in empowering teams, reinforcing the alignment between leadership effectiveness, innovation, and workforce adaptability (HM & Abidin, 2023; Faster Capital, 2024).

The findings affirm that the sector's response to technological disruption involves a blend of technology-centric and human-centered approaches. While technology enables greater efficiency and connectivity, human factors such as generational traits and adaptability play a crucial role in successful adaptation. This balanced approach ensures that job design remains flexible, fostering resilience and readiness for continuous change,

thereby addressing the research questions regarding organizational and individual adaptation to technological disruption.

Chapter Five

Chapter 5: Conclusion

5.1. Introduction

This last chapter combines the key outcomes and implications of the research, offering a thorough overview of the present and developing context of job design in the telecommunications sector. The sector, both globally and regionally, is characterized by swift technological breakthroughs like AI, IoT, and automation, transforming conventional job descriptions and skills needed. In Bahrain, these worldwide advancements are reflected by a strong local framework supported by innovative regulatory initiatives and economic plans, including Bahrain's Economic Vision 2030. These efforts have fostered a competitive market landscape that aligns with international norms and can rapidly embrace new technological paradigms.

The study highlights the significance of both organizational capacities and people adapting to managing technological changes. Although resources and training programs are crucial, the adaptability and mindset of employees are crucial variables in successful adaption. This human-centered approach aligns with the sector's focus on lifelong learning and skill development, promising ongoing productivity and satisfaction among employees.

This chapter explores the key aspects impacting the present and future perspectives of job design in the telecommunications sector, the research's contributions and broader implications for administrators and industry leaders, the limitations faced during the study, and suggestions for future research to expand upon these findings. This chapter seeks to outline a framework for strategic workforce development amidst ongoing technology evolution.

5.2. The Current Outlook for Job Design in the Telecom Sector

The telecommunications industry is experiencing notable global transition, driven by technological developments including artificial intelligence (AI), automation, the Internet of Things (IoT), and data analytics. These advancements have fundamentally transformed job structures, skill requirements, and working conditions, establishing telecommunications companies as one of the most adaptable and swiftly developing sectors. Integrating Information and Communication Technology (ICT) with conventional telecommunication services has underscored the necessity for a workforce with both technical and adaptive skills (Leimeister & Blohm, 2022). This integration highlights the fundamental value of lifelong learning since ongoing technology changes require continual capacity enhancement and reskilling (Berretta et al., 2023).

Regionally, particularly within the Gulf Cooperation Council (GCC) and Bahrain, these global trends manifest within a unique ecosystem marked by robust regulatory frameworks and strategic economic initiatives. Bahrain's *Economic Vision 2030* and efforts led by regulatory bodies such as the Telecommunications Regulatory Authority (TRA) and the Information & eGovernment Authority (IGA) have created an open and competitive market. This market environment, enhanced by significant infrastructure investments, ensures that the sector aligns with international standards and adapts quickly to global technological shifts. Such regulatory efforts have facilitated an atmosphere conducive to innovation and competitiveness in skills acquisition and job design. The sector's ability to respond dynamically to global changes is a testament to its strong infrastructural foundation and proactive policies.

The findings of this research, supported by qualitative interviews and critical reports like the *Skills Bahrain 2023 Telecommunication Skills Report*, illustrate how job roles are being restructured and transformed in response to technological disruption. While organizations in Bahrain provide extensive resources for skill development, the ability of employees to successfully adapt depends significantly on personal attributes such as mindset, drive, and adaptability. These intrinsic qualities often act as enablers or barriers to navigating change effectively. This highlights that while a technology-centric approach can enhance efficiency, a human-centered perspective that recognizes individual capabilities and motivations is crucial for sustained productivity and employee satisfaction.

Globally and regionally, job design in the telecommunications sector requires a strategic blend of technological integration and human adaptability. The rapid pace of technological evolution reinforces the importance of flexible job structures and a supportive environment that values both organizational resources and personal initiative. The role of regulatory frameworks and national visions in shaping these outcomes is pivotal, as they open pathways for workforce innovation and resilience. This comprehensive approach ensures that the sector keeps pace with technological advancements and remains a space where human potential is prioritized, fostering a workforce ready to meet future challenges with agility and innovation.

5.3. Implications and Contribution of the Research

This research contributes significantly to understanding how technological disruption impacts job design within the telecommunications sector, particularly in Bahrain. By focusing on qualitative insights gathered through interviews and supplemented by key data sources such as the *Skills Bahrain 2023 Telecommunication Skills Report*, reports from the Telecommunications Regulatory Authority (TRA), Information &

eGovernment Authority (IGA), and reports published by major telecom operators, this study offers an extensive view of industry-specific responses and workforce strategies. The findings underscore the importance of industry leaders embracing a human-centered approach that promotes adaptation and ongoing learning. This method is especially relevant due to the convergence of global technological norms and regional infrastructure, enabling Bahrain to adapt to worldwide advancements swiftly.

The research also sheds light on the personal traits of adaptability and mindset as critical factors influencing how employees cope with technological changes. These findings imply that while organizational support and resources are essential, personal drive remains a pivotal enabler for successfully navigating disruptions. Moreover, by addressing the dynamic nature of "technological disruption" and its evolving definition, the study contributes to the broader academic debate, suggesting that job design research needs to stay flexible and adaptive.

The outcomes highlight the importance of viewing the telecommunications sector as both a standalone field and a facilitator of connectivity that impacts multiple industries. They offer actionable insights for policymakers and organizations aiming to enhance workforce competitiveness and strategic resilience in a rapidly changing environment.

5.4. Recommendations

Based on the findings above, several key recommendations have been identified to enhance workforce adaptability and job design strategies within Bahrain's telecommunications sector in response to technological disruption. These recommendations focus on industry practices, workforce development, and policy initiatives to ensure sustainable growth and competitiveness.

- **Strengthening Continuous Learning and Skill Development**

Organizations should prioritize structured lifelong learning programs to equip employees with the necessary skills to navigate evolving technologies such as AI, IoT, and cloud computing. Beyond company-led training, fostering a culture that encourages personal initiative in skill development is essential. Partnerships with academic institutions and professional certification programs can further support employees in acquiring new competencies.

- **Enhancing Human-Centered Job Design**

While technology adoption is crucial, organizations must balance efficiency with employee well-being. Job design should integrate flexibility, autonomy, and employee engagement strategies to improve motivation and job satisfaction. Implementing job crafting approaches—where employees shape their roles based on strengths and interests—can enhance adaptability and retention.

- **Developing Agile Organizational Structures**

To remain competitive, telecom firms should embrace agile business models that allow for rapid adaptation to technological advancements. This includes shifting from rigid hierarchies to more dynamic and cross-functional teams. Encouraging interdepartmental collaboration and flexible job roles will help organizations stay resilient in an evolving digital landscape.

- **Aligning Workforce Strategies with National Economic Vision**

Organizations should ensure that workforce development aligns with Bahrain's Economic Vision 2030 and regulatory frameworks set by TRA. By actively engaging in national skills development initiatives, companies

can contribute to a future-ready workforce that meets the sector's evolving demands.

- **Addressing Workforce Generational Differences**

The study revealed that younger employees are more receptive to technological change, while older generations may require additional support. Tailored training programs should be developed to bridge generational gaps, ensuring smooth knowledge transfer and collaboration between experienced professionals and emerging talent.

- **Improving Data-Driven Decision Making**

Given the increasing reliance on AI and data analytics, organizations should invest in robust data governance and cybersecurity frameworks. Employees should be trained in data literacy to enhance decision-making and optimize technological tools effectively.

- **Encouraging Proactive Leadership in Digital Transformation**

Leadership plays a crucial role in guiding the workforce through technological shifts. Telecom organizations should invest in leadership development programs that equip managers with digital transformation strategies, change management skills, and the ability to foster an innovation-driven culture.

These recommendations aim to strengthen Bahrain's telecommunications sector by increasing its resilience to technological disruptions, improving job satisfaction, and ensuring long-term competitiveness in an increasingly dynamic global market.

5.5. Limitations of the Research

While this study provides valuable insights into the impact of technological disruption on job design within Bahrain's

telecommunications sector, certain limitations must be acknowledged. One primary limitation is the research's reliance on qualitative interviews as the main data collection method. Although these interviews provided rich, in-depth perspectives, the findings are inherently shaped by participants' subjective perceptions. The participant pool included professionals with varying experience levels, ranging from 2 to 25 years in the sector. This variety offered a broad view but may have also introduced biases based on individual backgrounds and career stages.

Another significant limitation was the timeframe allocated for completing this research. Given the evolving nature of technology, defining "technological disruption" proved challenging, as the term is dynamic and subject to continuous reinterpretation. This limitation impacted the consistency of technological definitions used throughout the study and emphasized the need for future research to explore how these definitions evolve over time.

While essential, the focus on job design revealed itself as a complex topic that calls for deeper investigation through diverse research methods and across multiple sectors. This study highlighted that the telecommunications sector not only shapes its internal job structures but also serves as a driver of connectivity and an enabler for other industries. Future research could benefit from expanding beyond telecommunications to understand how this sector's technological advancements influence job design in related fields.

Lastly, due to the constraints of this research, certain aspects relevant to technological disruption and job design could not be thoroughly explored. Future studies might address these gaps more comprehensively, incorporating longitudinal studies or mixed-methods designs to capture the continuous and interconnected nature of technological and job design evolution. A broader examination could also illuminate how

telecommunications, being synonymous with technology itself, plays a critical role in reshaping job structures and skill requirements across all sectors it supports.

5.6. Recommendations for Future Research

Building upon this study's findings and limitations, several recommendations for future research are proposed. Expanding the scope of research to include a more diverse range of industries would provide a broader understanding of how technological disruption impacts job design beyond the telecommunications sector. Given that telecommunications are integral to the functioning of other industries as a driver of connectivity and technological enabler, investigating its influence on sectors such as finance, healthcare, and education could yield more profound insights into cross-sectoral impacts.

Secondly, future research could benefit from employing mixed methods approaches, combining qualitative interviews with quantitative surveys or data analytics. This approach would provide more comprehensive evidence and reduce biases associated with the subjective nature of interview-based research. A longitudinal study design could also offer valuable insights into how job design evolves over time in response to ongoing technological advancements.

Additionally, more targeted research focusing on specific aspects of job design, such as employee well-being, adaptability, and the role of continuous learning, would be beneficial. Investigating how personal traits such as adaptability, mindset, and drive contribute to successful technology adaptation could provide a nuanced understanding of workforce readiness and resilience.

Finally, examining the changing definitions and boundaries of technological disruption in real time could help us understand its fluid nature. This dynamic approach would ensure that research keeps pace with

rapid technological advancements and aligns with the continuous shifts within the telecommunications sector and its regulatory environment.

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Appendices

Interview Questions

1. Can you describe your role and responsibilities within your telecommunications organization?
2. How have you observed technological disruptions impacting job roles and tasks in your organization?
3. Could you provide examples of specific technological advancements that have influenced and changed the nature of work in your company?
4. What skills or competencies have become more critical for the employees in your company due to technological disruption?
5. Have you experienced any challenges or opportunities related to adapting to new technologies or changes in job design in your role?
6. How do you perceive the organizational response to technological disruptions regarding job design and workforce management?
7. Can you share any strategies or initiatives your organization has implemented to support employees in adjusting to technological changes and evolving job requirements?
8. From your perspective, how have changes in job design impacted team dynamics or organizational culture?
9. How have technological disruption influenced your organization's employee morale, job satisfaction, and career prospects?
10. What are your expectations for the future of job design and workforce dynamics within the telecommunications sector, considering ongoing technological advancements?
11. Are there any additional insights or experiences you'd like to share regarding technological disruption and job design in your company?
12. Finally, is there anything else you believe is essential for me to understand about the intersection of technology, job design, and workforce dynamics in this industry?

Abstract

Technological disruption has become a defining factor in reshaping business environments, notably influencing job design, skill requirements, and strategic approaches across industries. This research, *Exploring Technological Disruption and Job Design in the Telecommunication Industry of Bahrain*, investigates how these disruptions have altered job roles, skill demands, and organizational strategies within Bahrain's telecommunications sector. The study adopts a qualitative approach, utilizing in-depth interviews complemented by secondary data from authoritative sources, including the Skills Bahrain 2023 Telecommunication Skills Report and reports from the Telecommunications Regulatory Authority (TRA), Information & eGovernment Authority (IGA), and key industry operators.

Findings indicate that Bahrain's telecommunications sector operates under a global framework, where international standards are in effect, and global shifts promptly impact the region. Additionally, it reveals that technological disruption has led to a redefinition of job roles, emphasizing the integration of analytical skills and adaptability as core competencies. The study highlights Bahrain's solid infrastructural foundation, which enables effective adaptation to sector requirements. Furthermore, it reveals the convergence of ICT and telecommunications, underlining the necessity for continuous skill development. While organizations provide substantial resources for employee adaptation, the research underscores that personal attributes such as mindset, personality, and individual drive are vital to successful adaptability. These intrinsic factors often determine how effectively employees navigate technological changes, emphasizing the importance of resilience and a proactive approach.

This research offers critical insights for policymakers, industry leaders, and practitioners by examining the intersection of technology, job design, and human adaptability. It advocates for strategies that align technological advancements with workforce capabilities, fostering resilience and ensuring the sector's readiness to meet ongoing and future challenges.

ملخص البحث

لقد بات الإحلال التقني (Technological Disruption) عاملاً حاسماً في إعادة تشكيل عالم الأعمال، لا سيما تأثيره على تصميم الوظائف وتحديد المهارات المطلوبة والمنهجيات الاستراتيجية في مختلف القطاعات. ويتناول هذا البحث المعنون "الإحلال التقني وأثره على تصميم الوظائف في قطاع الاتصالات بمملكة البحرين" كيف أسهم هذا الإحلال في تعديل المهام الوظيفية والمهارات المطلوبة والاستراتيجيات التنظيمية على صعيد قطاع الاتصالات في مملكة البحرين. إذ تتبنى الدراسة نهجاً نوعياً بإجراء مقابلات متعمقة مدعومة ببيانات ثانوية من مصادر موثوقة، بما في ذلك الدراسة البحثية لمهارات قطاع الاتصالات 2023 التي أجراها فريق "مهارات البحرين"، والتقارير الصادرة عن هيئة تنظيم الاتصالات وهيئة المعلومات والحكومة الإلكترونية وتقارير المشغلين الرئيسيين في القطاع.

وتشير النتائج إلى أن قطاع الاتصالات في مملكة البحرين يعمل ضمن إطار عالمي، حيث تطبق فيه المعايير الدولية، وتؤثر التحولات العالمية على المنطقة بشكل سريع. بالإضافة إلى ذلك، تكشف الدراسة إلى أن الإحلال التقني أدى إلى إعادة صياغة المهام الوظيفية، مع التشديد على دمج المهارات التحليلية والقدرة على التكيف باعتبارها كفاءات أساسية. وتسلط الدراسة الضوء على الأساس المتين للبنية التحتية في مملكة البحرين، والذي يتيح التكيف الفعال مع متطلبات القطاع. وعلاوة على ذلك، تكشف الدراسة عن أوجه الالتقاء بين قطاع تكنولوجيا المعلومات والاتصالات، وقطاع الاتصال، مما يؤكد ضرورة مواصلة تطوير المهارات. وفي حين تستثمر المؤسسات موارد هائلة لتكييف موظفيها، فإن البحث يؤكد على أن السمات الشخصية مثل طريقة التفكير، والشخصية، والدوافع الفردية، تعد عوامل جوهرية لتحقيق التكيف الناجح. وغالباً ما تحدد هذه العوامل الجوهرية مدى فعالية الموظفين في التعامل مع المتغيرات التكنولوجية، مما يؤكد على أهمية المرونة والنهج الاستباقي.

ويقدم البحث رؤية مهمة لصانعي السياسات وقادة القطاع والمختصين من خلال دراسة التداخل بين التكنولوجيا وتصميم الوظائف والقدرات البشرية على التكيف. ويدعو هذا البحث إلى وضع استراتيجيات توفق بين التطورات التكنولوجية وتعزيز قدرات القوى العاملة، مما يدعم المرونة ويضمن قدرة القطاع على مواجهة التحديات الحالية والمستقبلية.



جامعة البحرين
كلية ادارة الاعمال
قسم الادارة والتسويق

الاحلال التقتي وأثره على تصميم الوظائف في قطاع الاتصالات بمملكة البحرين: دراسة نوعية

اطروحة مقدمة لاكمال درجة الماجستير في ادارة الموارد البشرية

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ابريل 2025