

Tsiakalos Serafeim

Enhancing Organizational Resilience in the Air Transport Industry Through the Adoption of Emerging Technologies: A Case Study of the Middle Eastern Airlines

Master's Degree in
International Business
Management
Spring 2024



**KAMK • University
of Applied Sciences**

Abstract**Author(s):** Tsiakalos Serafeim**Title of the Publication:** Enhancing Organizational Resilience in the Air Transport Industry Through the Adoption of Emerging Technologies: A Case Study of the Middle Eastern Airlines**Degree Title:** Master's Degree in International Business Management**Keywords:** Organizational Resilience, Air Transport Industry, Emerging Technologies, Artificial Intelligence (AI), Machine Learning (ML), the Internet of Things (IoT), Big Data Analytics, Virtual Reality (VR), Augmented Reality (AR), Emirates, Qatatar Airways, Saudia, Technology Integration, Innovation in Aviation

The research investigated ways Middle Eastern Airlines strengthens their organizational resilience in the air transport industry through emerging technologies. The air transport industry has undergone several transformations from simple craft to advanced and large planes for passenger and cargo transportation. The air transport industry is enhancing global connectivity by easing the transcontinental movement of people and cargo and enabling access to remote areas. However, it is highly competitive due to the increasing number of airlines, as most stakeholders seek to benefit from its potential. The specific objectives were to examine how emerging technologies are leveraged, analyze the relationship between adopting these technologies and cultivating a resilient organization, and identify strategic recommendations for Middle Eastern Airlines to integrate emerging technologies. The study utilized a quantitative research design using numerical primary data from the respondents to understand organizational resilience in the air transport industry and collected data using online surveys. The researcher analyzed the data using descriptive and inferential statistics to identify patterns and evaluate the relationship between the variables. The findings indicated that Middle Eastern Airlines are leveraging emerging technologies to enhance organizational resilience. The uses included promoting safety, improving passenger experience and promoting operational efficiency. Besides, it showed that emerging technologies can positively impact organizational resilience depending on stakeholder interventions. The stakeholders could integrate emerging technologies in the marketing, human resources, and service delivery sectors to capitalize on the associated benefits. These outcomes imply that airline and airport managers should allocate more resources to support integrating emerging technologies into their operations.

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1 Chapter One: Introduction

The research investigated ways Middle Eastern Airlines strengthens their organizational resilience in the air transport industry through emerging technologies. The primary focus areas included determining how these technologies foster organizational resilience and suggest strategic recommendations to increase integration. Hence, this chapter provides detailed background information on the global air transport industry, from its history, growth, and significance to the global economy. Besides, it includes the problem statement highlighting the specific issue systematically studied to address the knowledge gap. The aim, objectives, and research questions define the study's scope by illustrating the particular focus areas and information the investigation collected. Conversely, the significance section identifies and highlights ways specific stakeholders, including future and air transport industry stakeholders, could benefit from the findings. The methodology summary and thesis structure conclude the introduction and illustrate the particular focus areas of subsequent chapters.

1.1 Background of the Air Transport Industry and its Significance.

1.1.1 History of the Global Air Transport Industry

The air transport industry has undergone several transformations from simple craft to advanced and large planes for passenger and cargo transportation. The evolution began with the invention of kites in the 5th century before Leonardo da Vinci created rational aircraft paintings in the late 14th century (Jaco Aerospace, n.d.). Jaco Aerospace (n.d.) adds that hydrogen discovery during the 17th and 18th centuries contributed to the introduction of hydrogen balloons that carried people at high altitudes. Tethered balloons were introduced in the 19th century and were primarily used for observing battles at safe distances. The phenomenon signifies that early aircraft inventions were used mainly for military purposes since they provided a vantage point. Isaac Newton's fluid dynamics and motion laws contributed to the development of modern aerodynamics, including the invention of gliders during the early 20th century and subsequent aircraft development. The transformation allowed investors to capitalize on the rising interests in the aviation sector, particularly from the governments.

The air transport industries' rapid growth and transformation began in 1945 due to advancements in technical innovations and a rise in demand. According to the International Air Transport Association,

the development included turbo propellers in the early 1950s, the 1958 introduction of Transatlantic jets, and the 1970 high-pass engines and widebody aircraft (IATA, n.d.). The phenomenon signifies that engine technology advancements and the introduction of avionics revolutionized the industry by boosting speeds, improving unit cost control, and increasing airplane sizes. IATA (n.d.) adds that they increased demand by reducing air rates for cargo and passenger fares, elevating it to the preferred mode for intercontinental transport. The Europe-North America route became the busiest as nations in these regions had advanced economies and high-income populations that could afford to use the means of transportation. Contemporary innovations in the air transport industry are centered on promoting safety expanding aircraft range, and capacity.

Despite the explosive increase in air transport demand since 1945, few countries control the aircraft manufacturing industry due to the associated financial and technical requirements. Dorfman et al. (2022) opine that aircraft manufacturing is a capital-intensive undertaking with significant requirements that most nations with smaller economies cannot establish. For instance, Boeing and the Commercial Aircraft Corporation of China, Ltd (COMAC) are the only firms with resources to manufacture large-scale planes. Conversely, manufacturers like Airbus are part of an international consortium that includes Spain, France, Germany, China, and the United Kingdom. The authors add that the resource requirements pose a significant challenge since few countries control the components market and have strategic agreements with the assemblers (Dorfman et al., 2022). The resource and geopolitical barriers to entry have led to increased specialization, with some nations investing more in gaining a competitive edge, taking the case of Middle Eastern airlines.

1.1.2 Air Transport Industry Growth in the Middle East

The Middle East air transport industry has snowballed owing to government intervention and the availability of financial resources to invest in its development. A Mordor Intelligence (2024) report indicates a \$64.31 billion market size and a compounded annual growth rate of 2.89%, signifying that it will expand to \$74.15 billion in 2029. The region's airlines are among the world's largest full-service providers, primarily operating long-haul routes, including Etihad, Qatar, and Emirates Airways. Besides, it has short-haul budget carriers, such as Wizz Air Abu Dhabi and Air Arabia Abu Dhabi, for domestic and regional flights. The phenomenon signifies that the demand for narrow-body aircraft in the region will likely rise, and member states will operate their skies to promote regional integration. The author adds that there is a growing demand for business jets as some countries continue positioning

themselves as global commercial and business hubs (Mordor Intelligence, 2024). The region will likely sustain the growth trends as the government implements measures to diversify their economies.

Middle East governments have adopted aggressive measures to strengthen their global competitiveness in their aviation sectors. The developments include air transport market deregulation and privatization of critical infrastructure such as airports to improve efficiency. According to Joshan and Maertens (2020), the efforts have resulted in the growth of regional budget airlines to capitalize on regional integration opportunities. Moreland et al. (2023) add that the performance is due to the region's geographical advantages, business attractiveness, and physical and intellectual infrastructure availability. Characteristics have contributed to developing regional aviation hubs, particularly in the United Arab Emirates (UAE), Qatar, and Saudi Arabia. Besides, regional governments are utilizing their hydrocarbon revenues to expand their aviation sector as a diversification strategy and gain regional strategic advantages. Similarities in resource endowment signify that the leading aviation hubs can capitalize on emerging technology as a differentiation strategy in the highly competitive air transport market.

Middle Eastern Airlines face increasing security threats due to instabilities affecting some member-states. According to Norlén (2022), regional rivalries, sectarian conflicts, radicalization, and intercountry wars are among the primary challenges. For instance, The Israel-Gaza Conflict, Saudi Arabia-Iran rivalry, civil wars in Yemen and Syria, and the Houthi incursions in the Persian Gulf and Red Sea are some of the issues aviation sector stakeholders must address. Large regional airlines are capitalizing on emerging artificial intelligence (AI) applications to mitigate security challenges and promote passenger safety. The trend shows an increasing reliance on technologies to boost operational efficiency, which is critical for surviving the competitive air transport market. The rivalry for regional dominance between Saudi Arabia, the UAE, and Qatar signifies that public and private sector investment in the sector will likely continue rising. The operating environment will continue to influence the type of emerging technologies aviation sector stakeholders adopt.

1.1.3 Importance of Organizational Resilience in Air Transport

Organizational resilience supports proactive decision-making that enables enterprises to survive during challenging market conditions. Therefore, it is strategically essential for contemporary firms since it ensures sustained revenue inflow after implementing robust measures to overcome change. Ac-

According to Siebert et al. (2020), it entails anticipating issues, evaluating available information, and developing tailored strategies before they occur. The authors add that it strengthens belief in one's abilities and boosts satisfaction, increasing the chances of recovering from market disruptions (Siebert et al., 2020). Enterprises with robust organizational resilience frameworks are better positioned to capitalize on emerging opportunities while optimizing the impact of potential challenges. For instance, recognizing that fares and rates are the primary inhibitors to increasing air transport use enables luxury airlines to introduce budget subsidiaries. Therefore, the decision highlights organizational resilience by indicating that the management anticipates a drop in passenger numbers due to adverse economic conditions and introducing a more affordable option.

Besides, organizational resilience enhances airlines' disaster response and recovery by enabling firms to mitigate the adverse impacts of sudden changes in market conditions. Ignatowicz et al. (2023) posit that managers evaluate potential negative scenarios, potential performance impacts, and possible solutions to reduce exposure, which primarily entails maintaining favorable liquidity levels. For instance, some airlines converted their passenger cabins into cargo hauls after the COVID-19 outbreak to leverage the increased demand and after a significant decline in air travel. The decisions ensure that some airlines sustained revenue inflow by carrying vaccines and other cargo as the containment measures restricted international travel to mitigate the pandemic's disruptive impact (Andreana et al., 2021). After lifting travel restrictions, the same airlines re-introduced seats to continue with passenger transport. Hence, organizational resilience demonstrates leadership effectiveness, ensuring organizations have sufficient frameworks to respond to and recover from anticipated adverse market conditions.

1.1.4 Significance of the Global Air Transport Industry

The global air transport industry is among the largest employers, contributing significantly towards sustained economic growth. A 2018 IATA report indicates that the sector created about 2.89 million jobs and generated approximately \$125 billion in tax revenues (Khanal et al., 2022). The statistics suggest that it is a critical sector in the global economy that further indirectly contributes to other sector's development, including tourism, trade and commerce, and manufacturing. Besides, the air transport sector's performance is highly tied to performance in other since they influence availability of opportunities for stakeholders to explore. Khanal et al. (2022) add that Australia alone employed 176,000 people and contributed about \$47.97 billion in tourism revenues in 2017. Hence, it improves living standards, generates economic growth, and reduces poverty by providing an income stream for its

employees and stakeholders offering support services. The sector is likely to sustain its contribution to the global economy as the improving living standards and recovery from the pandemic are projected to increase passenger numbers and cargo volume.

The air transport industry is enhancing global connectivity by easing the transcontinental movement of people and cargo and enabling access to remote areas. It has revolutionized growth by opening remote regions previously inaccessible to the global market, leading to economic diversification through developing alternative craft activities (Law et al. 2022). For instance, air transport connects remote locations in rural areas and islands to the global market by helping them exploit their natural resources and serene environment to generate revenue. Moreover, some airlines are strategic resources for some countries, including the UAE, since they have contributed significantly to their emergence as global trade and logistical hubs (Al-Kwafi et al., 2020). Remote islands such as Maldives and Seychelles benefit most from air transport as it has increased their connection to global tourism markets. The aviation sector has had a similar impact as the internet by establishing a global village since most regions are now accessible and benefit through establishing support services industries.

1.2 Research Problem

The global air transport industry is highly competitive due to the increasing number of airlines, as most stakeholders seek to benefit from its potential. The Middle East's central strategic location and the government's desire to diversify their economies have led to increased investments in the sector to position themselves as logistical hubs (Aquilina-Spagnol et al., 2020). It connects the global East to the West, and most of the leading destinations are within its eight-hour range, signifying that it is a critical transit point for passengers visiting multiple destinations. Khanal et al. (2022) add that the industry's development has a snowball effect since it fosters the growth and development of other sectors, leading to economic growth. The \$64.31 billion market size means it significantly contributes to the regional economies' growth, and its expansion will enhance their global competitiveness. Nonetheless, attaining the goal requires robust, proactive measures that reduce its exposure to market uncertainties and promote sustainability.

Past studies have demonstrated that organizational resilience is instrumental to the air transport industry's long-term growth. For instance, Su et al. (2023) noted that airlines' responsiveness to the market conditions during the COVID-19 pandemic influenced their survival after its eradication. Most interventions to strengthen resilience have been centered on establishing robust business models,

signing strategic alliances, and changing aircraft models to reduce operating costs. Nonetheless, these developments have been less effective in promoting sustainable growth as competition and market uncertainties impact the market adversely. Pereira et al.'s (2022) study indicated that technological innovations have significantly contributed to value creation in the air transport industry. The efficiency and sustainability, improved customer experience, safety, business and operational management, and general applications have revolutionized the industry's dynamics. Nonetheless, few studies have dwelled on the contribution of emerging technologies in enhancing organizational resilience, creating an information gap that should be filled to strengthen stakeholder decision-making effectiveness.

A failure to investigate the impact of emerging technologies in enhancing organizational resilience could limit stakeholders' capacity to make effective and informed decisions. This study sought to establish how Artificial Intelligence (AI), Machine Learning (ML), the Internet of Things (IoT), Big Data Analytics, and Virtual (VR) and Augmented Reality (AR) can strengthen airlines' ability to respond and recover from disasters. Perifanis and Kitsios (2023) noted that the application contributes significantly to business growth by enhancing efficiency and cost-effectiveness. Hence, the investigation sought to identify ways stakeholders leverage these technologies to improve organizational resilience and assess the correlation. The findings informed a suggestion of the strategic recommendations on ways Middle Eastern Airlines could strengthen their organizational resilience and promote sustainability using emerging technologies. The study assumed that knowledge of the applications' impact would further enhance the global competitiveness of Middle Eastern airlines through improved performance.

1.3 Aim, Purpose, and Research Questions

1.3.1 Research Aim

The investigation aimed to evaluate how Middle Eastern Airlines are leveraging emerging technologies to strengthen their organizational resilience.

1.3.2 Specific Objectives

- 1) To examine how emerging technologies are leveraged to enhance organizational resilience within the air transport industry.
- 2) To analyze the relationship between adopting these technologies and cultivating a resilient organizational culture within Middle Eastern Airlines.
- 3) To identify strategic recommendations for Middle Eastern Airlines to integrate emerging technologies further to reinforce its organizational resilience and sustainability.

1.3.3 Research Questions

- 1) How Middle Eastern airlines leverage emerging technologies to enhance organizational resilience?
- 2) What is the relationship between adopting emerging technologies and nurturing a resilient organizational culture within Middle Eastern Airlines?
- 3) What are the strategic recommendations for Middle Eastern Airlines to integrate emerging technologies further to reinforce its organizational resilience and sustainability?

1.4 Study Significance

The findings are helpful to aviation effective decision-making among aviation sector stakeholders seeking to improve financial performance and long-term growth. Air transport is a capital-intensive industry that even the largest airlines are struggling to maintain profitability (Dorfman et al., 2022). Hence, knowledge of ways to leverage the emerging technologies' contribution to strengthening organizational resilience will help adjust the business models and formulate appropriate strategies to exploit the potential. The applications could help optimize operating costs, mitigate aviation safety and security issues, and enhance customer experience and satisfaction. The three aspects comprise how stakeholders can use these study findings to promote operational efficiency and optimize resource use. Moreover, airline managers could use the findings to streamline operations and strengthen organizational resilience by adopting proactive business models. The outcomes will be a

vital decision-making basis since it seeks to answer the question 'what,' signifying that stakeholders can formulate creative ways of integrating emerging technologies in their strategic plans.

Emerging technologies are a relatively new field in which future scholars can use the findings to expand the information pool on enhancing organizational resilience. Operating cost is the industry's primary challenge, signifying that a broader knowledge pool will empower stakeholders to find creative ways to promote efficiency (Bauen et al., 2020). Therefore, future researchers could, for instance, evaluate strategies in the air transport sector that could integrate the Internet of Things and machine learning applications to improve efficiency and promote safety. The Middle East faces numerous security issues that require increased adoption of emerging technologies to protect critical infrastructure and assets from attacks. The interventions will strengthen the market's attractiveness for investment and preference among passengers. The investigators could focus on the areas highlighted as this study's scope limitations and the methodologies. A broader understanding of the association could strengthen the sector's contribution to the growth of regional economies.

1.5 Methods

The study integrated several methodologies to gather detailed information regarding the contribution of emerging technologies to strengthening organizational resilience in the aviation sector. For instance, it entailed a more focused literature review that included industry reports, peer-reviewed journal articles, white papers, and case studies on AI, ML, IoT, Big Data Analytics, Virtual Reality (VR), and Augmented Reality (AR). Besides, the study adopted a quantitative approach that involved gathering numerical data through surveys, then analyzing it using descriptive and inferential statistics to generate the findings. A case study analysis on the three leading regional airlines provided helpful insights regarding their competitive advantages and shortcomings. The section involved assessing the airlines' business models, strategic advantages and shortcomings that could affect organizational resilience. A combination of outcomes from statistical analysis and the case studies formed the basis for the discussion section on how the airlines are leveraging on emerging technologies. The measures ensured data quality, relevance, and credibility to enhance the generalizability and applicability of the findings. Data analysis followed a structured framework through content analysis to identify ways emerging technologies are helping airlines strengthen their organizational resilience. The methodologies were appropriate for this investigation since the information is publicly available online, meaning it would have been challenging to collect respondents from all airlines in the region using primary qualitative data from interviews data due to the size and geographic factors.

1.6 Thesis Structure

The thesis comprises several logically arranged chapters to hasten identifying and evaluating ways emerging technologies influence organizational resilience. Chapter One provided background information and defined the investigation's scope. Subsequent sections are centered on generating information that facilitates answering the research questions. For instance, chapter two comprises the theoretical, empirical, and conceptual frameworks to understand existing debates regarding the roles of emerging technologies in the aviation sector. It precedes the methodology section that illustrates the approaches the researcher selected to identify, select, analyze, and report the findings. Chapter four discusses the case study background of selected airlines in the Middle East region, including history, operational and strategic overview, and challenges. Chapter five will highlight the empirical findings, focusing on the statistical outcomes of descriptive and inferential statistics based on the information gathered through online surveys. The discussion section will focus on the interpretations of the findings and compare the airlines' performance, while the managerial implications will measure to improve integration. Recommendations, conclusion, and limitations chapters will end the thesis by summarizing the findings and indicating the issues faced during the study. The chapter will further include recommendations for strategies and technologies that airlines can implement to enhance their resilience. A conceptual model will be included to support the suggestions to provide context and capacity to support informed decision-making. The information will be the basis for empowering stakeholders to implement robust measures to capitalize on the emerging technologies.

2 Chapter Two: Literature Review

2.1 Introduction

Emerging technologies are instrumental in fostering improved operational efficiency and performance by reducing operating costs. However, these two aspects are inadequate to achieve sustainable growth since sudden changes in market conditions can erode management effectiveness. Previous investigations have identified organizational resilience as among the critical factors that hasten the achievement of strategic goals. Hence, this chapter reviews existing theoretical models to determine existing knowledge and assumptions to form the basis for identifying the knowledge gap. Besides, it includes the empirical framework that evaluates and compares previous authors' findings, which is critical in understanding the current debates on the topic. Conversely, the conceptual frames define primary organizational resilience concepts, models, and emerging technologies relevant to the air transport industry. The chapter's discussions and findings informed the choice of methodologies and interpretation of findings in the subsequent chapters. Only studies published within the last five years were included in the literature review.

2.2 Theoretical Framework

2.2.1 Organizational Resilience Theory

Lengnick-Hall et al.'s (2011) organizational resilience theory postulates that it is not the types of challenges faced but how entities handle the situation. According to Duchek (2020), the model assumes that management should anticipate potential market adversities and implement sufficient frameworks that hasten response and recovery. Besides, it indicates that attaining competitiveness depends on how entities prepare for and handle challenges. Chen et al. (2021) add that it is based on several concepts, including bouncing back, developable capacity, stable trajectory, and organizational behavior adaptations. The theory further assumes that companies have redundancy systems that allow them to refocus their business model if market conditions become unfavorable. The authors add that resilience empowers organizations with strategic, cultural, learning, and relationship capital to help them overcome adversities (Chen et al., 2021). Therefore, leadership effectiveness depends on how leaders leverage their competitive advantages for sustainable growth.

Organizational resilience theory was appropriate for this research since it illustrates the importance of contingency planning in the air transport industry for sustainable development. The sector faces numerous challenges, including rising fuel costs, pandemics, and security challenges, leading to some airlines permanently ceasing operations. Hence, the model shows that stakeholders can leverage strategic, cultural, learning, and relationship capital to develop responsive models by promoting business continuity. For instance, some airlines, including Emirates, repurposed their passenger planes to carry cargo during the pandemic, which is a profitable venture, especially in transporting vaccines. Therefore, it leveraged its strategic capital, notably the widebody passenger planes, to transport large cargo volumes from manufacturers. Based on this study, airlines could capitalize on the strategic and learning resilience to adopt emerging technologies that will help them overcome contemporary aviation sector issues.

2.2.2 Technology Acceptance Model (TAM)

Fred Davis 1986 TAM suggests that perceived ease of use and usefulness are the primary factors influencing the acceptance of computer systems. The model assumes that a person's perception regarding a specific type of technology mediates the impact of external factors on IT usage behavior (Sagnier et al., 2020). Hence, when management feels that a particular technology would be challenging to use, they are less likely to adopt it since it would be inconvenient. Besides, it implies that decisions to acquire a technology depend on its perceived contribution to improving their lives or business operations. The phenomenon signifies that external variables, including costs, are less considered when making related acquisitions. Sagnier et al. (2020) add that perceived ease of utility and usefulness influence behavioral intention to use based on their understanding. Hence, organizations only acquire a technology when they feel it would positively impact their performance.

TAM's assumptions illustrate the motivating factors behind the global air transport competition as more airlines seek to expand their market share. The emerging technologies present numerous benefits to Middle East aviation stakeholders but have some shortcomings that stakeholders must address. The attribute affirms the model's relevance to this investigation since they indicate that airlines will only embrace the technologies if they feel it would strengthen their global competitiveness. Moreover, they must determine whether their staff have the technical capabilities and skills to operate the AI applications required to maximize their potential. These characteristics may justify why some airlines focus more on budget passenger services while others concentrate on enhancing the travel experience. The differences in business models signify that the technology adoption rates will differ. The

study will seek to evaluate the generalizability of these assumptions by comparing technology adoption between Middle East budget and full-service carriers and how it affects their resilience.

2.2.3 Diffusion of Innovations Theory

E.M. Rogers's 1962 diffusion of innovation theory posits that the speed and pattern through which a new idea and product follow several steps depends on recipient characteristics. According to Sartipi (2020), it assumes that interpersonal contact and media influence participant judgment, opinions, and adoption. People share information to reach a mutual understanding, leading to distinct segments with heterogeneous reactions to innovations. Farajnezhad et al. (2021) add that the primary components and concepts include innovation, adopter categories, diffusion, communication channels, social systems, and time. The speed of adoption depends on the five categories, including innovators, early adopters, early majority, late majority, and laggards. Knowledge, persuasion, decision, implementation, and confirmation are the five diffusion process stages that users follow when embracing innovations. Diffusion of innovation theory acknowledges that motivation for users to acquire new creations depends on information availability and the adopter categories they belong to.

Diffusion innovation theory illustrates the varied pace of adoption of new technologies among the leading Middle Eastern airlines. The theory is appropriate for this research since it indicates that some airlines belong to the early adopters' group by being among the first to embrace innovations to enhance customer experience and operational efficiency. Other providers, mainly budget carriers, use low cost as their competitive advantage, signifying that they may be less motivated to embrace emerging technologies due to the associated initial capital outlay. Moreover, it may indicate that they are still in the persuasion stage of the diffusion process but unable to make a favorable supportive decision to the cost implications. Based on the model assumptions, full-service carriers belong to the early adopters' group since their business models focus on enhancing the passengers' travel experience. Emerging technologies present significant growth potential, but numerous intervening variables influence their contribution towards strengthening organizational resilience among the airlines.

2.3 Empirical Framework

2.3.1 Leveraging Emerging Technologies to Enhance Organizational Resilience

Previous investigations have indicated that air transport industry stakeholders leverage AI to support operational and pricing decisions to boost overall performance. For instance, Kabashkin et al. (2023) found that they use the application to optimize critical activities such as monitoring air traffic, weather conditions, and airport operations to support real-time decisions. Rizk Soliman et al. (2024) concur, adding that the airlines leverage it for predictive maintenance, demand forecasting, chatbots and customer service, and risk management. Besides, the authors noted that it helps enhance cyber security, providing personalized services and supply chain optimization (Rizk Soliman et al., 2024). The two author groups concur that integrating AI into airline operations strengthens their capacity to minimize disruptions and overcome unforeseen challenges. (Kabashkin et al., 2023; Rizk Soliman et al., 2024). Nonetheless, the scholars generalized their findings to the entire air transport industry, meaning the deductions cannot be applied to specific regions due to differences in developmental characteristics. The study addresses the information gap by narrowing the focus to determine ways Middle Eastern airlines leverage air to strengthen their organizational resilience.

The air transport industry is leveraging ML to strengthen organizational resilience by enhancing its capacity to cope with emerging issues and capitalize on market opportunities. Jiang et al.'s (2023) study indicated that stakeholders use the applications to improve customer service and personalization through virtual assistants and chatbots. The author determined that the industry uses the technology to enhance fraud detection and cyber security by detecting patterns and anomalies associated with unscrupulous activities and threats (Jiang et al., 2023). The outcomes concur with Liu et al.'s (2023) finding that it strengthens airlines' adaptive capacity, enhancing risk management mainly through predictions. The two author groups' studies align on the conclusion that ML automates processes and provides valuable information, enhances uncertainty preparedness, and strengthens organizational resilience (Jiang et al., 2023; Liu et al., 2023). This study is based on these findings to investigate how ML helps Middle Eastern Airlines prepare, respond, and adapt to unforeseen market changes.

Past studies have demonstrated that IoT revolutionizes air transport by enhancing resource allocation and promoting operational efficiency. For instance, Dubey et al. (2023) established that it enhances supply chain visibility by tracking the movement of goods from support services providers to airports

to minimize disruptions and ensure the availability of critical components. The findings support Zhao et al.'s (2023) deduction that it boosts predictive maintenance since IoT sensors predict specific components' life spans and enhance energy efficiency. The two author groups agree that IoT is an instrument for automation and remote monitoring of critical air transport sector activities, enhancing resilience by optimizing resource utilizations (Dubey et al., 2023; Zhao et al., 2023). The studies provide helpful insight regarding how organizations leverage IoT to enhance resilience. Nonetheless, their deductions cannot be generalized to this research since it only focuses on the air transport industry with unique characteristics.

Studies show aviation sector stakeholders leverage big data analytics to strengthen organizational resilience through informed and effective decision-making. Mohamed and Al-Azab (2021) determined that the application enhances operational optimization by analyzing large data volumes and creating patterns that allow stakeholders to respond accordingly. The authors add that it enables the sector to enhance customer experience by permitting personalized services and improving performance (Mohamed & Al-Azab, 2021). Alyahya et al. (2023) concur that it enhances strategic agility in creative environments by enabling firms to prepare, respond, and recover from unforeseen market challenges. Alyahya et al.'s (2023) and Mohamed and Al-Azab's (2021) findings align with the conclusion that data analytics provides real-time information to support effective decision-making. The determinations offer valuable insight into how stakeholders leverage emerging technology to strengthen organizational resilience. The study sought to assess the applicability of the findings to the Middle East air transport sector.

The air transport industry is leveraging VR to promote organizational resilience through technical skills improvement and promote aviation safety and security. Jiang et al. (2023) found that it creates a fully immersive training experience during virtual training simulations for the ground staff and the cabin crew, enhancing their preparedness to handle diverse in-flight and airport situations. Marcucci et al. (2022) concur that it enhances resilience by improving learning time and expertise, minimizing disruptions, and promoting operational efficiency. The two author group's conclusions align with the assertion that VR imparts the cabin and ground crew with knowledge of handling diverse situations, including emergency landings and planes with technical issues (Jiang et al., 2023; Marcucci et al., 2022). The phenomenon signifies that VR provides stakeholders with a cost-effective platform to train employees on handling several unforeseen events instead of using actual planes that could expose them to greater risk. The study sought to determine the generalizability of these conclusions to the Middle East air transport sector.

Studies show that airlines are using AR to promote aviation safety through extensive cabin crew training and enhancing situational awareness. For instance, Arjoni et al. (2023) noted that AG composed a training scenario to improve the cabin crews' understanding of aircraft systems, passenger services, and emergency procedures. Houweling et al. (2024) add that the application enhances situational awareness and navigation, for instance, by using Head-up displays to project vital flight information, improving decision-making and safety during flight. The two author groups agree that AR enhances organizational resilience in the aviation sector by preparing pilots for unforeseen situations by providing real-time information regarding flight conditions (Arjoni et al., 2023; Houweling et al., 2024). However, the scholars generalized their conclusions to all airlines, which may not be the case since technologies vary significantly according to the type of services offered. The researcher sought to evaluate the applicability of these findings by conducting a similar investigation targeting the Middle East air transport industry.

2.3.2 Emerging Technologies and Organizational Resilience

ML nurtures a resilient organizational culture by strengthening adaptability, expanding capacity to overcome unforeseen challenges, and promoting innovation. Szukits and Móricz's (2023) investigation demonstrated that the application analyzes large data volumes quickly and accurately to predict future scenarios and identify trends for effective decision-making. Besides, the ease of getting precise real-time information encourages employees to rely on factors rather than assumptions, strengthening their capacity to overcome unforeseen challenges (Szukits & Móricz, 2023). Gligorea et al. (2023) concurs that emerging technologies significantly influence the development of a resilient organizational culture by promoting adaptive learning. Hence, it strengthens the institutional capacity to adapt to the dynamic skill requirements and fosters a continuous learning culture (Gligorea et al., 2023). The studies provide helpful insight regarding ways ML nurtures a resilient culture through informed decision-making. The study investigated the applicability of these findings to the Air transport sector in the Middle East to assess the generalizability of the conclusions.

Past studies have demonstrated that IoT cultivates an organizational resilience culture by enhancing proactive decision-making through availing real-time data and boosting connectivity. For instance, Leso et al. (2023) noted that it continuously evaluates and provides accurate insights regarding customer needs and requests and permits the creation of interconnected and flexible firms' systems. A flexible business model enhances organizational responsiveness to changes in the market environment, strengthening their resilience towards unforeseen issues (Leso et al., 2023). Liu et al. (2022)

concur that it fosters creativity and innovation by providing real-time data that stakeholders need to formulate new strategies to cope with contemporary market developments. The two author groups agree that IoT nurtures a resilient organizational culture by enhancing adaptability and optimizing operations to improve flexibility (Leso et al., 2023; Liu et al., 2022). However, the scholar's studies centered on all organizations, which may not be accurate for individual industries. Therefore, this aimed to determine these conclusions' applicability to the Middle East aircraft transport sector.

Scholars have established that big data analytics fosters a resilient organizational culture by strengthening decision-making and employee performance. For instance, Bahrami and Shokouhyar (2022) noted promoting productivity and supporting supply chain capability by improving information quality and innovative capacity. Organizational performance is an essential resilience component since it ensures the availability of resources to enhance responsiveness to the prevailing market conditions. The deductions align with Cui et al.'s (2022) determination that it fosters creativity and innovation by extracting actionable insights from multiple sources to strengthen enterprises' internal competitiveness. Besides, the authors noted a direct positive correlation between investment in big data analytics and organizational performance (Cui et al., 2022). The two author groups agree that big data analytics is revolutionizing management by increasing the ease at which data from multiple sources can be combined and analyzed to provide valuable insights (Bahrami & Shokouhyar, 2022; Cui et al., 2022). However, none of these studies were conducted in the aviation sector, meaning the deductions cannot be generalized to individual industries. Therefore, this study narrowed its focus to target Middle East air transport stakeholders to assess the conclusions' generalizability.

Previous studies have shown that virtual reality enhances organizational resilience by optimizing aviation student training costs. For instance, Gómez-Cambrónero et al. (2023) established that it permits providing personalized training experiences, which enhances the student's technical skills through experiential learning. Besides, the authors noted that it can be tailored to the trainees' requirements for extended periods to handle diverse flying situations (Gómez-Cambrónero et al., 2023). Dymora et al. (2021) support this perspective, adding that the emerging technology streamlines the pilot training process since it was associated with about 90% correct answers, an increase of approximately 32.7% compared to traditional methods. The two author groups agree that VR enhances organizational resilience by promoting operational efficiency, improving training, and boosting crisis management capacity (Dymora et al., 2021; Gómez-Cambrónero et al., 2023). The phenomenon signifies that VR was associated with an increased likelihood of pilots making the right decisions in varied flying situations, minimizing accidents and potential losses. This study sought to establish the generalizability of the conclusions to Middle Eastern Airlines by conducting a similar investigation.

Augmented reality's instrumental roles in the aviation sector are enhancing passenger experience, cabin crew training, and streamlining maintenance operations. Riegler et al. (2021) found out that it can be used to provide entertainment services for passengers. McGill et al. (2020) conclude that it can enhance passenger productivity by creating a virtual workspace and improving comfort, particularly during long flights. Besides, Hongli et al.'s (2021) study determines that it enhances aircraft maintenance operations by providing technicians with context-aware and real-time information to improve repair accuracy and efficiency. Hongli et al.'s (2021), McGill et al.'s (2020), and Riegler et al.'s (2021) findings imply that AR enhances organizational resilience by strengthening brand loyalty among customers and reducing airline susceptibility to accidents and other aviation issues. Hence, the conclusions provide helpful insights that justify air transport stakeholders' need to integrate AR into their management system. The researcher conducted a similar investigation to determine the applicability of the deduction to the leading Middle Eastern Airlines.

2.3.3 Strategic Recommendations for Integrating Emerging Technologies

Air transport industry stakeholders should establish a clear roadmap that outlines the integration of emerging technologies into the air transport industry. Han and Jeon (2023) found that it allows organizations to detect when there is a change of direction and identify the gap that stakeholders may address to achieve long-term goals. Besides, the authors determined that it enhances the integration of emerging technologies into organizational systems to promote sustainability (Han & Jeon, 2023). Osborne et al. (2021) concur with this viewpoint, adding that it minimizes uncertainty risk by enhancing organizational responsiveness to changes in the market environment. The two author groups agree that organizations should define the gap between the technology adoption status and the future measures they must implement to achieve the desired goals (Han & Jeon, 2023; Osborne et al., 2021). Nonetheless, these studies targeted all organizations, meaning the authors' conclusions cannot be generalized to the air transport sector. This investigation sought to determine the applicability of focusing on the same topic but a different target.

Research and development (R&D) is a proactive strategy that air transport industry stakeholders should adopt to strengthen organizational resilience and promote long-term growth. A study by Weiyu et al. (2022) indicates that R&D expenditure positively correlated with improved economic performance and long-term growth by fostering technical innovation. Sarpong et al. (2023) add that it supports creating sustainable, sophisticated innovations that enhance organizational competitiveness. Sarpong et al. (2023) and Weiyu et al. (2022) agree that R&D strengthens organizational resilience and

capacity to mitigate uncertainties by providing creative solutions for issues faced. The findings provide valuable insight regarding the potential benefits that air transport industry stakeholders could realize by investing in R&D to facilitate the integration of emerging technologies. The primary assumption is that the investment will empower firms to identify creative ways to maximize the impact of AI applications on organizational resilience. The study aimed to assess the applicability of these deductions by focusing on Middle Eastern Airlines.

Previous investigations have demonstrated that collaboration between air transport industry stakeholders ensures a unified and coordinated approach to integrating emerging technologies. For instance, Saghafian et al. (2021) established that the level of knowledge creation and sharing influences organizational readiness to adopt new technologies and strengthen resilience. The authors add that it facilitates knowledge transfer, which is critical in establishing industry-wide standards by removing barriers limiting industry-wide capacity to mitigate adoption challenges (Saghafian et al., 2021). Hindi and Frenkel (2022) agree that external collaborations in developing sustainable innovation in technology companies increase their revenue performance. The two author groups agree that collaboration enhances organizational resilience by boosting financial performance and aiding the establishment of industry-wide standards to guide the integration of emerging technologies (Hindi & Frenkel, 2022; Saghafian et al., 2021). Despite the effectiveness in justifying the importance of collaboration, the reviewed studies focused on non-aviation sector firms. This research aimed to address the issue by investigating the generalizability of the authors' assertions to the Middle Eastern Airlines case study.

Technology integration in aviation systems has coincided with a growing threat of cyberattacks that can disrupt operations, creating security and safety incidents. Therefore, air transport industry stakeholders should strengthen their cybersecurity mechanisms to reduce susceptibility to attacks and boost organizational resilience. Berlilana et al. (2021) determined that the frequency and severity of cyberattacks increase and that adopting robust defensive measures strengthens organizational security performance. Saeed et al. (2023) contend that emerging technologies such as big data analytics, AI, cloud computing, and blockchain have increased cyber-security risks for organizations undergoing digital transformation. The two author groups agree that the sustained integration of emerging technologies predisposes organizations to cybersecurity challenges that stakeholders must mitigate to reduce exposure (Berlilana et al., 2021; Saeed et al., 2023). However, the deductions cannot be generalized to the air transport industry since they were generalized to all organizations. The investigator addressed the information gap by conducting similar research focusing on strategic recommendations for Middle Eastern airlines.

Air transport industry organizations should integrate emerging technologies with employee upskilling and training to ensure they have sufficient human resources capacity to manage the systems. Beichter and Kaiser (2023) determined that upskilling strengthens organizational resilience by maintaining future viability and employee innovativeness. The authors added that technological change and emerging technologies are the primary drivers for new managerial skills and the need to promote employee preparedness for new tasks (Beichter & Kaiser, 2023). Farias and Resende (2021) concur with this viewpoint, adding that training broadens employees' skills and competencies, enhances new technology acceptance, and empowers them to contribute significantly to integration. The two author groups agree that upskilling and training promote organizational resilience by imparting employees with new knowledge that could nurture creativity and boost organizational performance. (Beichter & Kaiser, 2023; Farias & Resende, 2021). The studies are informative about the strategies organizations can employ to encourage integrating emerging technologies. Therefore, this study sought to establish the findings' generalizability to the Middle Eastern airlines case.

Air transport industry stakeholders should enhance passenger experience by improving safety, comfort, and convenience. De Cosmo et al. (2023), in their investigation, found that the quality of flight services positively influences passenger satisfaction and brand loyalty. The authors further established that the two performance indicators positively correlated with improved revenue performance, which avails financial resources needed to fund the integration of emerging technologies (De Cosmo et al., 2023). The findings align with Sumitha and Santhosh's (2023) assertion that customer feedback significantly influences the adoption of AI-driven solutions. The two author groups agree that passenger experience can be an information source regarding the emerging technologies to adopt and strengthen the organizational capabilities to implement supportive infrastructure (De Cosmo et al., 2023; Sumitha and Santhosh, 2023). Nonetheless, the authors generalized their findings to the entire air transport industry. This study evaluated the applicability of these deductions by investigating ways Middle Eastern aviation stakeholders can capitalize on passenger experience to enhance emerging technology integrations.

Past scholars recommend that aviation sector stakeholders seek regulatory compliance and certification to establish standards and guidelines to ensure the integration of secure and safe emerging technologies. For instance, Freij (2022) argued that regulations promote better product understanding by demanding content transparency. Besides, the author notes that firms can integrate regulatory requirements into their products as part of a solution for a company's customers (Freij, 2022). Other studies indicate that increased adoption of emerging technologies can enhance compliance by automating associated processes, including monitoring and reporting through real-time analysis of large

data volumes (Li et al., 2023). The two author groups agree that regulatory compliance can enhance emerging technologies by minimizing exposure to legal liabilities while facilitating adherence (Freij, 2022; Li et al., 2023). The findings provide helpful insight regarding the relationship between compliance and increased adoption. The study sought to establish the applicability of these deductions to Middle Eastern airlines.

Investing in connectivity, including high-speed internet, will empower air transport Middle Eastern airlines' stakeholders to capitalize on emerging opportunities while optimizing the risks. According to Rocha and Kissimoto (2022), emerging technologies such as AI and IoT require high-speed connections to function optimally. Due to limited capacity, the air transport stakeholders may not achieve their desired performance and efficiency goals. Chen and Wang (2023) add that high-speed internet promotes innovation and adoption of emerging technologies by enhancing connectivity between devices and communication, boosting efficiency. For instance, air transport industry stakeholders are more likely to integrate emerging technologies if internet connections are cost-effective and offer better speeds. Besides, a high internet speed enhances access to information and user experience and permits the adoption of smart devices. A continued improvement in internet infrastructure will accelerate innovation and adoption of emerging technologies.

2.4 Conceptual Framework

2.4.1 Organizational Resilience and its Components

Organizational resilience is a reactive approach to sustainable growth that describes the capacity to recover after a disaster instead of resistance to an anticipated event. It represents a company's ability to effectively absorb and formulate situation-specific reactions and undertake transformative activities to exploit the disruptive surprises that threaten survival (Wut et al., 2022). The phenomenon signifies the capacity to self-renew through innovation, promoting sustainability. Evenseth et al. (2022) add that it is a company's incremental capacity to forecast and adjust to market environment changes, minimizing the risk of minor issues escalating into a full-blown breakdown. Therefore, a management strategy involves building organizational capacity to survive specific problems instead of preventing them. The model assumes that some challenges cannot be prevented, but it is a leadership responsibility to optimize the adverse impact while capitalizing on the opportunities.

Leadership and governance are organizational resilience components that emphasize nurturing a supportive culture. It involves the manager defining the measures, prioritizing activities, allocating appropriate resources, and making critical decisions that provide direction. Ayoko (2021) posits that leadership buffers the uncertainty and stress associated with crisis, turbulence, and disruptions, enabling managers to focus on decisions that minimize the associated impacts. Pavarin et al. (2022) add that governance entails implementing appropriate frameworks to ensure that organizational processes generate results that meet stakeholders' needs and efficiently utilize scarce resources. For instance, Leadership and governance influenced Emirates Airways' decision to convert passenger planes into cargo carriers during the COVID-19 pandemic. The response ensured the aircraft could still generate revenues by transporting vaccines from manufacturers to the markets when passenger volumes significantly dropped. The leadership and governance model are centered on promoting effective decision-making.

Risk management is an organizational resilience component that entails identifying, evaluating, and managing threats to understand their impacts on operations, stakeholders, and reputation. The outcomes guide the implementation of appropriate mitigation strategies to minimize exposure and increase survival likelihood (Dahmen, 2023). Therefore, it entails strengthening the institutional capacity to overcome disturbances and stress by maintaining the functionalities that stakeholders need to ensure survival. The author adds that the components comprise three functionalities: the ability to resist unfavorable situations, recover after disturbances, and resume normal operations (Dahmen, 2023). The description demonstrates that risk management can be a proactive and a defensive strategy for promoting organizational resilience by enabling stakeholders to make informed decisions before, during, and after disasters. For instance, Middle Eastern Airlines determines that passenger volumes may drop and then repurposes their planes to carry cargo, a service whose demand is rising in the region. Risk management is a survival strategy intended to reduce a firm's exposure to collapse in the face of adversities.

Crisis management and response is a leadership function establishing processes and procedures to respond decisively to crises and emergencies. Mokline and Ben Abdallah (2021) opine that a business continuity function addresses crisis-related damage while restoring critical organizational operations quickly to mitigate adverse impacts. The resilience component's effectiveness depends on the capacity to identify and evaluate the effect of disruptive events and prepare for them by adjusting procedures and operations to promote flexibility. For instance, Middle Eastern airline stakeholders can activate emergency response teams, establish clear roles and responsibilities, and communicate and coordinate response efforts to mitigate the associated impacts. Therefore, it prepares organizations for the

'worst case scenario' by hastening recovery, implementing tailored solutions that minimize exposure, and maximizing survival chances. The phenomenon signifies that crisis management and response are organizational resilience components for disasters that stakeholders cannot prevent but instead adjust.

Employee engagement strengthens organizational resilience by nurturing a collaborative, adaptable, and innovative employee pool that increases the capacity to recover from setbacks. The component minimizes resistance to change, fostering innovation acceptance, strengthening loyalty and dedication to the company, and strengthening optimism, self-efficacy, and well-being (Prayag et al., 2023). The authors add that engaged employees support organizational resilience by positively responding to crises and maintaining optimal performance despite the stressful work environment (Prayag et al., 2023). For instance, natural disasters can disrupt business operations, affecting revenue performance and an airline's ability to mitigate obligations, which employees can help mitigate by suggesting new ideas and improving productivity. Middle Eastern air transport industry stakeholders can nurture an engagement culture through regular communication and feedback soliciting, empowering them to make decisions and creating learning opportunities. Organizations can strengthen resilience by communicating in advance to boost employee willingness to support management initiatives.

Learning and continuous improvement enhance organizational resilience by promoting adaptation to change and boosting innovation and creativity. Evenseth et al. (2022) postulate that it empowers entities to adjust to emerging risks, new circumstances, and evolving market needs. The authors add that it can encourage employees of air transport to explore new ideas and approaches to develop innovative solutions to emerging issues and boost organizational resilience (Evenseth et al., 2022). Douglas and Haley (2024) add that it optimizes resource utilization, enhances risk identification and mitigation, nurtures a culture of adaptability, enhances employee problem-solving skills, and fosters strategic decision-making. The benefits signify that learning and continuous improvement are integral to organizational resilience, strengthening organizational capacity to survive varied market conditions. Middle Eastern airline stakeholders should prioritize it to boost industry resilience and thrive in the competitive, uncertain, dynamic business environment.

Middle Eastern airlines should undertake community engagement to boost organizational resilience by building stakeholder relationships and trust to promote collaboration. According to Cherry et al. (2022), it builds local social capital by fostering cooperation and goodwill. During crises, the network can provide assistance, support, and resources, strengthening capacity to withstand market adversities. The authors add that it enhances access to resources and expertise, enabling airlines to capitalize on local skills that support efforts in responding to and recovering from disruptions (Cherry et al.,

2022). For instance, regional airlines can exploit local aviation expertise and resources to sustain operations when foreign maintenance services are unavailable, taking the COVID-19 period cases as an example. Besides, it allows entities to win stakeholder support and advocacy, which is critical during crises to bolster organizational resilience. Community engagement can enhance organizational resilience by promoting adaptive capacity and innovation, as stakeholder feedback helps identify new approaches, ideas, and solutions to emerging issues.

Financial resilience enhances organizational capacity to withstand market adversities by strengthening liquidity minimizing default and capital flight risk. El-Chaarani et al. (2023) contend that crisis periods are characterized by supply shocks limiting equity capital inflow and demand shocks increasing defaults caused not a higher proportion of non-performing loans. The authors add that a high liquidity position in the Middle East and North African (MENA) region improved banks' financial performance and minimized insolvency risks (El-Chaarani et al., 2023). The situation is similar to the air transport industry since it is capital-intensive, as airlines have more considerable debt to sustain their operations. For instance, maintaining a favorable liquidity position will ensure that airlines have adequate fuel and labor supply to execute the numerous functions that insolvency issues could otherwise derail. Financial resilience promotes long-term growth by strengthening capacity to mitigate short-term cash-flow problems.

2.4.2 Organizational Resilience Models

The organizational resilience model highlights how entities can adapt and respond to adversities, challenges, and uncertainties while maintaining their core objectives and functions. According to Chen et al. (2021), the theory's three components include leadership and strategy, culture and behaviors, and preparedness and managing risks for sustainable performance. Besides, the model suggests that the stakeholder behaviour for enhancing organizational resilience should include being adaptive and flexible, inclusive, and collaborative, resourceful, innovative, creative, and preparedness (Chen et al., 2021). It considers organizational resilience multi-level and emphasizes managing risks and uncertainties. The characterization signifies that the model emphasizes resourcefulness and redundancy, learning and reflection, and stakeholder engagement as a basis for continuous improvement. Organizational resilience theory provides a comprehensive framework for understanding how the Middle Eastern air transport industry builds and maintains resilience capabilities that enable them to thrive even during crises.

The business continuity management model is a holistic approach to identifying potential organizational threats and implementing appropriate measures to sustain operations before, during, and after crises. Fani and Subriadi (2019) postulate that it provides a structural framework for formulating, executing, and maintaining a business continuity program to promote long-term survival and growth. The authors add that a business continuity plan creates measures to sustain business activities and ensure that vital functions will be available for customers and suppliers, hastening the return to normal operations (Fani & Subriadi, 2019). The model can be applied to the COVID-19 period, in which airlines resorted to cargo while others slashed the scale of their operations to minimize costs and enhance recovery. Therefore, a business continuity plan is essential to management's commitment to long-term growth and sustainability. The model improves organizational resilience by cushioning some operations from external shocks.

Dave Snowden's and Cynthia Kurtz's Cynefin framework is a model that guides individuals and organizations on ways to understand and respond to complex situations. According to Nachbagauer (2021), it categorizes issues due to their severity and ease of mitigation, enabling stakeholders to prioritize effectively. Simple challenges are predictable and have a clear cause-effect relationship, signifying that they require straightforward solutions through identifying patterns and applying known solutions (Nachbagauer, 2021). Nachbagauer (2021) adds that the second level comprises complicated issues in which the cause-effect relationships are not apparent, thus requiring analysis, expertise, and research to identify the solutions. In complex problems characterized by uncertainty, emergent behaviour, and interconnectedness, the cause-effect relationships can only be determined retrospectively (Nachbagauer, 2021). Chaotic disorders require immediate solutions to stabilize since the situation may be rapidly changing and unpredictable. Disorder is the most severe problem associated with confusion and ambiguity, necessitating gathering detailed information to understand the situation and respond accordingly. The Cynefin framework is descriptive, helping air transport stakeholders to understand the nature of their challenges and the appropriate interventions.

The resilience engineering framework is a model stakeholders use to understand and enhance survival capacity in complex socio-technical environments by assessing the interaction between a system's elements. Tasic et al. (2020) contend that it comprises four dimensions, including anticipation, that entails proactive identification and evaluation of potential hazards, risks, and opportunities. It aims to understand ways entities anticipate and prepare for multiple scenarios and detect and respond to early warning signs of possible adversities. The second dimension entails understanding how companies monitor and track system parameters to identify anomalies and maintain situational awareness

(Tasic et al., 2020). The third aspect is the response, which describes stakeholders' actions after identifying specific issues to manage and mitigate potential disruptions (Tasic et al., 2020). Learning is the fourth dimension that involves entities using their failures and successes as the bases for improvement and strengthening capabilities over time. The resilience engineering framework can be used to promote organizational resilience since it can allow air transport stakeholders to identify their strengths and vulnerabilities and implement appropriate recovery strategies.

Dynamic capabilities framework is a theoretical model used to understand ways companies can adapt, innovate, and sustain their internal competitiveness in an uncertain and dynamic market environment. According to Ellström et al. (2021), it emphasizes the institutional ability to detect external environment changes, seize opportunities, and reconfigure its internal resources and capabilities to respond accordingly. The authors add that the model's primary dimensions include sensing, seizing, and reconfiguring, which are cyclical, considering the continuous changes in market environment conditions (Ellström et al., 2021). The phenomenon signifies that air transport organizations should allocate sufficient surveillance resources to strengthen their situational awareness and ability to promptly respond to emerging challenges and opportunities. Besides, the model emphasizes agility, adaptability and flexibility, enabling Middle Eastern airlines to thrive in the dynamic and uncertain market environment. The dynamic capabilities framework suggests that organizations can sustain their competitive advantages by strengthening their ability to continuously sense, seize, and reconfigure their resources in response to external pressures.

Hollnagel's, Woods's, and Leveson's resilience cube model is a theoretical framework that organizations use to conceptualize and assess survival ability in multiple contexts. Yu et al. (2023) opine that the response dimension encompasses organizational and system capacity to detect, diagnose, and address crises in real-time through decision-making, communication, problem-solving, and resource allocation. The authors add that recovery is the second aspect that involves repairing damages and restoring lost functions to return to normalcy after a crisis (Yu et al., 2023). Robustness is the final dimension covering a system structure's strengths, redundancy, and durability, including fail-safe mechanisms and engineering design features (Yu et al., 2023). The theory suggests that Middle Eastern airlines can strengthen their resilience by supporting response, recovery, and robustness capabilities to survive in the highly dynamic and competitive air transport industry. The resilience cube model guides the identification of strengths, weaknesses, and opportunities for improvement to strengthen stakeholders' ability to formulate effective survival strategies.

The integrated organizational resilience model (IORM) is a framework that guides ways organizations should strengthen their preparation, response, and recovery for business disruptions. Duchek (2020)

denotes that cognitive resilience is centered on strengthening stakeholders' ability to cope with adversity and maintain mental well-being to hasten recovery from setbacks. The author adds that behavioral resilience is the second dimension that ensures the effective utilization of available resources and appropriate decisions to minimize organizational exposure to adversities (Duchek, 2020). Conversely, contextual resilience refers to environmental conditions affecting the institutional ability to anticipate, respond to, and recover from catastrophes (Duchek, 2020). The model provides a structural and holistic framework, enabling firms to build and strengthen their resilience capabilities. The globalized market environment signifies that air transport stakeholders must adopt robust measures that enhance their competitive advantages. Middle Eastern airlines can use the IORM to boost industry-level responsiveness to changes in market conditions.

3 Chapter Three: Research Methodology

The study investigated organizational resilience in the air transport industry through emerging technologies, focusing on Middle Eastern airlines. Hence, an in-depth and focused selection of methodologies was appropriate to address the specific objectives. The chapter illustrates the choices and justifications to ensure that the selected method contributed significantly towards generating the needed information. The primary subheadings include the research design, data gathering techniques, sampling methods and participant size. The chapter concludes with a description of the data analysis and presentation techniques. The methods comply with established ethical standards in the institutional review board to affirm the outcomes' reliability and validity. Besides, the adherence aimed to improve effectiveness in addressing the research problem and confirm this investigation's contribution towards expanding the knowledge pool on organizational resilience among Middle Eastern airlines.

3.1 Research Design

The study utilized a quantitative research design using numerical primary data from the respondents to understand organizational resilience in the air transport industry. According to Barroga and Matanguihan (2022), it entails a systematic investigation that quantifies variables to establish relationships between them using statistical methods to conclude. The authors add that the findings are reported in a structured format to facilitate review, interpretation, and information dissemination to relevant stakeholders (Barroga & Matanguihan, 2022). Besides, it uncovers trends and derives overarching insights regarding a research problem to inform effective decision-making. The research design choice influenced the selection of data gathering and analysis techniques since it requires information in a numerical format to support statistical analyses. It affects the sampling method and respond size requirements since large sample sizes are necessary to draw statistically significant inferences. Quantitative research was instrumental in understanding the relationship between emerging technologies and organizational resilience.

The quantitative research approach was appropriate for this study due to the objectives and the target population characteristics. It facilitates collecting accurate and reliable data, is cost-effective and time-saving, eliminates respondent and selection biases, and permits using multiple statistical methods to answer the research problem (Barroga & Matanguihan, 2022). Besides, the Middle East is a larger area that would erode data collection feasibility using qualitative methods such as interviews. The region

is extensive, with numerous air transport sector stakeholders that may not be accessible using other methods. Nonetheless, the research acknowledged that the approach provides a less detailed picture of the motivations, thoughts, and drivers influencing the participants' perspectives. It did not allow the research to seek follow-up information that would have provided context to the gathered data. Despite the shortcomings, the research selected a quantitative approach since the study was centered on understanding the relationships between emerging technologies and organizational resilience.

3.2 Data Collection Methods

The study utilized online surveys, the primary data collection methods, targeting air transport stakeholders among Middle Eastern airlines. The technique involved creating a questionnaire in line with the research questions and then uploading it to web-based vendors for distribution to respondents (Singh & Sagar, 2021). Singh and Sagar (2021) add that it begins with defining the specific objectives, identifying potential vendors, designing the survey, conducting a pilot study, distributing the questions, and monitoring the responses. The research uploaded the instruments to introduce screening questions to ensure that only the air transport stakeholders who met the inclusion criteria were permitted to complete the study. The following are the screening questions the survey used in selecting participants.

1. Which of the following industries best describes your profession?
2. In which region are you based?
3. Which of the following age groups do you associate with?
 - a. Below 18 years
 - b. Above 18 years

The web-based surveys were ideal for this research due to the participants' geographical distribution and the need for a large sample size to increase the chances of statistically significant outcomes. According to Nayak and Narayan (2019), the technique is cost-effective when targeting large sample sizes, supports real-time data analysis, is convenient, and is associated with a minimum error margin. Nevertheless, the authors note that it has questionable data reliability, and the numerous questions may limit respondent cooperation, increasing the cases of incomplete responses (Nayak & Narayan, 2019). The research mitigated the shortcomings by keeping the surveys short and concise to minimize

instances of participants losing interest. Besides, a brief consent form was included in the questionnaire to ensure respondents understood what the study was about and their potential contributions to addressing the knowledge gap on organizational resilience. Data from the vendors was cleaned and entered a statistical program for subsequent analysis and reporting.

3.3 Sampling and Participants

3.3.1 Sampling Technique

A stratified sampling technique divided the respondents into admin/management, flight/cabin crew, and ground staff. The three groups comprised the strata containing homogeneous characteristics from which respondents were randomly selected to participate (Lynn, 2019). The study assumed that members of each group had similar roles, exposing them to the same emerging technologies and understanding of organizational resilience. Besides, no category was allowed to have more than 50% of the participants, signifying that some stakeholders were blocked after the set quota was reached. For instance, the option cabin crew was addressed to the screening list after the proportion reached 35% to increase the chances of getting representative results. Lynn (2019) adds that the method is ideal for heterogeneous populations to increase the ability to generate generalizable findings. Stratified sampling techniques helped expound the unique differences among the respondents and form the basis for statistical analysis to establish whether the participants' mean differences were statistically significant based on their occupations.

The choice of stratified sampling technique was attributed to improved respondent representativeness and a higher likelihood of getting valid results. According to Lynn (2019), it increases precision, minimizes bias, is cost-effective, and improves data quality. Hence, it was appropriate for this investigation to establish whether there was a statistically significant relationship between emerging technologies and organizational resilience among the regional airlines. However, the authors note that the method was time-consuming and required advanced statistical techniques to analyze the data (Lynn, 2019). Selecting relevant strata groups took longer than expected, causing the researcher to rush on to other research activities. The researcher addressed the shortcoming by adopting a time-saving and cost-effective data-gathering technique to mitigate the impact of delays in respondent selection. The approach was selected since its precision and improved data quality advantages outweighed its resource requirement shortcomings.

3.3.2 Sample Size Determination

The investigation utilized the following sample size determination formulation since the target population was unknown. The number of stakeholders was estimated to be more than 10,000. Equation 1 highlights the formula used.

$$\text{Sample Size} = \frac{Z \text{ Score}^2 \times \text{StdDev} \times (1 - \text{StdDev})}{\text{Confidence Interval}^2}$$

The researcher chose a 95% confidence interval, meaning the margin of error was capped at ± 5 and the Z-score set at 1.96. Therefore, equation 2 illustrates the procedure followed in determining the sample size.

$$\text{Sample Size} = \frac{1.96^2 \times (0.5 \times 0.5)}{0.05^2}$$

$$\text{Sample size} = \frac{0.9604}{0.0025}$$

$$\text{Sample Size} = 384.16$$

Therefore, the study's sample size was 385 participants. Table 1 illustrates the target sample size for each stratum based on the overall respondent size.

Table 1: Sampling frame

Strata	Projected Frequency (f)	Projected percentage (%)
Admin/Management	97	25.2%
Ground Staff	154	40%
Flight/Cabin Crew	134	34.8%
Total	385	100%

Source: Sampling method

3.4 Data analysis techniques

Descriptive statistics formed the firm segment of the data analysis activities. The researcher sought to characterize the data by identifying patterns and summarizing the results to pave the way for detailed inferential statistics. The primary measures include frequencies, percentages and standard deviations to understand the distribution of responses and the participants. For instance, mean and standard deviation were used to identify the aspects of the questionnaire that the respondents supported most and those they did not based on their levels of agreement. The questionnaire followed a 5-point Likert scale model, in which participants were required to strongly agree, agree, remain neutral, disagree, or strongly disagree. The levels of agreement for each variable were analyzed using descriptive statistics and presented using tables and charts. A short description of the findings followed each graphical representation to facilitate interpretation and reporting. Labels were placed on top of each illustration for reference purposes.

Inferential statistics comprised the second set of analyses and sought to establish whether there were statistically significant associations between emerging technologies and organizational resilience. T-test analyses and analysis of variance (ANOVA) were used to establish whether the mean difference in aviation sector stakeholders' demographic characteristics was statistically significant. The difference was that T-tests were used for variables with two factors, such as gender, while ANOVA was used for those with three or more aspects, including occupation, experience level, and educational attainment. The researcher further performed multiple linear regression analysis to determine whether emerging technologies significantly predicted organizational resilience among air transport stakeholders. Besides, Pearson moment correlation analysis was used to evaluate the strengths of the association between emerging technologies and organizational resilience. A significance level of less than 0.05 at a 95% confidence interval indicated a statistically significant relationship. The four inferential statistics helped answer the research questions and affirm the investigation's considerable contribution towards expanding the knowledge pool on organizational resilience.

The data collection and analysis procedures followed the institutional review board recommendations to affirm the outcomes' validity, credibility and generalizability. The questionnaire did not collect identifiable information to protect respondents' anonymity. Besides, it included a short consent form, which the participants were required to reach and indicate whether they accepted the terms before proceeding. The investigator disabled the vendor feature that automatically gathered respondents' internet protocol (IP) addresses to protect their identities against third-party access. Participation was

by free will, and respondents who felt uncomfortable answering the questions had the right to discontinue their participation. The phenomenon signifies that no one was coerced or motivated to participate using financial motivations to affirm data validity and credibility. The collected information was then encrypted and safely stored to facilitate analysis and reporting. Measures were taken to ensure the respondents' participation did not predispose them to physical and psychological harm. The data would be discarded after the research's approach to avoid its use to aid a malicious agenda.

3.5 Research Strategy

This study utilized a case study strategy to hasten collecting detailed data regarding the association between emerging technologies and organizational resilience among Middle Eastern airlines. According to Priya (2021), entails studying phenomenon in real-life contexts within a specified periods. The strategy was appropriate for this investigation since it allowed the investigator to explore in detail how emerging technologies are affecting organizational resilience among the regional airlines. Besides, the flexibility in supporting multiple research methodologies helped to establish relationship between phenomenon. For instance, understanding the association between AR, VR, IoT, and big data analytics on organizational resilience can promote informed decision making. Case study research strategy was helped collect detailed data that enhanced effectiveness in addressing the research problem.

3.6 Expected Outcomes

The researcher anticipated that there would be a statistically significant relationship between emerging technologies adoption and organizational resilience. On objective one, it was expected that Middle Eastern airlines are leveraging on emerging technologies to improve safety, promote operational efficiency, enhance cabin crew training, and improve customer satisfaction. The strategic recommendation would include increasing emerging technologies adoption and tailoring them to the business model and objectives, improving internet connectivity, and strengthening cyber defenses. The study anticipated the outcomes would be concur with those in the literature review.

4 Chapter Four: Case Study Background of Leading Middle Eastern Airlines

4.1 Introduction

This research investigated emerging technologies' influence on Middle Eastern Airlines' organizational resilience. Therefore, this chapter provides an in-depth review of the three largest national airlines in the region, including Emirates Airways, Qatar Airways, and Saudia Airways. The discussion focuses on their history, background, organizational and strategic overview, and organizational resilience-related challenges. The outcomes will inform a comparative analysis of the four entities, focusing on how they use emerging technologies to strengthen their global competitiveness. Besides, the researcher compares this chapter's results with those from statistical primary data analysis to determine whether they concur or differ. The investigator chose one airline from each of the leading in the region to ensure that there were representatives.

4.2 Brief history and background Airlines

4.2.1 Emirates Airways

Dubai government established Emirates Airline on March 25, 1985, as the United Arab Emirates' first flag carrier. According to Guruprasad et al. (2019), its first flight was between Dubai and Karachi before making second and third flights to Mumbai and Delhi. The authors add that its founding began with establishing the Dubai National Air Transport Association (DNATA) in 1959, then the Dubai government gave it a \$10 million grant (Guruprasad et al., 2019). The first two planes were leased from the Dubai royal family and another from Pakistan, a Boeing 373-300, before later expanding the fleet as it captured more regional market share. Besides, Pakistan International Airlines provided technical and administrative assistance, which helped Emirates Airways overcome the human resources challenges. The humble beginnings provided a solid foundation for the establishment of the largest airlines in the world based on aircraft fleets, passenger numbers, and cargo volume.

The company began as a regional airline connecting passengers within the Middle East, Indian sub-continent, and Asia. The Royal Family's condition for its founding was to operate without government

subsidies after the \$10 million grant. Guruprasad et al. (2019) note that the business model was successful since, within the first year, it had carried about 10,000 tons of cargo and 260,000 passengers. The airline expanded rapidly by adding new aircraft and destinations, including introducing long-haul flights like the 2004 non-stop flight to New York (Mathe et al., 2019). The airline sustained the trajectory to become the largest single operation of Boeing and Airbus flights, which boosted its passenger and cargo volume, enabling it to maintain growth and profitability. Its success is primarily due to its innovative business strategy and exemplary leadership, which has elevated it among the largest global airlines. It has also received several awards for its services and performance.

Emirates Airways' operational and strategic plan seeks to enhance efficiency, improve travelers' in-flight services, and expand global presence to improve their experience. Al-Kwafi et al. (2020) posit that it ranked 1 in the 2016 global customer ranking for having the world's best in-flight entertainment. The authors add that the airline regularly upgrades its fleet to improve operational efficiency since newer aircraft are more fuel-efficient than the older models (Al-Kwafi et al., 2020). Besides, the fleet expansion is core to its strategy of reaching more destinations in different nations to grow its market share and reinforce its global competitiveness (Al-Kwafi et al., 2020). Therefore, earning recognition for the most luxurious travel experience signifies that it targeted the high-income consumer segment. Availability in multiple locations and operating a fuel-efficient fleet aims to reduce operating costs and promote economies of scale, which are critical for sustaining profitability.

Organizational resilience-related challenges facing Emirates Airways relate to its business model and geographical location in a volatile region. The focus on premium travelers and investment in significant aircraft acquisition and integration of the latest technologies have led to a high operating cost (Guruprasad et al., 2019). The strategy predisposes it to market volatility, especially during economic downturns such as recessions and COVID-19. Guruprasad et al. (2019) add that the airline operates from a single hub, which increases susceptibility to significant disruptions, considering that it operates in a politically unstable region. The reliance on high-yielding customers increases its susceptibility to fluctuations in the global economy since income changes affect demand for luxury services. Besides, the dependence on Dubai International Airport signifies that disruptions could derail its operation, limiting its capacity to compete against other established airlines. Seeking an alternative hub and integrating low-cost carrier services could enhance Emirates Airways' organizational resilience.

4.2.2 Qatar Airways

The Qatari Royal Family founded Qatar Airways in 1993 and began operations in 1994 with its hub in Doha. According to Chiambaretto and Wassmer (2019), the airline did not own a single aircraft or staff and chose to wet-lease the first flights. The strategy slowed its growth plan for the first four years, leading to major reorganization as it sought to reorganize itself in the global aviation industry. The authors add that the efforts included suspending about 50% of its routes, halting expansion, and shifting from a point-to-point to a hub-and-spoke system (Chiambaretto & Wassmer, 2019). The downscaling helped it optimize revenue performance to ensure business sustainability as it faced stiff competition from other regional and global airlines. The State of Qatar acquired a 50% stake, while the remaining is under the Royal family and other private investors. The reorganization was successful as the airline rapidly expanded in number of destinations, passenger traffic, and fleet sizes.

The state-owned national carrier operates as a subsidiary of the Qatar Airways Group, with a global network offering cargo and passenger services. The airline changed its business model and focused on improving the quality of services, fleet size, and destinations to expand its global competitiveness. A 2021 report indicates that the strategy was successful since Skytrax recognized it as the airline of the year for its exemplary services (Sivasundaram and Fazil, 2023). Besides, it won World's Best Business Class, World's Best Business Class Airline Lounge, Best Airline in the Middle East, World's Best Business Class Onboard Catering, and World's Best Business Class Airline Seat awards in 2021 (Sivasundaram and Fazil, 2023). The acquisition of wide-body long-haul airplanes enabled it to expand its route coverage, including multiple cities in Australia and New Zealand (Baxter, 2023). The performance signifies that Qatar Airways has sustained expansion of its operations as a strategy to capture a large global market share.

The airlines' operational and strategic overview is based on a hub-and-spoke network that promotes efficient resource utilization and enhances connectivity and economies of scale. Sivasundaram and Fazil (2023) postulate that focusing on service quality has improved customer satisfaction and loyalty, especially among business travelers. Atalık et al. (2019) concur that service quality factors such as seat comfort, staff service, food and beverages, and entertainment positively influence the customers' perception of value for money regarding the Qsuite. The business model is appropriate for Qatar Airways since it combines low-cost and full-service carrier packages, signifying that it must continuously improve the quality of its services to maintain profitability. Besides, it gives the airline a strategic advantage since it reduces susceptibility to market volatility as the low-cost segment will sustain the

income stream. The strengths enhance the airlines' organizational resilience, critical for surviving the highly dynamic aviation industry.

Middle East geopolitical tensions pose a significant challenge to Qatar Airways' organizational resilience since they have caused disruption of operations and a decline in flight traffic. The 2017 Qatar blockade by Bahrain, Saudi Arabia, Egypt, and the United Arab Emirates blocking airspaces against flights to and from Doha adversely affected airline operations (Albasoos et al., 2021). Albasoos et al. (2021) add that the incident forced the rerouting of planes through Iran and Turkey, leading to the grounding of 50 daily flights and an 18% decline in seating ability. Qatar's central location in the Gulf Cooperative Council (GCC) and operations from a single hub in Doha exacerbated the situation by reducing the airlines' regional market share. The geopolitical challenge adversely affected Qatar Airways' organizational resilience, and its reoccurrence could further erode its global competitiveness due to a decline in flight traffic and destinations served.

4.2.3 Saudia Airways

A royal decree of King Abdulaziz Ibn led to the 1945 establishment of Saudi Arabian Airlines, later changing its name to Saudia. The first plane, the Douglas DC-3 Dakota, was a gift from U.S. President Roosevelt and was used in domestic flights between Dhahran, Riyadh, and Jeddah before expanding the fleet to four (Saudia Airlines, 2022). In 1946, it requested charter flights to London before adding two more Dakotas and commencing regional flights in 1947 (Saudia Airlines, 2022). The airline continued to expand its fleet size, routes, and destinations, capitalizing on the Hajj and Umrah Pilgrimage. The phenomenon signifies that its initial focus areas were Muslim-dominant countries, enabling it to capitalize on the vast number of passengers during the Holy voyages. Saudi Airlines maintained the expansion trajectory to include more destinations outside the Middle East, including Europe, the Americas, Africa, Asia, and Oceania.

Saudia Airlines is a government-owned entity founded by the Ministry of Defense and serves domestic, regional, and international routes. According to Afridi (2021), it serves 95 destinations using a fleet of 184 aircrafts operating from its Jeddah hub. The author adds that it employs 44,000 employees in its nine subsidiaries, elevating it to the largest regional airline considering passenger capacity, seats, fleet structure, and number of flights (Afridi 2021). The large size gives it a competitive advantage since it serves numerous destinations and consumer segments. The government is undertaking significant modernization and liberalization to improve its market reputation and obtain Middle East SkyTeam

alliance membership (Afridi 2021). The developments include remodeling the fleet structure, enhancing the in-flight passenger experience, and IT systems. The reorganization will enable it to compete favorably against regional industry rivals such as Qatar Airways, Emirates Airways, and Etihad Airways.

Saudia Airlines' operational and strategic overview is centered on digitization to improve operational efficiency and the quality of services rendered to customers. Aljahdaly and Balubaid (2020) contend that the business model involves increased technology integration to boost revenue performance and mitigate competitive pressure from other regional airlines. The authors add that the objectives of digital transformation include enhancing customer understanding and fostering top-line growth, focusing on the processes (Aljahdaly & Balubaid, 2020). For instance, customers can access most of the services through 'self-service portals,' which are convenient and improve the quality and efficiency of transactions. The airline's digital transformation journey is part of its contribution towards achieving the Saudi Vision 2030. Besides, it is instrumental in mitigating the aggressive competition and providing innovative services that meet customer satisfaction and maximize revenues. Saudia Airlines needs these readjustments to achieve its long-term growth plans and contribute significantly to the Kingdom's prosperity.

Previous studies have indicated that the organizational resilience-related challenges facing Saudia Airlines were related to service quality. For instance, Manna'a and Rahmati (2021) determined that most customers were less contented with the airline's traveling experience, including limited personalization. Hence, they favorably ranked other regional airlines in this performance metric, signifying that it was less attractive for those who felt it did not meet their expectations. Competitive rivalry in the Middle East aviation industry means that a failure to improve service quality could derail the airline's efforts to revamp its operations and attain set objectives. Besides, the availability of numerous options minimizes customer switching costs, considering the presence of other airlines offering exemplary services at competitive rates. Overcoming the strategic weaknesses and threats will require a complete reorganization of Saudi Airlines' business model and adopting consumer-centric strategies to improve satisfaction and loyalty.

5 Chapter Five: Results

5.1 Introduction

The study investigated organizational resilience in the air transport industry through emerging technologies, focusing on Middle Eastern Airlines. This chapter provides a comprehensive illustration of the results based on the specific objectives to increase effectiveness in addressing the research problem. It comprises several analyses including descriptive statistics that evaluate the responses using standard deviation and means. The demographic results are expressed in frequencies and percentages to demonstrate their distribution within the sample. The response rate shows the actual number of participants against the target sample and explains potential causes of the variations. Besides, the chapter includes a T-test analysis focusing on gender that determines whether the mean differences between the male and female air transport stakeholders is statistically significant. ANOVA has been used to establish whether the differences in the means of groups within the independent variables are significant. Multiple regression analysis shows whether the independent variables; adoption, strategic recommendations, and leveraging emerging technologies significantly predict the dependent variable, organizational resilience. Correlation analysis concludes the chapter demonstrating the strengths of association between the study variables.

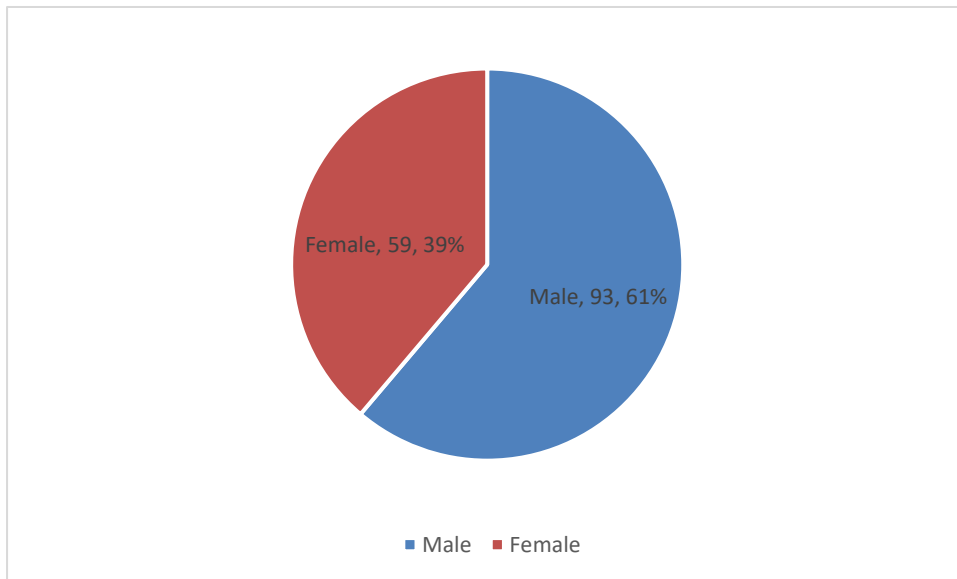
5.2 Response Rate

The study targeted a sample of 385 participants, but the actual involvement was significantly low. The study collected data from 152 respondents who completed the questionnaire. Hence, the response rate based on the actual participants included was 39.5%. The low response rate was attributed to the short data collection period that made it challenging to achieve the target sample size.

5.3 Demographic Results

5.3.1 Gender

The study characterized the air transport stakeholders according to their biological gender groups. The goal was to understand their distribution within the sample. Figure 1 shows the results.



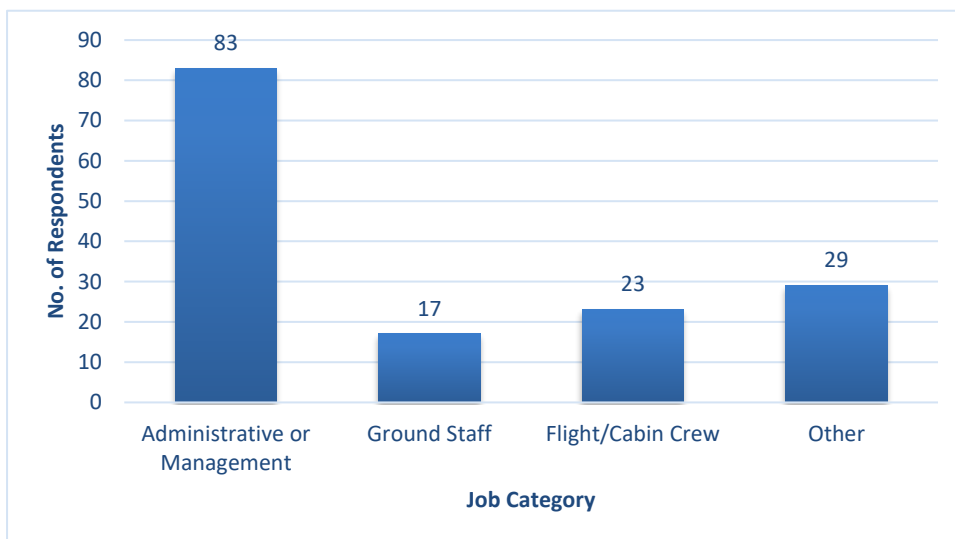
Source: Survey Data

Figure 1: Gender of responders (n=152)

Figure 1 results show that most participants were males 93 (61%) while females were the least represented 59 (39%)

5.3.2 Occupation

The second demographic attribute the study characterized was the occupation. The study targeted four groups based on the elimination questions that were introduced to ensure that only air transport stakeholders meeting the inclusion criteria were allowed to participate. Figure 2 illustrates the outcomes.



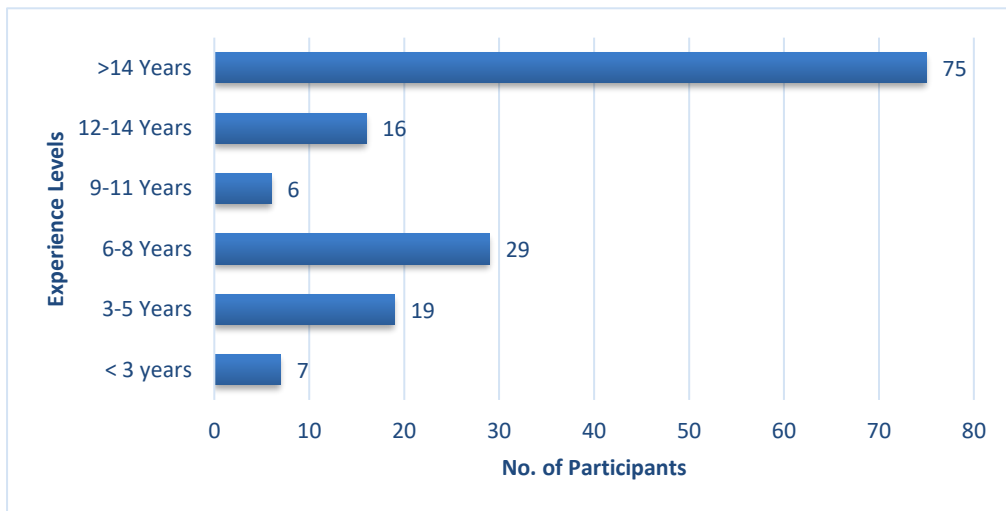
Source: Survey Data

Figure 2: Respondent distribution according to occupation (n=152)

Figure 2 results demonstrate that most participants occupied administrative and management roles 83 (54.6%), followed by those in the other group 29 (19.1%), while flight/cabin crew 23 (15.1%). About 17 (11.2%) indicated that they were they worked as ground staff.

5.3.3 Level of Experience

The study evaluated the respondents experience levels to determine the number of years they had worked in the air transport industry. The primary assumption was that a higher level of experience was associated with increased knowledge levels regarding the impact of emerging technologies on organizational resilience among Middle Eastern Airlines. Figure 3 indicates the results.



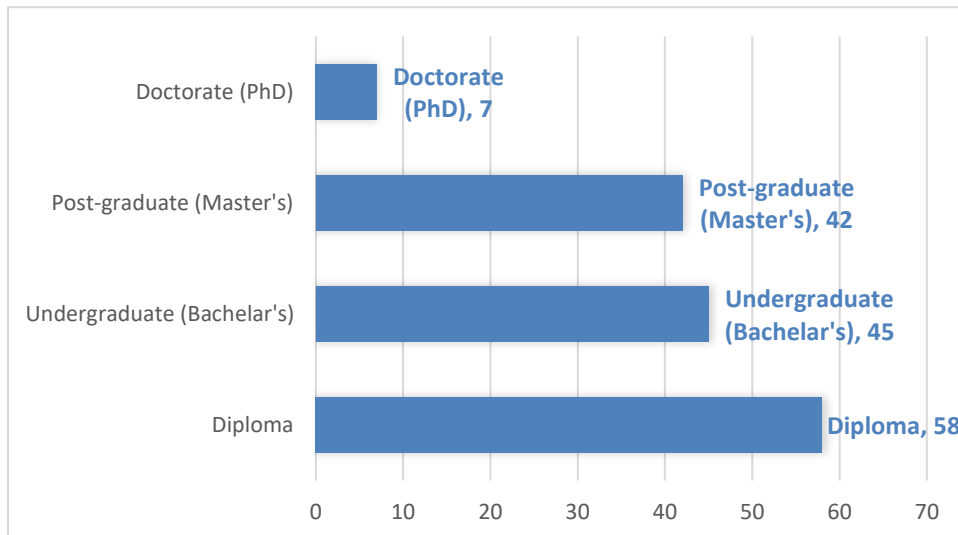
Source: Survey Results

Figure 3: Air transport stakeholder distribution according to experience levels (n=152)

Figure 3 results indicate that most stakeholders had work in the air transport sector for more than 14 years 75 (49.3%), followed by those in the 6-8 years category 29 (19.1%), while their colleagues with 3-5 years comprises 19 (12.5%). Participants in the 12-14 years category were 16 (10.5%). The least represented groups were respondents in the 9-11 years 6 (3.9%) and less than 3 years category since they constituted 7 (4.6%) of the sample.

5.3.4 Education Attainment

Academic achievement was their third demographic characteristics studied. The main categories included diploma, undergraduate, postgraduate, and doctorate Figure 4 highlights the results.



Source: Survey Results

Figure 4: Stakeholder distribution according to academic achievement (n=152)

Figure 4 outcomes indicate that most stakeholders had a diploma 58 (38%) followed by those with an undergraduate/bachelor's degree 45 (29%), while post-graduate degree holders comprised 42(28%). Doctorate/PhD holders were the least represented since they comprised 7 (5%) of the sample size.

5.4 Descriptives

5.4.1 Leveraging Emerging Technologies to Enhance Organizational Resilience

Descriptive statistics were performed to identify the specific factors within the variables which the respondents emphasized most and least. The first one focused on leveraging emerging technologies to enhance organizational resilience. Table 2 illustrates the results.

Table 2: Descriptive statistics on leveraging emerging technologies for organizational resilience (n=152)

Leveraging Emerging Technologies for Organizational Resilience	M	SD
Air transport industry stakeholders leverage AI to support operational and pricing decisions to boost overall performance	3.9803	0.9453
Airlines are using AR to promote aviation safety through extensive cabin crew training and enhancing situational awareness.	3.7303	1.2013
The air transport industry is leveraging VR to promote organizational resilience through technical skills improvement and promote aviation safety and security.	3.5921	1.1119
Aviation sector stakeholders leverage big data analytics to strengthen organizational resilience through informed and effective decision-making.	3.7961	0.9444
IoT revolutionizes air transport by enhancing resource allocation and promoting operational efficiency	4.1053	0.7819
Air transport industry stakeholders leverage enhancing its capacity to cope with emerging issues and capitalize on market opportunities.	3.9079	0.8484

Source: Survey Data

Table 2 results show that IoT enhancing resource allocation and operational efficiency had the highest mean but not the highest standard deviation ($M = 4.1053$, $SD = 0.7819$) followed by big data analytics promoting informed and effective decision-making ($M = 3.9803$, $SD = 0.9453$). Conversely, the factors with the lowest figures were VR improving technical skills and enhancing aviation safety and security ($M = 3.5921$, $SD = 1.1119$) followed by AR supporting cabin crew training and enhancing situational awareness ($M = 3.7303$, $SD = 1.2013$). Nonetheless, the average rounded-off scores indicate that the air transport stakeholders were neutral regarding the ways of leveraging emerging technologies to enhance organizational resilience.

5.4.2 Adopting Emerging Technologies for Organizational Resilience

The second descriptive analysis focused on ways of adopting emerging technologies to enhance organizational resilience. Table 2 shows the outcomes.

Table 3: Descriptive statistics on adopting emerging technologies for organizational resilience (n=152)

<i>Adopting Emerging Technologies for Organizational Resilience</i>	M	SD
Augmented reality's instrumental roles in the aviation sector are enhancing passenger experience, cabin crew training, and streamlining maintenance operations.	4.0197	0.8875
Virtual reality enhances organizational resilience by optimizing aviation student training costs.	3.8026	0.8691
Big data analytics fosters a resilient organizational culture by strengthening decision-making and employee performance.	3.9671	0.8008
IoT cultivates an organizational resilience culture by enhancing proactive decision-making through availing real-time data and boosting connectivity.	3.9013	0.7165
ML nurtures a resilient organizational culture by strengthening adaptability, expanding capacity to overcome unforeseen challenges, and promoting innovation.	3.9342	0.8431

Source: Survey Data

Table 3 results show that Augmented reality being used to enhance passenger experience, cabin crew training and streamlining maintenance operations had the highest mean and standard deviation (M = 4.0197, SD = 0.8875) followed by big data analytics improving employee performance and strengthening decision-making (M = 3.9671, SD = 0.8008). VR optimizing aviation student training costs has the lowest figures (3.8026, SD = 0.8691) followed by IoT enhancing proactive decision-making through improved connectivity and providing real-time data (M = 3.9013, SD = 0.7165). The average and rounded off scores for the highest and lowest means was 3 meaning that most air transport stakeholders neither agreed or disagreed that adopting the emerging technologies enhanced organizational resilience.

5.4.3 Strategic Recommendations for Middle Eastern Airlines

Descriptive statistics on the strategic recommendations for Middle Eastern airlines generated significant variations in the stakeholder perspectives. Table 4 illustrates the outcomes.

Table 4: Descriptive statistics on strategic recommendations for middle eastern airlines (n=152)

<i>Strategic Recommendations for Middle Eastern Airlines</i>	M	SD
Air transport industry organizations should integrate emerging technologies with employee upskilling and training to ensure they have sufficient human resources capacity to manage the systems.	4.2434	0.8218
Investing in connectivity, including high-speed internet, will empower air transport Middle Eastern airlines' stakeholders to capitalize on emerging opportunities while optimizing the risks.	3.9013	0.9403
Aviation sector stakeholders seek regulatory compliance and certification to establish standards and guidelines to ensure the integration of secure and safe emerging technologies.	3.8816	0.8683
Air transport industry stakeholders should enhance passenger experience by improving safety, comfort, and convenience.	4.2434	0.7368
Air transport industry stakeholders should strengthen their cybersecurity mechanisms to reduce susceptibility to attacks and boost organizational resilience.	4.0987	0.8593
Collaboration between air transport industry stakeholders ensures a unified and coordinated approach to integrating emerging technologies.	3.9474	0.8518
Research and development (R&D) is a proactive strategy that air transport industry stakeholders should adopt to strengthen organizational resilience and promote long-term growth.	4.1118	0.8881

Air transport industry stakeholders should establish a clear roadmap that outlines the integration of emerging technologies into the air transport industry. 4.2303 0.7674

Source: Survey Data

Table 4 outcomes indicate that *integrate emerging technologies with employee upskilling and training to ensure they have sufficient human resources capacity to manage the systems* had the highest mean and standard deviation (M = 4.2434, SD = 0.8218), followed by *enhancing passenger experience by improving safety, comfort, and convenience* with the same outcomes (M = 4.2434, SD = 0.7368). Conversely, *seeking regulatory compliance and certification to establish standards and guidelines to ensure the integration of secure and safe emerging technologies* had the lowest mean and standard deviation (M = 3.8816, SD = 0.8683) followed by *investing in connectivity, including high-speed internet, will empower air transport Middle Eastern airlines' stakeholders to capitalize on emerging opportunities while optimizing the risks* (M = 3.9013, SD = 0.9403). Results from the average score of the means for all strategic recommendations was 4 meaning that most respondents supported the strategic recommendations as effective in promoting organizational resilience.

5.4.4 Organizational Resilience Among Middle Eastern Airlines

The final descriptive analysis sought to determine the distribution of respondents' perspectives regarding organizational resilience among Middle Eastern Airlines. Table 5 shows the outcomes.

Table 5: Descriptive statistics on organizational resilience among middle eastern airlines (n=152)

Organizational Resilience Among Middle Eastern Airlines	M	SD
Financial resilience enhances organizational capacity to withstand market adversities by strengthening liquidity minimizing default and capital flight risk.	3.9803	0.8648
Middle Eastern airlines should undertake community engagement to boost organizational resilience by building stakeholder relationships and trust to promote collaboration.	3.9211	0.8498

Learning and continuous improvement enhance organizational resilience by promoting adaptation to change and boosting innovation and creativity.	4.1513	0.7525
Employee engagement strengthens organizational resilience by nurturing a collaborative, adaptable, and innovative employee pool that increases the capacity to recover from setbacks	4.1184	0.7541
Crisis management and response is a leadership function establishing processes and procedures to respond decisively to crises and emergencies.	4.1053	0.8150
Risk management is an organizational resilience component that entails identifying, evaluating, and managing threats to understand their impacts on operations, stakeholders, and reputation.	4.0724	0.7814
Leadership and governance are organizational resilience components that emphasize nurturing a supportive culture.	4.0987	0.7525
Organizational resilience represents a company's ability to effectively absorb and formulate situation-specific reactions and undertake transformative activities to exploit the disruptive surprises that threaten survival	3.9737	0.7969

Source: Survey Data

Table 5 results show that *Learning and continuous improvement enhance organizational resilience by promoting adaptation to change and boosting innovation and creativity* had the highest mean and standard deviation (M = 4.1513, SD = 0.7525). It was followed by *Employee engagement strengthens organizational resilience by nurturing a collaborative, adaptable, and innovative employee pool that increases the capacity to recover from setbacks* (M = 4.1184, SD = 0.7541), while crisis management and response enhancing organizational actions during emergencies (M = 4.1053, SD = 0.8150). *Middle Eastern airlines should undertake community engagement to boost organizational resilience by building stakeholder relationships and trust to promote collaboration* had the lowest mean and standard deviation (M = 3.9211, SD = 0.8498) followed by *Organizational resilience represents a company's ability to effectively absorb and formulate situation-specific reactions and undertake transformative activities to exploit the disruptive surprises that threaten survival* (M = 3.9737, SD = 0.7969). The average and rounded off scores for the organizational resilience factors was 4 signifying that most of the aviation sector stakeholders agreed to the highlighted statements.

5.5 T-test Analysis

Five t-test analyses were conducted to evaluate the mean difference of male and female respondents according to the variable scoring and the individual factors within each. The first one focused on ways of leveraging emerging technologies to enhance organizational resilience. Table 6 shows the results.

Table 6: T-test analysis on leveraging emerging technologies to enhance organizational resilience (n=152)

Leveraging Emerging Technologies	Gender	M	SD	T-test	Sig.
Leverage AI to support operational and pricing decisions	M	3.957	0.954	-0.382	0.703
	F	4.017	0.937		
AR to promote aviation safety	M	3.871	1.153	1.794	0.075
	F	3.501	1.250		
VR to promote technical skills improvement and promote aviation safety and security.	M	3.559	1.192	-0.478	0.633
	F	3.644	0.978		
Big data analytics to promote informed and effective decision-making.	M	3.871	0.875	1.183	0.239
	F	3.678	1.041		
IoT enhancing resource allocation and promoting operational efficiency	M	4.108	0.827	0.046	0.963
	F	4.102	0.711		
Leverage emerging technologies to enhance capacity to cope with emerging issues and capitalize on market opportunities.	M	3.957	0.871	0.909	0.365
	F	3.831	0.812		

Preconditions Checked:

In conducting independent sample t-tests, the following preconditions were checked:

1. Independence of Observations: Each subject belonged to only one group.
2. Normality: The dependent variable was tested for normal distribution using the Shapiro-Wilk test.
3. Homogeneity of Variances: Equality of variances was assessed using Levene's test.
4. No Significant Outliers: Outliers were identified and assessed using boxplots.

Source: Survey Data

Table 6 indicate mixed results on leveraging of emerging technologies to promote organizational resilience. Female air transport stakeholders had higher means than males in leveraging AI to support operational and pricing decisions (Female = 4.017, Male = 3.957) and VR to promote technical skills improvement and aviation safety and security (Female = 3.644, Male = 3.559). Conversely, males had higher means on the factor, AR promoted aviation safety (Male = 3.871, Female = 3.871), big data analytics to promote informed and effective decision-making (Male = 3.871, Female = 3.678), and leverage emerging technologies to enhance capacity to cope with emerging issues and capitalize on market opportunities (Male = 3.957, Female = 3.831). Besides, males had higher means than females in the factor IoT enhancing resource allocation and promoting operational efficiency (Male = 4.108, Female = 4.102). The t-test results showed that the mean differences between female and male air transport sector stakeholder were not statistically significant in all the five emerging technologies leveraging strategies. Hence, the null hypothesis that there were no significant differences between male and female air transport sector stakeholders regarding ways of leveraging emerging technologies was not rejected.

The second t-test analysis focused on the effect of adopting emerging technologies in enhancing organizational resilience. Table 7 illustrates the outcomes.

Table 7: T-test analysis on adoption of emerging technologies for a resilient organizational culture (n=152)

Adoption of Emerging Technologies	Gender	M	SD	T-test	Sig.
AR enhancing passenger experience, cabin crew training, and streamlining maintenance operations.	M	4.054	0.838	0.574	0.567
	F	3.966	0.964		
	M	3.785	0.930	-0.328	0.744

Virtual reality optimizing aviation student training costs.	F	3.831	0.769		
Big data analytics strengthening decision-making and employee performance.	M	4.054	0.757	1.640	0.104
	F	3.831	0.854		
IoT enhancing proactive decision-making through availing real-time data and boosting connectivity.	M	3.893	0.758	-0.197	0.844
	F	3.915	0.650		
ML strengthening adaptability, expanding capacity to overcome unforeseen challenges, and promoting innovation.	M	3.871	0.875	-1.190	0.236
	F	4.034	0.787		

Source: Survey Data

Males had larger means than female in AI enhancing passenger experience, cabin crew training, and streamlining maintenance operations (Males = 4.053, Females = 3.966), and big data analytics strengthening decision-making and employee performance (Males = 4.053, Females = 3.830). Conversely female stakeholders had higher means than males in virtual reality optimizing aviation student training costs (Female = 3.784, Males = 3.830), IoT enhancing proactive decision-making through availing real-time data and boosting connectivity (Females = 3.915, Males = 3.893), and ML strengthening adaptability, expanding capacity to overcome unforeseen challenges, and promoting innovation (Females 4.034, Males = 3.871). The t-test results showed that the mean differences between female and male air transport sector stakeholder were not statistically significant in all the five aspects of adopting emerging technologies to strengthen organizational resilience. Hence, the null hypothesis that there were no significant differences between male and female air transport sector stakeholders regarding adoption of emerging technologies was not rejected.

The third t-test analysis focused on characterizing responses on the strategic recommendations for integrating emerging technologies in the air transport sector among Middle Eastern airlines. It aimed to identify the suggestions most respondents supported and those they did not. Table 8 illustrates the results.

Table 8: Strategic recommendations for integrating emerging technologies in the air transport sector (n=152)

Group Statistics					
	G	M	SD	T-test	Sig.
Integrate emerging technologies with employee upskilling and training to ensure they have sufficient human resources capacity to manage the systems.	M	4.215	0.870	-0.552	0.582
	F	4.288	0.744		
Investing in connectivity, including high-speed internet, will empower air transport Middle Eastern airlines' stakeholders to capitalize on emerging opportunities while optimizing the risks.	M	3.946	0.925	0.731	0.466
	F	3.831	0.967		
Regulatory compliance and certification to establish standards and guidelines to ensure the integration of secure and safe emerging technologies.	M	3.860	0.879	-0.382	0.703
	F	3.915	0.856		
Enhance passenger experience by improving safety, comfort, and convenience.	M	4.194	0.755	-1.064	0.289
	F	4.322	0.705		
Strengthen their cybersecurity mechanisms to reduce susceptibility to attacks and boost organizational resilience.	M	4.097	0.897	-0.035	0.972
	F	4.102	0.802		
Collaboration between air transport industry stakeholders ensures a unified and coordinated approach to integrating emerging technologies.	M	3.903	0.834	-0.792	0.430
	F	4.017	0.880		
R&D to strengthen organizational resilience and promote long-term growth.	M	4.043	0.965	-1.272	0.205
	F	4.220	0.744		
	M	4.323	0.709	1.810	0.073

Establish a clear roadmap that outlines the integra-	F	4.085	0.836
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tion of emerging technologies into the air transport industry.

Source: Survey Data

Table 8 results demonstrated mixed outcomes regarding the statistical significance of the mean differences between male and female air transport stakeholders. Firstly, males had larger means in the suggestions *Investing in connectivity, including high-speed internet, will empower air transport Middle Eastern airlines' stakeholders to capitalize on emerging opportunities while optimizing the risks* (Male = 3.946, Female = 3.831) and *establish a clear roadmap that outlines the integration of emerging technologies into the air transport industry* (Male = 4.323, Female = 4.085). Females has larger means and standard deviation in the remaining recommendations. For instance, on *Collaboration between air transport industry stakeholders ensures a unified and coordinated approach to integrating emerging technologies* (Female = 4.017, Male = 3.903), *Integrate emerging technologies with employee upskilling and training to ensure they have sufficient human resources capacity to manage the systems* (Females = 4.288, Males = 4.215). Similarly, females had higher means in the strategic recommendations; *Regulatory compliance and certification to establish standards and guidelines to ensure the integration of secure and safe emerging technologies* (Females = 3.915, Males = 3.860) and *Enhance passenger experience by improving safety, comfort, and convenience* (Females 4.322, Males = 4.194). T-test results indicate that the mean differences of the air transport stakeholders based on gender were not statistically significant for all the strategic recommendations at a 95% confidence interval since the p-values were greater than 0.05. For instance, *establish a clear roadmap that outlines the integration of emerging technologies into the air transport industry* ($t = 1.810$, $p = 0.073$). Hence, the null hypothesis that there were no significant differences between male and female air transport sector stakeholders regarding strategic recommendations for emerging technologies integration was not rejected.

The fourth-test analysis evaluate the mean differences between male and female air transport stakeholders based on organizational resilience factors. Table 9 shows the results.

Table 9: T-test analysis on organizational resilience (n=152)

Group Statistics					
	G	M	SD	T-test	Sig.
Financial resilience strengthens liquidity minimizing default and capital flight risk.	M	4.000	0.847	0.348	0.729
	F	3.949	0.898		
Middle Eastern airlines should undertake community engagement to build stakeholder relationships and trust to promote collaboration.	M	3.882	0.845	-0.712	0.478
	F	3.983	0.860		
Learning and continuous improvement promote adaptation to change and boosting innovation and creativity.	M	4.215	0.704	1.271	0.206
	F	4.051	0.818		
Employee engagement nurtures a collaborative, adaptable, and innovative employee pool that increases the capacity to recover from setbacks	M	4.140	0.774	0.444	0.658
	F	4.085	0.726		
Crisis management and response is a leadership function establishing processes and procedures to respond decisively to crises and emergencies.	M	4.151	0.820	0.862	0.390
	F	4.034	0.808		
Risk management entails identifying, evaluating, and managing threats to understand their impacts on operations, stakeholders, and reputation.	M	4.022	0.793	-1.017	0.311
	F	4.153	0.761		
Leadership and governance emphasize nurturing a supportive culture.	M	4.097	0.808	-0.041	0.967
	F	4.102	0.661		
Organizational resilience represents a company's ability to exploit the disruptive surprises that threaten survival	M	3.893	0.786	-1.578	0.117
	F	4.102	0.802		

Source: Survey Data

Table 9 results indicate that mixed results regarding the mean differences among the respondents. Men had larger means in about 4 (50%) of the cases similar to the females' outcomes. For instance, the aspect *Crisis management and response is a leadership function establishing processes and procedures to respond decisively to crises and emergencies* (Male = 4.151, Female = 4.034). Similarly, *Employee engagement nurtures a collaborative, adaptable, and innovative employee pool that increases the capacity to recover from setbacks* (Male = 4.140, Female = 4.085). Conversely, females had larger means including on *Organizational resilience represents a company's ability to exploit the disruptive surprises that threaten survival* (Female = 4.102, Male = 3.893) and *Middle Eastern airlines should undertake community engagement to build stakeholder relationships and trust to promote collaboration* (Females = 3.983, Males = 3.882). T-test analysis results showed that the mean differences between male and female air transport sector stakeholders were not statistically significant for all the organizational resilience factors since the p-value was greater than 0.05. For instance, *risk management entails identifying, evaluating, and managing threats to understand their impacts on operations, stakeholders, and reputation* ($t = -1.017$, $p = 0.311$). Hence, the null hypothesis that the mean differences among the air transport stakeholders and all the organizational resilience factors was not rejected.

The final t-test analysis evaluates the gender-based mean differences based on the scoring of the dependent variables. Table 10 illustrates the outcomes.

Table 10: T-test analysis based on gender and the dependent variables (n=152)

Group Statistics					
	Gender	M	SD	T-test	Sig.
Leveraging on Emerging Technologies	M	23.32	3.639	0.890	0.375
	F	22.78	3.682		
Adoption of Emerging Technologies and Building a Resilient Organizational Culture	M	19.66	1.885	0.225	0.822
	F	19.58	2.261		
Strategic Recommendations for Integrating Emerging Technologies	M	32.58	2.651	-0.434	0.665
	F	32.78	2.823		

Organizational Resilience Among Middle Eastern Airlines	M	32.40	2.580	-0.138	0.891
	F	32.46	2.628		

Source: Survey Data

Results in Table 10 indicate that males had larger means in all the variables except on strategic recommendations for integrating emerging technologies (Female = 33.42, Male = 32.79) and organizational resilience (Female = 32.46, Male = 42.40). The outcomes further indicate that the mean differences between the participants based on gender were not statistically significant since none had a p-value less than 0.05. For instance, *Adoption of Emerging Technologies and Building a Resilient Organizational Culture* had ($t = 0.225$, $P = 0.822$) at a 95% confidence interval.

5.6 ANOVA

5.6.1 Occupation

The investigator conducted an Analysis of variance to evaluate whether there were statistically significant mean differences between the respondents based on the occupations. Table 11 shows the results.

Table 11: ANOVA on occupation (n=152)

ANOVA				
	Leveraging on Emerging Technologies	Adoption of Emerging Technologies and Building a Resilient Organizational Culture	Strategic Recommendations for Integrating Emerging Technologies	Organizational Resilience Among Middle Eastern Airlines
Occupation	F = 0.086	F = 0.950	F = 1.151	F = 0.302
	Sig. = 0.968	Sig. = 0.418	Sig. = 0.331	Sig. = 0.824

	M	SD	M	SD	M	SD	M	SD
Administrative or Management	23.12	3.687	19.84	2.021	32.88	2.834	32.43	2.480
Ground Staff	23.06	3.191	19.29	1.795	33.12	2.027	32.23	3.011
Flight/Cabin Crew	22.83	4.428	19.65	2.058	31.83	2.949	32.83	2.498
Other	23.34	3.287	19.17	2.172	32.41	2.457	32.17	2.804

Preconditions Checked:

In conducting ANOVA, the following preconditions were checked:

1. Independence of Observations: Each subject belonged to only one group.
2. Normality: The dependent variable for each group was tested for normal distribution using the Shapiro-Wilk test.
3. Homogeneity of Variances: Equality of variances was assessed using Levene's test.
4. No Significant Outliers: Outliers were identified and assessed using boxplots.

Source: Survey Data

Table 11 results show that there were no statistically significant differences in occupation and the dependent variables; leveraging on emerging technologies ($F = 0.086$, $p = 0.968$), Adoption of Emerging Technologies and Building a Resilient Organizational Culture ($F = 0.950$, $p = 0.418$), Strategic Recommendations for Integrating Emerging Technologies ($F = 1.1519$, $p = 0.331$), and Organizational Resilience Among Middle Eastern Airlines ($F = 0.302$, $p = 0.824$). Therefore, the null hypothesis that there would be no significant difference between the dependent variables and occupation was not rejected.

To further understand the dispersion where group means were the same, eta-squared (η^2) values were calculated to indicate the effect size. Eta-squared is calculated using the formula:

$$\eta^2 = \frac{SS \text{ between}}{SS \text{ total}}$$

where SS between is the sum of squares between groups and SS total is the total sum of squares. These values provide insight into the proportion of total variability attributable to the occupation factor.

Eta-Squared Values:

- Leveraging on Emerging Technologies: $\eta^2 = 0.086$
- Adoption of Emerging Technologies and Building a Resilient Organizational Culture: $\eta^2 = 0.018$
- Strategic Recommendations for Integrating Emerging Technologies: $\eta^2 = 0.022$
- Organizational Resilience Among Middle Eastern Airlines: $\eta^2 = 0.006$

5.6.2 Level of Experience

The second ANOVA was conducted to determine whether there were statistically significant mean differences among the respondents based on the level of experience and the dependent factors. Table 12 highlights the results.

Table 12: ANOVA on occupation and the dependent variables (n=152)

ANOVA								
	Leveraging on Emerging Technologies		Adoption of Emerging Technologies and Building a Resilient Organizational Culture		Strategic Recommendations for Integrating Emerging Technologies		Organizational Resilience Among Middle Eastern Airlines	
Level of Experience	F = 0.616		F = 0.509		F = 0.652		F = 0.962	
	Sig. = 0.688		Sig. = 0.769		Sig. = 0.661		Sig. = 0.443	
	M	SD	M	SD	M	SD	M	SD
< 3 Years	24.29	2.498	19.86	1.676	33.43	2.936	30.57	3.952
3-5 Years	22.00	3.986	19.00	2.261	32.26	2.864	32.00	2.108

6-8 Years	23.21	3.783	19.76	1.939	33.21	2.274	32.41	2.529
9-11 Years	23.33	2.251	19.50	1.049	32.67	3.559	32.67	3.327
12-14 Years	23.81	3.060	20.00	1.862	31.94	3.172	32.50	2.828
> 14 Years	23.08	3.827	19.64	2.148	32.63	2.670	32.67	2.473

Preconditions Checked:

In conducting ANOVA, the following preconditions were checked:

1. Independence of Observations: Each subject belonged to only one group.
 2. Normality: The dependent variable for each group was tested for normal distribution using the Shapiro-Wilk test.
 3. Homogeneity of Variances: Equality of variances was assessed using Levene's test.
 4. No Significant Outliers: Outliers were identified and assessed using boxplots.
-

Source: Survey Data

Table 12 results indicate that there were no statistically significant differences in the air transport stakeholders levels of experience and the dependent variables; leveraging on emerging technologies ($F = 0.616$, $p = 0.688$), adoption of emerging technologies and building a resilient organizational culture ($F = 0.509$, $p = 0.769$), strategic recommendations for integrating emerging technologies ($F = 0.652$, $p = 0.661$), and organizational resilience Among Middle Eastern Airlines ($F = 0.962$, $p = 0.443$), at a 95% confidence interval. Therefore, the null hypothesis that there would be no significant difference between the dependent variables and the levels of experience was not rejected.

To further understand the dispersion where group means were the same, eta-squared (η^2) values were calculated to indicate the effect size. Eta-squared is calculated using the formula:

$$\eta^2 = \frac{SS \text{ between}}{SS \text{ total}}$$

where SS between is the sum of squares between groups and SS total is the total sum of squares. These values provide insight into the proportion of total variability attributable to the occupation factor.

Eta-Squared Values:

- Leveraging on Emerging Technologies: $\eta^2 = 0.086$
- Adoption of Emerging Technologies and Building a Resilient Organizational Culture: $\eta^2 = 0.018$
- Strategic Recommendations for Integrating Emerging Technologies: $\eta^2 = 0.022$
- Organizational Resilience Among Middle Eastern Airlines: $\eta^2 = 0.006$

5.6.3 Educational Attainment

The final ANOVA analysis was done to determine whether the means of air transport stakeholders were statistically significant. The dependent variables were scored to generalize the outcomes based on the dependent variables. Table 13 highlights the outcomes.

Table 13: ANOVA on stakeholders' educational attainment based on the dependent scored dependent variables (n=152)

ANOVA									
	Leveraging on Emerging Technologies		Adoption of Emerging Technologies and Building a Resilient Organizational Culture		Strategic Recommendations for Integrating Emerging Technologies		Organizational Resilience Among Middle Eastern Airlines		
Highest Academic Achievement	F = 0.259		F = 0.575		F = 1.303		F = 0.705		
	Sig. = 0.855		Sig. = 0.633		Sig. = 0.276		Sig. = 0.550		
	M	SD	M	SD	M	SD	M	SD	
Diploma	23.19	3.877	19.84	1.852	32.28	3.065	32.24	2.704	
Undergraduate (Bachelor's)	22.80	4.009	19.53	2.232	32.73	2.580	32.27	2.758	
Postgraduate (Masters)	23.19	3.094	19.36	1.832	32.83	2.429	32.64	2.346	

Doctorate (PhD)	24.0	2.828	20.00	3.266	34.29	1.380	33.57	1.902
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Source: Survey Data

Table 13 outcomes show that there were no statistically significant differences in the air transport stakeholders higher educational achievement and the dependent variables; leveraging on emerging technologies ($F = 0.259$, $p = 0.855$), adoption of emerging technologies and building a resilient organizational culture ($F = 0.575$, $p = 0.633$), strategic recommendations for integrating emerging technologies ($F = 1.303$, $p = 0.276$), and organizational resilience Among Middle Eastern Airlines ($F = 0.705$, $p = 0.550$), at a 95% confidence interval. Therefore, the null hypothesis that there would be no significant difference between the dependent variables and the highest educational attainments was not rejected.

5.7 Multiple Regression Analysis

The study performed a multiple regression analysis to determine whether the independent variables; leveraging, adoption, and strategic recommendation of integration of emerging technologies significantly influenced the dependent variable, organizational resilience. The analysis generated several tables to explain the association between the variables. It began with the model summary table that illustrates the strengths of association between the dependent variable and the model. Table 14 shows the model summary results.

Table 14: Model summary results from a multiple regression analysis (n=152)

Model Summary				
Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	0.502 ^a	0.252	0.237	2.26290

a. Predictors: (Constant), Strategic Recommendations for Integrating Emerging Technologies, Adoption of Emerging Technologies and Building a Resilient Organizational Culture, Leveraging on Emerging Technologies

Source: Survey Data

The R-value columns highlights the correlation between the independent and the dependent variables. A value more than 0.4 is considered desirable. Therefore, the 0.502 figure is desirable. The second column shows the R-square value which explains the total variation in the dependent variable that could be predicted by the independent factors. Values more than 0.5 indicate that the model was sufficiently effective to establish a relationship. In this case, 0.252 is low. Conversely, the adjusted R-square indicates the proportion of the target population that this sample study findings could be generalized to in a multiple regression analysis. The value 0.237 is not far off from 0.552, so it is good.

Before conducting the multiple regression analysis, the following preconditions were checked:

- All Variables at Interval Level: Ensured that all the variables included in the regression model were measured at least at the interval level.
- Linearity: Verified the linearity between the dependent and independent variables by examining scatter plots.
- No Multicollinearity: Checked for multicollinearity using the correlation coefficient matrix and Variance Inflation Factor (VIF) between independent variables. A correlation matrix of all independent variables is provided in the appendix to ensure no multicollinearity.

The second results in the multiple regression shows the ANOVA table used to establish whether the model is sufficient to determine the changes in the dependent variable. Table 15 shows the outcomes.

Table 15: ANOVA results in multiple regression analysis (n=152)

ANOVA^a						
Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	255.185	3	85.062	16.611	0.000 ^b
	Residual	757.868	148	5.121		
	Total	1013.053	151			

a. Dependent Variable: Organizational Resilience among Middle Eastern Airlines

b. Predictors: (Constant), strategic recommendations for integrating emerging technologies; adoption of emerging technologies and building a resilient organizational culture; leveraging on emerging technologies

Source: Survey Data

Table 15 results indicate that the sig. value was 0.000 which is less than 0.05 at a 95% confidence interval. Hence, the results are statistically significant. Conversely, the F-ratio column illustrates an improvement in the predictor factor by fitting the multiple regression model after considering the present inaccuracies. Values more than 1 for F-ratios yield efficient models. The value in table 14 is 16.611, which is good.

The final result in the multiple linear regression was the coefficient table that highlights how individual independent variables predicted the dependent factor. Table 16 shows the outcomes.

Table 16: Coefficients table in multiple regression analysis (n=152)

Coefficients^a					
Model	Unstandardized Coefficients		Standardized Coefficients	T	Sig.
	B	Std. Error	Beta		
(Constant)	16.311	2.927		5.571	0.000
Leveraging Emerging Technologies	-0.112	0.051	-0.158	-2.189	0.030
Adoption of Emerging Technologies and Building a Resilient Organizational Culture	0.386	0.092	0.303	4.172	0.000
Strategic Recommendations for Integrating Emerging Technologies	0.341	0.068	0.357	4.992	0.000

a. Dependent Variable: Organizational Resilience among Middle Eastern Airlines

Source: Survey Data

Table 16 results indicate that the p-value for the independent variable leveraging on emerging technologies was 0.030, which is smaller than 0.05 at a 95% confidence interval. Therefore, the null hypothesis that there was leveraging emerging technologies did not significantly affect organizational resilience among Middle East airlines was rejected. The phenomenon signifies that there was significant change in organizational resilience in the region's air transport sector because of leveraging on

emerging technologies. Similarly, the independent factor adoption of emerging technologies to create a resilient organizational culture predicted changes in organizational resilience among the regional air transport sector firms ($p = 0.00$). Hence, the null hypothesis that there was not statistically significant association between adoption of emerging technologies and organizational resilience was rejected. The assertion was due to the p-value being less than 0.05. Besides, strategic recommendations for integrating emerging technologies significantly impacted on organizational resilience since the significance level was less than 0.05. Thus, the null hypothesis that there was no statistically significant relationship between strategic recommendations and organizational resilience was rejected.

Conversely the p-value for the constant was significant ($p = 0.000$) indicating that the if independent variables included in the regression model at some point were zero, then the dependent factor will be the same as the constant term. The B column shows the slope between the independent and dependent variable in the multiple regression analysis, while the standard error measures the model's precision in estimating the coefficient's unknown value. The equation below represents the multiple regression values after replacing the B coefficients with actual values.

$$Y = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \varepsilon$$

Y is organizational resilience

β_0 is the Y intercept

X_1 is Leveraging Emerging Technologies

X_2 is Adoption of Emerging Technologies and Building a Resilient Organizational Culture

X_3 is Strategic Recommendations for Integrating Emerging Technologies

Therefore,

$$Y = 16.311 - 0.112X_1 + 0.386X_2 + 0.341X_3 + \varepsilon$$

5.8 Correlation Analysis

Pearson Moment correlation analysis was the final inferential statistic performed to evaluate the strengths of relationship between the investigation independent and dependent variables. The analysis aimed to determine whether the association was statistically significant and the effect on changes

in organizational resilience. Table 17 illustrates the findings. Scatter plots for each pair of variables are provided in the appendix to demonstrate linearity.

Table 17: Correlation analysis results (n=152)

Correlations			Leveraging on Emerging Technologies	Adoption of Emerging Technologies and Building a Resilient Organizational Culture	Strategic Recommendations for Integrating Emerging Technologies
Organizational Resilience	Pearson Correlation	-0.127	0.304	0.391	
Among Middle Eastern Airlines	Sig. (2-tailed)	0.120	0.000	0.000	

Source: Survey Data

Table 17 results indicate that there was a statistically significant correlation between the independent and dependent variables since the p-values were less 0.05 in some of the variables. For instance, there was no correlation between leveraging on emerging technologies and organizational resilience among Middle Eastern Airlines ($r = -0.127$, $p = 0.120$). However, there was a moderate positive correlation between organizational resilience and the adoption of emerging technologies for building a resilient culture ($r = 0.304$, $p = 0.000$) and *strategic recommendations for integrating emerging technologies* ($r = 0.391$, $p = 0.000$) at a 95% confidence interval. Overall, identified emerging technologies factors enabled the air transport stakeholders to strengthen organizational resilience among Middle Eastern airlines.

6 Chapter Six: Discussion

6.1 Introduction

An in-depth understanding of how this study contributes to existing knowledge and compares with past studies is critical to determine its effectiveness in addressing the research questions. Hence, the discussion chapter delves into the empirical findings from the online surveys to assess their implications for the air transport industry. The review aligns with the investigation's specific objectives to increase effectiveness in addressing the information gap on the topic. The primary focus sections include leveraging emerging technologies, their impact on organizational resilience, and strategic recommendations for integrating them into stakeholders' business models. A comparative analysis of the airlines with its regional competitors concludes the chapter and highlights those whose strategies are most effective in fostering organizational resilience.

6.2 Discussion

6.2.1 Leveraging Emerging Technologies

The regression analysis findings indicated that Middle Eastern Airlines are leveraging emerging technologies to enhance organizational resilience. Outcomes from descriptive statistics compound this deduction, suggesting that stakeholders could use AR to improve aviation safety. The determination concurs with Houweling et al.'s (2024) assertion that it enhances the pilot's situational awareness, boosting their capacity to respond to unforeseen occurrences promptly. Besides, the finding on IoT's role in promoting operational efficiency and enhancing resource allocation supports Zhao et al.'s (2023) deduction that the emerging technology is reducing costs in the air transport industry. The other results align with previous authors' conclusions, including VR promoting technical skills improvement and big data analytics fostering informed and effective decision-making. The findings demonstrate that the sector stakeholders have multiple ways to leverage emerging technologies to achieve growth objectives and enhance sustainability. The advantages signify that they can be used to mitigate emerging challenges and capitalize on new service delivery opportunities.

Besides, the outcomes align with organizational resilience theory, suggesting that management effectiveness depends on handling unforeseen adverse occurrences to facilitate recovery. The emerging technologies provide a contingency planning platform to strengthen industry stakeholders' capacity to mitigate market uncertainties. Geopolitical tensions, pandemics, and rising operating costs characterize the contemporary environment, signifying that resilience measures are necessary to ensure survivability. For instance, airlines that adopt AR, VR, and IoT can capitalize on the benefits to promote operational efficiency and improve service quality. The two metrics are paramount for surviving their highly dynamic and competitive aviation market, where numerous airlines provide passengers with diverse options. Hence, the organizational resilience model justifies embracing emerging technologies for sustainable growth by reducing exposure to market uncertainties. Stakeholder business continuity depends on utilizing innovations to differentiate themselves from other providers.

6.2.2 Impact of Emerging Technology Adoption on Organizational Resilience

The findings indicated that emerging technologies can positively impact organizational resilience depending on stakeholder interventions. For instance, they noted that ML strengthens adaptability, and IoT and big data analytics foster proactive decision-making. The outcomes support Szukits and Móricz's (2023) conclusion that real-time and accurate data gathering and analysis can empower stakeholders to predict future scenarios and adjust strategies accordingly. Besides, the determinations align with Liu et al.'s (2022) deduction that IoT promotes creativity and innovation. The alignment between the current and past studies is that adopting emerging technologies promotes organizational resilience by improving the capacity to gather, analyze, and interpret large data volumes. Therefore, increased adoption reduces susceptibility to market uncertainties and improves recovery chances in case of significant operational disruptions. Emerging technologies provide a new front for air transport sector stakeholders to reorganize and align their business models with the market trends.

The determinations align with TAM's assumption that the perceived technology ease of use and usefulness are the primary factors driving adoption. Literature analysis outcomes indicate that the benefits of emerging technologies outweigh the risks, which enhances implementation feasibility. To strengthen their competitive advantages, improved operational efficiency, service quality, cost-effectiveness, and safety are the primary issues stakeholders are addressing. The benefits are motivations the sector can base on to increase adoption and strengthen organizational resilience. The model emphasizes the importance of scrutinizing technology, focusing on the benefits and costs, and then de-

termining the viability of integrating them into a business. For instance, emerging technologies predispose airlines and airports to cyberattacks due to increased dependence. The phenomenon signifies that stakeholders must find ways to mitigate this shortcoming and maximize the associated advantages. Based on this study's context, it is economically feasible to adopt the new technologies.

6.2.3 Strategic Recommendations for Integrating Emerging Technologies

Results from the statistical analysis indicate that Middle Eastern airline stakeholders could integrate emerging technologies in the marketing, human resources, and service delivery sectors to capitalize on the associated benefits. For instance, the findings showed that they could combine the innovations with employee upskilling and training, enhance passenger experience, and undertake R&D initiatives. The determinations align with Osborne et al.'s (2021) assertion that the technologies could be used to improve the sector's responsiveness to market environment changes. Moreover, they support Weiyu et al.'s (2022) deduction that R&D fosters technical development critical for long-term growth. The alignment between this research's outcomes and previous scholars' conclusions affirms its significant contribution to understanding the impact of emerging technologies in the air transport sector. The strategic recommendations identified in the study findings provide a firm basis for formulating appropriate strategies to strengthen the regional airlines' global competitiveness.

The study findings concur with the diffusion of innovation theory assumption that interpersonal contact among stakeholders will influence emerging technologies' adoption. The model is appropriate to this study since it indicates that technology adoption depends on user interests and associated benefits based on Farajnezhad et al.'s (2021) deduction. For instance, some airlines in the Middle East target premium customers, other are budget carriers, while some combine the two segments. The case study of Emirate Airways indicates that the company's desire to provide exemplary services is what motivated it to be among the first to introduce in-flight entertainment systems behind all seats. Conversely, Saudia Airlines combines luxury and budget flights to cater for all consumer groups' needs, signifying that it combines several business models. The diffusion of innovation theory has affirmed that airline characteristics influence their emerging technologies adoption.

6.3 Comparative analysis with other airlines or case studies

The comparative analysis of the three airlines' business models and strategic overview is also included. This section evaluates how the differences in business model and strategic overview influence their adoption of emerging technologies. Table 18 illustrates the comparison.

Table 18: Comparative analysis of the three leading Middle Eastern Airlines

Airline	Strengths	Weakness	Opportunities	Threats
Emirates Airlines	<ul style="list-style-type: none"> • Global reach is due to fleet size and destinations served. • Brand recognition for luxury, innovation, and exemplary customer service 	<ul style="list-style-type: none"> • High operating costs that affect profitability and increase competition from budget carriers 	<ul style="list-style-type: none"> • Strategic collaborations and partnerships with other airlines and other related businesses to expand its reach, access innovative solutions, and reduce costs. 	<ul style="list-style-type: none"> • Stiff competition from other regional airlines such as Etihad and Qatar. • Increased exposure to geopolitical risks can decrease the demand for air travel to the region and the use of the airline.
Qatar Airways	<ul style="list-style-type: none"> • It has an extensive global presence due to its large modern fleet and extensive route network. 	<ul style="list-style-type: none"> • High operating costs arise from premium services offered and the maintenance of a large fleet. 	<ul style="list-style-type: none"> • Expanding to new routes through strategic partnerships and alliances. • Diversifying services to reduce risk exposure. 	<ul style="list-style-type: none"> • Geopolitical tensions, such as the 2017 blockade, increase the risk of business interruption and market share loss.

	<ul style="list-style-type: none"> • Diversified business operation includes complete services, low-cost budget flights, and a robust cargo division. 	<ul style="list-style-type: none"> • Excessive reliance on international routes due to a small domestic market. 	<ul style="list-style-type: none"> • Integrating emerging technologies to enhance operational efficiency and profitability. • Developing new hubs to reduce exposure to geopolitical risks. 	<ul style="list-style-type: none"> • Competition from regional airlines, particularly Emirates and Etihad, is eroding its revenue performance. • Changes in consumer behavior, particularly a shift toward sustainable travel
Saudia Airlines	<ul style="list-style-type: none"> • Has a more extended market experience since it was established earlier than other regional airlines. • Access to more funding for R&D than other regional airlines. 	<ul style="list-style-type: none"> • Services quality concerns among consumers since surveys have shown that it has not met their expectations. 	<ul style="list-style-type: none"> • The airline could embrace technologies to improve service quality to its target markets, including customization. • Modernize its fleet to improve fuel and operational efficiency. 	<ul style="list-style-type: none"> • The entry of numerous low-cost carriers to the region has increased competition and reduced its market share. • Recovery from the COVID-19 pandemic is taking longer than expected, indicating that it has weak organizational resilience.

Source: Case Study Analysis

7 Chapter Seven: Recommendations

7.1 Introduction

The findings indicated that emerging technologies have a statistically significant positive impact on organizational resilience among Middle Eastern Airlines. This chapter provides actionable suggestions on what air transport industry stakeholders could do not maximize the benefits of adopting emerging technologies. The core sections include the recommendations, managerial, practical, and research implications, and suggest emerging technologies that airlines can explore further. The conceptual model concludes the chapter and illustrates the direction and nature of the relationship between the study variables.

7.2 Recommendations

Middle Eastern air transport stakeholders should increase the integration of emerging technologies into their business models to overcome challenges hampering competitiveness growth. The study indicated cost, customer satisfaction, and safety are the primary issues limiting goal attainment. Therefore, IoT, AR, VR, and big data analytics present an opportunity to improve operational efficiency, customer satisfaction, and profitability. The benefits could include service personalization to improve quality perceptions and to enhance pilots' training and situational awareness during flight to promote safety. For instance, Emirates Airways maintains its premium customer segment by continuously embracing innovations to improve the travel experience. The technologies could increase switching costs, thus reducing competition among the regional airlines.

The emerging technologies provide a platform for capitalizing on opportunities to strengthen global competitiveness. For instance, AR has proved effective in streamlining maintenance operations, which can reduce operating costs and promote profitability. Besides, big data analytics could empower airlines to gather data about their customers' historical information, including travel and the services requested. The solution could require customers to create accounts on the airlines' online portals and use the login credentials when seeking in-flight entertainment and catering. The two technologies present an opportunity to reduce maintenance costs, promote safety, and create a large pool of loyal customers. Stakeholders can use loyalty points to increase switching costs and encourage the usage of the technologies among maintenance crews.

Regional airlines should invest in integrating robust defenses in their information systems to reduce susceptibility to cyberattacks. The assertion is attributed to technology dependence being a risk factor for third-party malicious activities. The industry security measures aim to protect passenger data and minimize vulnerability to significant disruptions. For instance, the Middle East geopolitical tensions signify that insurgents cause launch cyber-attacks on regional airlines to impact their adversaries significantly. Therefore, the defenses will enhance the industry's reputation for safety and security while increasing the likelihood of recovery after similar attacks. The suggestion is due to the assumption that integrating emerging technologies will increase the chances of foreseeing similar occurrences.

7.3 Implications

7.3.1 Managerial Implications

These outcomes imply that airline and airport managers should allocate more resources to support integrating emerging technologies into their operations. The efforts could improve employee productivity, reduce fleet and administrative costs, and position the stakeholders to exploit emerging opportunities. For instance, airlines could use VR and AR in pilot and ground crew training to improve their situational awareness and ability to handle unforeseen occurrences. Besides, they could use big data analytics to provide customized services through real-time data analysis to aid decision-making. Industry managers should reposition their respective organizations to capitalize on the opportunities created and mitigate competitive pressure. For instance, relying on IoT to improve service quality could improve customer satisfaction, fostering brand recognition and quality. Embracing the new technologies will be economically feasible since the long-term performance and efficiency benefits will outweigh the short-term high initial acquisition costs.

7.3.2 Practical Implications

The determination that emerging technologies strengthen organizational resilience necessitates stakeholders to determine the appropriate integration approaches to maximize benefits. The focus should be answering the questions 'when,' 'how,' and 'why.' 'When' concentrates on the timing of adopting the technologies to maximize the positive impact on stakeholder competitiveness, while 'how' is centered on identifying the ideal implementation approaches. Conversely, the 'why' question

justifies selecting specific technologies and not others to ensure that the reorganization aligns with the core business objectives. For instance, AR is ideal for pilot and ground-creation training by introducing simulations of various flying and maintenance adverse incidents to improve the ability to respond to actual situations. Selecting the right technologies will allow stakeholders to leverage their internal advantages to achieve sustainable growth through improved performance. The Middle Eastern airlines are better positioned to lead the global air transport industry since they have sufficient financial backing to support R&D efforts and promote digital transformation.

7.3.3 Industry-Wide Implications

The findings indicated that despite the associated benefits, adopting emerging technologies is a capital-intensive venture that requires robust business models to recoup the investments. The determinations imply that air transport stakeholders in the Middle East should sign strategic alliances and partnerships, particularly in digital innovations, to reduce costs. Besides, it would help them mitigate competitive pressure from Western and Asian airlines through improved operational efficiency. The collaboration agreements should include clauses allowing parties to customize the group innovations to individual business models to avoid eroding internal competitiveness. The phenomenon signifies that the strategy would reduce time to market, positioning the regional carriers as among the first adopters. Hence, the partnerships will give them early access to solutions for common issues, help them become industry pioneers, and reduce administrative costs. Regional airlines have significant growth potential if they create a conducive collaborative environment to enhance the adoption of emerging technologies.

7.4 Strategies or Technologies That Airlines Can Further Explore

Air transport industry stakeholders among Middle Eastern airlines have numerous technology options they can use to strengthen their global competitiveness. This section focuses on those that this study has not covered. Table 2 illustrates the list.

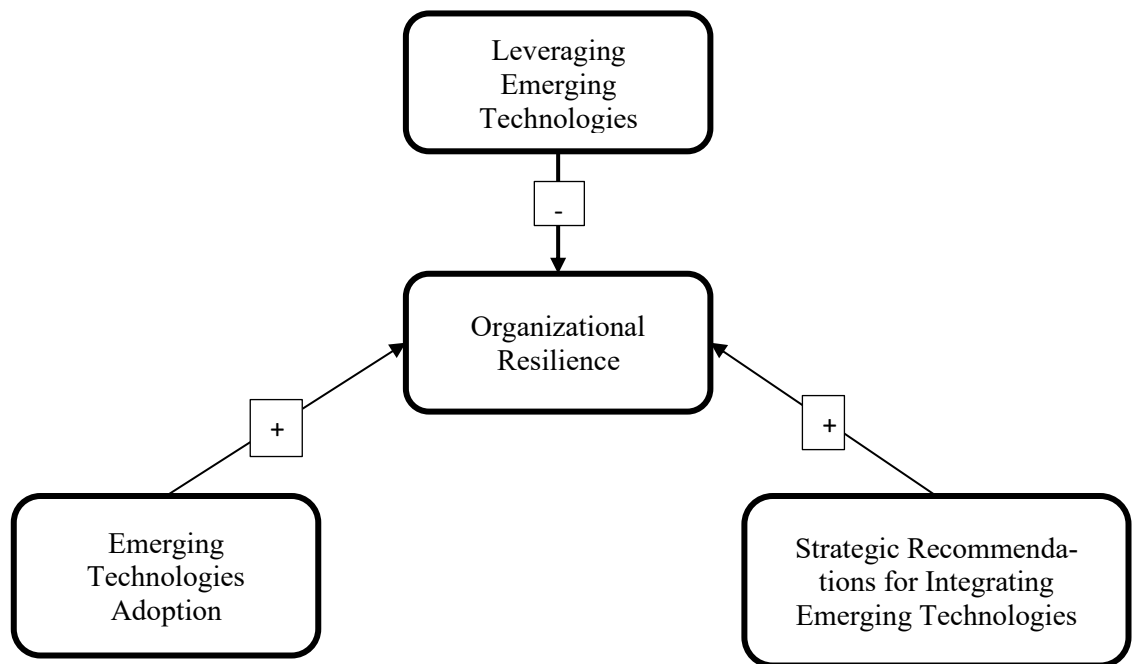
Table 19: Strategies or technologies that airlines can further explore

Technology	Description	Industry Applications	Benefits	Source
Mobile technologies, Apps	Software designed to be used on mobile devices such as smartphones and tablets	<ul style="list-style-type: none"> • Check-in • Ticketing • Real-time travel updates. • Customer service • Boarding 	<ul style="list-style-type: none"> • Improved operational efficiency and customer experience 	La et al. (2021)

Cloud computing	The use of computing services, including software, analytics, and databases over the internet	<ul style="list-style-type: none"> • Storage • Cyber security 	<ul style="list-style-type: none"> • Improve large datasets management • Improve stakeholder collaborations 	Li et al. (2021)
Cyber security solutions	Mechanisms implemented to reduce computer systems' susceptibility to hacking	<ul style="list-style-type: none"> • Cyber defenses 	<ul style="list-style-type: none"> • Airlines need cyber security systems to protect customer data, promote safety and security, and reduce exposure to technology-related disruptions. 	Ukwandu et al. (2022)
Sustainable smart technologies	Technologies that minimize the adverse environmental impacts of air transport activities	<ul style="list-style-type: none"> • Fuel-efficient engines. • Alternative energy sources • Reducing plastic waste 	<ul style="list-style-type: none"> • Promote business and environmental sustainability. • Increase air transport sector contribution to environmental conservation. 	Carayannis et al. (2022)
Blockchain technologies	A database mechanism that permits seamless information sharing across multiple stakeholders within a business network	<ul style="list-style-type: none"> • Ticketing • Baggage tracking. • Loyalty programs 	<ul style="list-style-type: none"> • Efficient and secure data management across multiple sections within a system • Minimizes the chances of compromising data integrity. • Promotes transparency 	Di Vaio and Variale (2020)

7.5 Conceptual model

The conceptual model illustrates the direction and nature of the relationship between the study variables. It shows how each variable affects the other based on the regression and correlation analysis outcomes. Figure 5 illustrates the findings.



Source: Survey Data

Figure 5: Conceptual model

The chart indicates that leveraging emerging technologies negatively impacts organizational resilience, as determined by the correlation and multiple linear regression results. However, the relationship is different for emerging technologies adoption since they positively predicted organizational resilience. The outcomes are similar to the effect of strategic recommendations for integration, signifying that stakeholders should embrace the suggestions to realize the benefits of emerging technologies. The conceptual model emphasizes the congruence between this study's findings and assumptions of existing theories and previous authors' conclusions.

8 Chapter Eight: Conclusion

8.1 Conclusion.

Emerging technologies present an opportunity to enhance business sustainability by improving operational efficiency and service quality. Middle Eastern airlines stakeholders are leveraging the benefits to perceived benefits to optimize performance. The statistically significant adverse prediction means that a unit's rise in leveraging technologies is associated with a decline in organizational resilience. Besides, they indicate that the benefits are conditional in that the industry stakeholders must fulfill specific conditions to realize the desired outcomes. For instance, aligning adoption to the organizational business model and strategic objectives to avoid duplication and improve efficiency. For example, airlines that outsource maintenance services have a limited need for AR, which is known to streamline the activity through fault detection and suggest possible interventions. Hence, an in-depth review of emerging technologies should inform decisions regarding technology selection and integration. Information-based adoption could reverse the negative relationship between leveraging technologies and organizational resilience.

Adopting emerging technologies fosters organizational resilience among Middle Eastern airlines by enhancing performance metrics. For instance, it enhances passenger experience, a critical determinant of perceived quality and customer satisfaction. Contented clients are likelier to remain loyal to an airline since their services meet or exceed expectations. Besides, IoT and big data analytics promote informed and effective decision-making through real-time data processing to create possible scenarios for implementing appropriate solutions. Contemporary airlines face numerous challenges, including high operating costs, competition, and disruptions, which they can address by adopting emerging technologies. The positive association between adoption and organizational resilience justifies integrating them to promote business sustainability. Middle Eastern airlines have rapidly grown to become among the largest globally, and they can maintain their position by adopting emerging technologies that align with their business objectives.

Integrating emerging technologies into the business models of Middle Eastern airlines will enhance their resilience against market uncertainties and promote sustainable growth. Attaining the goals requires application in human resources development activities such as employee training. The incorporation should focus on enhancing the passenger experience by improving safety and security and providing customized, innovative services to improve satisfaction. Nonetheless,

attaining the goals requires allocating substantial resources to R&D activities to nurture a creativity culture and installing high-speed internet connections to ensure their systems' operability. Besides, collaboration with policymakers will ensure that air transport stakeholders have legal backing to integrate the emerging technologies and avoid liabilities. Attaining the desired outcomes will require multi-stakeholder partnerships to create a conducive implementation environment that enhances customer-perceived quality and goal attainment among service providers. The suggestions will enhance operational feasibility since this and previous research have demonstrated that emerging technologies are instrumental for business growth.

9 Chapter Nine: Limitations and Future Research

9.1 Study Limitations

This study utilized a quantitative research approach that is associated with limited depth shortcomings. The method establishes relationships between variables, including the impact of leveraging emerging technologies, adoption, and strategic recommendations on organizational resilience. Therefore, it does not provide contextual information on the factors that influence the participants' responses regarding the impacts of emerging technologies. Besides, it gives limited information on thoughts, drivers, and motivations, which is critical in assessing the outcomes' applicability to other settings. The limitations justify the need for qualitative studies using open-ended questions or interviews to understand the motivations behind the participants' responses.

The Middle East's unique ownership structure and socioeconomic characteristics limit the outcomes' generalizability to other countries. Most of the airlines are government-owned, signifying that their operating conditions may differ from outside the region. For instance, the United States and Brazil have never owned a national airline, which indicates that stakeholders in the areas operate in a free market economy. Secondly, Middle Eastern airlines receive substantial investment from hydrocarbon revenues, strengthening their financial capacity to maintain modern fleets and operate numerous routes. The differences limit this study's findings' applicability to others since the capacity to adopt emerging technologies may vary.

This research's sample size was relatively small compared to the target population and industry stakeholder distribution. The phenomenon signifies a high probability of sampling errors since the number of participants is not representative of the target population. For instance, the sample size was 152 participants, against the more than 10,000 people employed in the sector. Besides, the smaller sample size may have been insufficient for statistical measures, contributing to the lack of correlation between leveraging emerging technologies and organizational resilience. Future studies with large sample sizes are necessary to evaluate the validity and credibility of these research determinations.

9.2 Suggested Areas for Future Research

The study limitations form the basis for the following recommendations for future research to broaden the information pool on the association between emerging technologies and organizational resilience.

- 1) A qualitative study on the association between adopting emerging technologies and organizational resilience among Middle Eastern airlines. This study will generate contextual information to understand the factors influencing participant decisions.
- 2) Effectiveness of AR, VR, IoT, and big data analytics in enhancing organizational resilience. This research should seek to compare and decide which among the emerging technologies air transport stakeholders should emphasize to achieve performance objectives.
- 3) A quantitative study on the effect of emerging technologies on organizational resilience, focusing on air transport stakeholders in other regions, including East Africa, Europe, Central Asia, and South America.

Future scholars should investigate risks associated with the increased adoption of emerging technologies on organizational resilience. The findings would inform decisions on formulating appropriate interventions to reduce exposure.

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Appendix 1 – Invitation to participate in the survey

Subject: Invitation to Participate in Research on Emerging Technologies in the Air Transport Industry

Dear

I'm currently working on my MBA Thesis focused on the role of emerging technologies in enhancing the resilience of the air transport industry with a focus on Middle Eastern Airlines. Your perspectives would provide invaluable insights into this study.

Could I ask for a few minutes of your time to fill out the below brief questionnaire? Your participation is voluntary, anonymous, and highly appreciated.

< L I N K >

Thank you in advance for your support! Please don't hesitate to reach out if you have any questions.

P.S. If you have colleagues or friends working for Middle Eastern Airlines who might be interested in sharing their insights, please feel free to forward this survey to them. Your help in reaching a broader audience is greatly appreciated!

Best

Appendix 2 – Survey

Organizational resilience refers to an organization’s ability to adapt and recover from significant changes in the internal or external environment. It is the capacity of an organization to withstand challenges and rapidly recover from them. It involves being prepared, adaptable and able to evolve, so that when difficulties arise, the organization can continue to function effectively and even find new opportunities for growth.

Emerging Technologies refer to new and rapidly evolving technological advancements that are currently developing or will be developed in the next few years. These technologies have the potential to significantly alter lives, industries and societies. Some examples of emerging technologies include: Artificial Intelligence (AI) and Machine Learning (ML), Blockchain, Quantum Computing, Internet of Things (IoT), Augmented Reality (AR) and Virtual Reality (VR), Advanced Robotics and Automation, Big Data Analytics etc.

Section A: Demographic Data

Kindly fill the following section by ticking on the option that best describes you.

1. What is your biological gender?

Male [] Female []

2. What is your occupation?

Administrator/ Management [] Ground Staff [] Flight/ Cabin Crew []

3. What is your level of experience in the air transport industry

<3 years [] 3-5 Years [] 6-8 years []

9-11 Years [] 12-14 Years [] >14 Years []

4. What is your highest level of educational attainment?

Diploma [] Undergraduate [] Masters [] Doctorate []

Section B: Leveraging Emerging Technologies for Organizational Resilience

5. Please complete the following section by indicating your levels of agreement regarding the highlighted statements.

Note. SA – Strongly Agree A – Agree N – Neutral D – Disagree SD – Strongly Disagree

Leveraging Emerging Technologies	SD	D	N	A	SA
Air transport industry stakeholders leverage Artificial Intelligence (IT) to support operational and pricing decisions to boost overall performance					
Airlines are using Augmented Reality (AR) to promote aviation safety through extensive cabin crew training and enhancing situational awareness.					
The air transport industry is leveraging Virtual Reality (VR) to promote organizational resilience through technical skills improvement and promote aviation safety and security.					
Aviation sector stakeholders leverage Big Data Analytics to strengthen organizational resilience through informed and effective decision-making.					
Internet of Things (IoT) revolutionizes air transport by enhancing resource allocation and promoting operational efficiency					
Air transport industry stakeholders leverage enhancing its capacity to cope with emerging issues and capitalize on market opportunities.					

6. Others, kindly specify.

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Section C: Relationship Between Adopting These Technologies and Cultivating a Resilient Organizational Culture

7. Please complete the following section by indicating your levels of agreement regarding the highlighted statements.

Note. SA – Strongly Agree A – Agree N – Neutral D – Disagree SD – Strongly Disagree

Emerging Technologies Adoption and Resilience Culture	SD	D	N	A	SA
Augmented reality's (AR) instrumental roles in the aviation sector are enhancing passenger experience, cabin crew training, and streamlining maintenance operations.					
Virtual reality (VR) enhances organizational resilience by optimizing aviation student training costs.					
Big Data Analytics fosters a resilient organizational culture by strengthening decision-making and employee performance.					

Internet of Things (IoT) cultivates an organizational resilience culture by enhancing proactive decision-making through availing real-time data and boosting connectivity.					
Machine Learning (ML) nurtures a resilient organizational culture by strengthening adaptability, expanding capacity to overcome unforeseen challenges, and promoting innovation.					

8. Others, kindly specify.

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Section D: Strategic Recommendations for Integrating Emerging Technologies

9. Please complete the following section by indicating your levels of agreement regarding the highlighted statements.

Note. SA – Strongly Agree A – Agree N – Neutral D – Disagree SD – Strongly Disagree

Strategic Recommendations for Integrating Emerging Technologies	SD	D	N	A	SA
Air transport industry organizations should integrate emerging technologies with employee upskilling and training to ensure they have sufficient human resources capacity to manage the systems.					
Investing in connectivity, including high-speed internet, will empower air transport stakeholders to capitalize on emerging opportunities while optimizing the risks.					
Aviation sector stakeholders seek regulatory compliance and certification to establish standards and guidelines to ensure the integration of secure and safe emerging technologies.					
Air transport industry stakeholders should enhance passenger experience by improving safety, comfort, and convenience.					
Air transport industry stakeholders should strengthen their cybersecurity mechanisms to reduce susceptibility to attacks and boost organizational resilience.					
Collaboration between air transport industry stakeholders ensures a unified and coordinated approach to integrating emerging technologies.					
Research and development (R&D) is a proactive strategy that air transport industry stakeholders should adopt to strengthen organizational resilience and promote long-term growth.					
Air transport industry stakeholders should establish a clear roadmap that outlines the integration of emerging technologies into the air transport industry.					

10. Others, kindly specify.

.....

Section E: Organizational Resilience

11. Please complete the following section by indicating your levels of agreement regarding the highlighted statements.
 Note. SA – Strongly Agree A – Agree N – Neutral D – Disagree SD – Strongly Disagree

Organizational Resilience	SD	D	N	A	SA
Financial resilience enhances organizational capacity to withstand market adversities by strengthening liquidity minimizing default and capital flight risk.					
Airlines should undertake community engagement to boost organizational resilience by building stakeholder relationships and trust to promote collaboration.					
Learning and continuous improvement enhance organizational resilience by promoting adaptation to change and boosting innovation and creativity.					
Employee engagement strengthens organizational resilience by nurturing a collaborative, adaptable, and innovative employee pool that increases the capacity to recover from setbacks					
Crisis management and response is a leadership function establishing processes and procedures to respond decisively to crises and emergencies.					
Risk management is an organizational resilience component that entails identifying, evaluating, and managing threats to understand their impacts on operations, stakeholders, and reputation.					
Leadership and governance are organizational resilience components that emphasize nurturing a supportive culture.					
Organizational resilience represents a company's ability to effectively absorb and formulate situation-specific reactions and undertake transformative activities to exploit the disruptive surprises that threaten survival					

12. Others, kindly specify.

Thank you for participating!

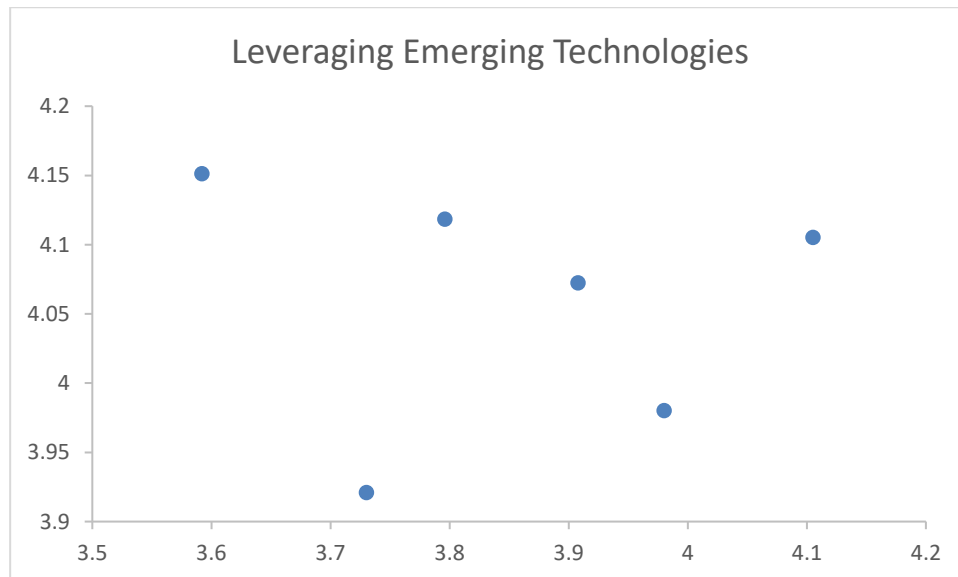
Appendix 3 – Correlation Matrix of Independent Variables

	Leveraging on Emerging Technologies	Adoption of Emerging Technologies	Strategic Recommendations for Integrating Emerging Technologies
Leveraging on Emerging Technologies	1.00	0.45	0.34
Adoption of Emerging Technologies	0.45	1.00	0.22
Strategic Recommendations for Integrating Emerging Technologies	0.34	0.22	1.00

Appendix 4 – Scatter Plots for Linearity

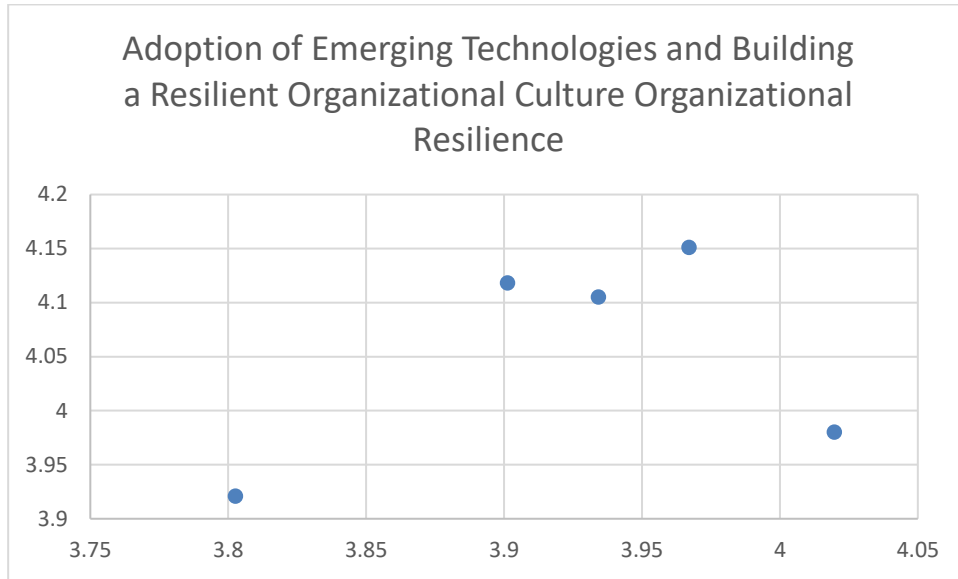
Scatter Plot 1: Leveraging on Emerging Technologies vs. Organizational Resilience

Leveraging on Emerging Technologies	Organizational Resilience
3.9803	3.9803
3.7303	3.9211
3.5921	4.1513
3.7961	4.1184
4.1053	4.1053
3.9079	4.0724



Scatter Plot 2: Adoption of Emerging Technologies and Building a Resilient Organizational Culture vs. Organizational Resilience

Adoption of Emerging Technologies	Organizational Resilience
4.0197	3.9803
3.8026	3.9211
3.9671	4.1513
3.9013	4.1184
3.9342	4.1053



Scatter Plot 3: Strategic Recommendations for Integrating Emerging Technologies vs. Organizational Resilience

Strategic Recommendations	Organizational Resilience
4.2434	3.9803
3.9013	3.9211
3.8816	4.1513
4.2434	4.1184
4.0987	4.1053
3.9474	4.0724
4.1118	4.0724
4.2303	3.9737

