Digital Transformation in Public Transportation: Investigate the impact of Digital Transformation in Public Transportation Business Model in UAE on Public Transportation Customer Relationship

التحول الرقمي في المواصلات العامة: دراسة أثر التحول الرقمي في نموذج أعمال المواصلات العامة في الامارات العربية المتحدة على العلاقة مع مستخدمي المواصلات العامة.

by

FIRAS FATHI THEKRALLAH

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Abstract

Digital transformation become a major need, and for many businesses it’s not optional to speed up their digital transformation because of all the uncertainty about the future such as COVID-19 pandemic.

Government agencies can enhance services, save money and the same time improve the quality of resident’s life by digitizing processes and making organizational changes, also many government entities have discovered that the digital transformation of a government is difficult however, it is extremely lucrative for residents and government officials.

The United Arab Emirates is one of the most developed countries in the middle east and north africa for citizen-centric online public services, as multiple digital government strategies had been introduced such as the fourth industrial revolution strategy, the artificial intelligence strategy, the national innovation strategy, and the emirates blockchain strategy 2021, moreover UAE government achieved major digital accomplishments in a variety of fields, including education, health, cybersecurity, digital government, and smart cities.

The aim of this research is to identify the impact of digital transformation of public transportation business model on customer relationship using a quantitative research methodology by utilizing a quantitative survey for collecting numerical data.

Results indicates that there is a moderately positive association between the digital transformation of public transportation business model on customer relationship.

Keywords: Digital Transformation, Digital Transformation in Public Transportation in UAE, Customer Relationship

نبذة مختصرة

بالنسبة للعديد من الشركات والمؤسسات في قطاعات مختلفة يعتبر التحول الرقمي في عملياتها وخدماتها ضرورة لابد منه خصوصا في ظل التحديات المختلفة التي تواجه العالم والتي قد تؤثر على سير عملها والخدمات التي تقدمها واخرها وباء كوفيد 19.

يمكن لمؤسسات القطاع العام من تحسين خدماتها بالإضافة الى توفير المال وتحسين حياة المواطنين من خلال التحول الرقمي لعمليات وإجراء تغييرات في الهيكل التنظيمي للمؤسسة حيث تبين للعديد من الهيئات الحكومية أن التحول الرقمي للحكومة صعب ولكنه مجزي بشكل لا يصدق للمواطنين وموظفي الحكومة.

الإمارات العربية المتحدة هي واحدة من أكثر الدول تطوراً في الشرق الأوسط وشمال إفريقيا للخدمات الرقمية و التي تركز على المواطن، حيث قامت حكومة دولة الامارات العربية المتحدة بوضع استراتيجيات حكومية رقمية متعددة مثل استراتيجية الثورة الصناعية الرابعة ، واستراتيجية الذكاء الاصطناعي ، واستراتيجية الابتكار، و استراتيجية بلوك تشين الإمارات 2021 ، بالإضافة الى ذلك حققت حكومة الإمارات إنجازات رقمية كبيرة في مجموعة متنوعة من المجالات ، بما في ذلك التعليم والصحة والأمن السيبراني والحكومة الرقمية والمدن الذكية.

الهدف من هذا البحث هو دراسة مدى تأثير التحول الرقمي لنموذج أعمال المواصلات العامة في الإمارات العربية المتحدة على العلاقة مع العملاء باستخدام منهجية البحث الكمي من خلال استخدام المسح الكمي لجمع البيانات الرقمية.

وخلصت النتائج إلى وجود ارتباط إيجابي بين التحول الرقمي لنموذج أعمال النقل العام على العلاقة مع العملاء.

كلمات ذات دلاله: التحول الرقمي، التحول الرقمي في المواصلات العامة في دولة الامارات العربية المتحدة، علاقة المتعاملين.

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Chapter 1: Introduction

1.1 Overview

Fitzpatrick et al. (2020) believed that that the COVID-19 crisis will expedite the transition to digital, as digital transformation become a major need. For many businesses it's not optional to speed up their digital transformation because of all the uncertainty about the future.

Verina & Titko (2019) suggested a common definition of digital transformation; as the incorporation of digital technology into all elements of a business, resulting in a fundamental shift in how firms function and deliver value to consumers.

As a result of digital transformation, the connection between consumers and businesses will unavoidably alter, while customer relationships are already digitally driven from start to finish, and the lines between online and offline are becoming increasingly blurred. Self-service, automation, smart data usage, and proactive customer care have fast become commonplace among today's customers, making it challenging to maintain a competitive advantage in client interactions. Companies with an online start are presently leading the way in establishing themselves in the digital world, but many firms with an offline origin have lagged behind in the digitalization of their client interactions, implying that they may face an unclear future (Belleghem 2016).

The public services is not away from this , as in an unforeseen situation, such as the COVID-19 pandemic, delivery of public services should not be suspended; instead, it must be delivered to public services users by acquire necessary digital technology, moreover COVID-19 has been an accelerator in public sector digital transformation (Agostino, Arnaboldi & Lema 2020).

According to Deloitte (2018) report ;due to changes in demographic, new societal behaviors, and technology advancements are considered among the main factors that transforming the public sector. Governments would need to be on the cutting edge of these changes, digital technologies provide a

surpassing chance for the public sector to redefine itself, in 2017, worldwide market of around US$1.2 trillion was created by the confluence of four important technologies: social apps, mobile technology, big data analytics, and cloud infrastructure. The three major drivers of digital transformation in the public sector, according to Deloitte, are cost and budget challenges, customer/citizen needs, and federal government mandates.

Digital transformation focuses on improvements in organizational structures, processes, functions and business models by using digital tools to improve their performance dramatically (Sahu, Deng & Mollah 2018). Digital transformation has the potential for providing customers with a smarter and faster services and successfully shaping the digital transition of their business model, digital transformation affects all social sectors in economies (Schallmo, Williams & Boardman 2017).

Government agencies can enhance services, save money and the same time improve the quality of resident's life by digitizing processes and making organizational changes, also many government entities have discovered that the digital transformation of a government is difficult however, it is extremely lucrative for residents and government officials (Corydon, Ganesan & Lundqvist 2016).

Co-production and co-creation became the latest terms in the literature dealing with how community members contribute to the delivery of public services in the current digital age. There's growing agreement that digitalization not only improves coproduction by making it more effective and efficient, but it also fundamentally changes how community members and consumers of public services contribute to the development of public services, so instead of simply digitizing analog services, the next stage of digital governance is digital transformation, which involves a comprehensive examination and reform of existing services. Human-centered design approaches, represents a co-creation centered on incorporating user demands into the service design process in order to offer public value. (Mergel et al. 2018).

The relationship between customers and businesses will inevitably change as a result of digital transformation whereas customer relationships are already digitally driven from start to finish, and the distinctions between online and offline are becoming increasingly blurred. Today's consumers have quickly become familiar to self-service, automation, smart data use, and proactive customer service, making it difficult to maintain a competitive edge in customer relationships. Companies with an online origin are currently leading the way by establishing themselves in the digital world, while many businesses with an offline origin have lagged behind in the digitalization of their customer relationships which could imply that they might face an uncertain future (Belleghem 2016).

1.2 The Significance of the Research

According to the united nations department of economic and social affairs (DESA) division of public administration and development management (DPADM) report published in 2020, the UAE is ranked 21st in the world and the leader in the MENA region in e-government development, UAE government achieved major digital accomplishments in a variety of fields, including education, health, cybersecurity, digital government, and smart cities (Department of Economic and Social Affairs 2020), more over UAE government introduced and implemented multiple initiatives and strategies toward Digital UAE (UAE Government 2020).

H. H. Sheikh Mohammed bin Rashid Al Maktoum, vice-president and prime minister of the United Arab Emirates and ruler of Dubai reviewed the national program for happiness and wellbeing on March 7, 2016, The program establishes government policies, initiatives, and services aimed at promoting the benefits of a healthy lifestyle in the community, as well as a plan to develop a happiness index to measure people's satisfaction, this initiative aimed to ensure that happiness is a part of all government policies, programs, and services, encouraging happiness and wellbeing as a way of life in society, and establishing metrics and tools to measure happiness, following to that, UAE government established the ministry of state for happiness in February 2016 to coordinate all

government plans, programs, and policies in order to build a happier society, also one of the first strategic 'smart city' efforts in Dubai is the happiness meter, this meter depicts the objective of happiness as a measurement, accordingly a map of happiness across the city, created using a centralized data dashboard, this would allow corporate and public sector organizations that host happiness meter contact points to compare and score consumer experiences across industries and geographic locations, as well as differentiating between direct and web-based engagements, this initiative considered as the first of its sort in the world in that it measures experiences throughout a full city, encompassing both private and public sector enterprises. (UAE Government 2021).

Public transportation sector is considered as one of the major sectors in public services in UAE as UAE government intervention techniques include promoting the use of public transportation and reducing the use of personal vehicles (Worku 2013).

Public transportation services are being impacted by digital transformation strategies and initiatives introduced by UAE government , although people happiness and customer satisfaction is one of centric of UAE government interest specially the satisfaction related to government services , however going through the literature, there was a lack on researches related to the digital transformation studying the impact of digital transformation in public transportation business model on customer relationship, specifically in United Arab Emirates , accordingly this research would be an added value for public transportation providers in United Arab Emirates to identify the impact expected on customer relationship and what is the areas of improvement that would maximize the benefits of digital transformation process.

1.3 The Research Question

In order to investigate the impact of digital transformation of public transportation business model in UAE on customer relationship, the following question should be answered:

How is digital transformation of public transportation business model in UAE would impact customer relationship?

After completing the literature reviews needed to cover the research topic, the hypotheses that would support answering the research question will be developed.

1.4 Research Structure

This research is divided into five chapters as follows, where the first chapter will provide an introduction about the research topic and the significance behind this research and the research question that need to be answered at the end of this research. Chapter 2 will go through the available literature covering the research topic in order to identify the factors that need to be measured and according support the formulation of hypotheses required to answer the research question. Chapter 3 will illustrate the research methodology adopted and how the research measuring tool had been developed. Chapter 4 will go through the analysis of data collected through the quantitative survey and results found, and finally Chapter 5 which will provide a conclusion of the derived results, limitation, and suggestions for future work.

Chapter 2: Literature Review

In this chapter will go through the available literature that will cover the topics related to the research question. First section will cover digital transformation definition and elements, digital transformation in public sector, digital transformation in UAE and finally digital transformation initiatives in public transportation services in UAE.

Section two will cover the digital transformation of business model, as business models will help in assessing the impact of digital transformation on public transportation and identify the elements that will have impact on customer relationship.

2.1 Digital Transformation

Vial (2019) proposed a conceptual definition for digital transformation (DT) as a process that seeks to improve an organization by causing significant changes in its characteristics through the use of knowledge, computer technology, communication, and interoperability technologies, as well as an inductive framework that summarizes the available information based on the author's study, this inductive framework is illustrated in Figure 1:

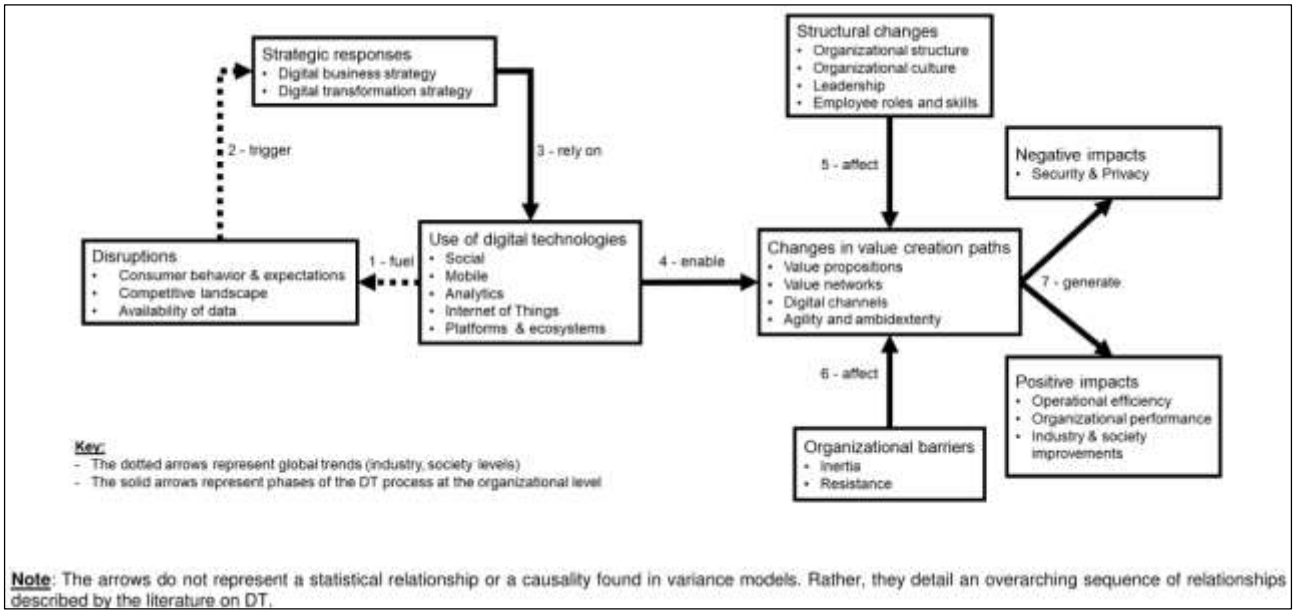


Figure 1: Digital Transformation Inductive Framework, (Vial 2019, p. 11)

The developed framework is built on relationships that emerged throughout eight overarching building blocks that describe digital transformation as a process in which digital technologies have a significant role in the production and reinforcement of social and cultural disturbances as well as commercial disruptions, however the author argued that an organization's value is limited by digital technologies on its own, however, it is the use of digital technologies within a particular context that allows a company to find new methods to generate value, in maintaining with the long-held belief that organizational change is an emergent phenomenon, moreover the literature emphasizes that modification and redefinition of business models in the context of digital transformation changes will impact value propositions, value networks, digital channels, and enabling agility and ambidexterity.

Reis et al. (2018) defined digital transformation as the utilization of emerging technologies which thus facilitates significant business improvements and has an impact on all aspects of customers' lives, author mentioned that according to analysis conducted; both “digital transformation” and “digitalization” are used through the literature in the same context which refer to services, processes, and organizational structures using IT/IS and web-based enablers.

On the other hand Gebayew et al. (2018) concluded that digital transformation can be referred as the utilization of new technological opportunities to create value and increase competitive advantage for organizations , Such transformations can have an influence on the structure of an organization, main resources, and business model, also highlighted that the impact of digital transformation on business activities or functions, business processes, customer, worker, and partner approaches, and business models is identified, some of the advantages of digital transformation for businesses include: increased customer satisfaction, improved customer experience, increased productivity, increased revenue from products and services, and cost savings.

Henriette, Feki & Boughzala (2015) point out that it is frequently referred to a new business model or a reshaping of current business models, which is affected by a variety of variables, such as: new

technologies, Opportunities to extend the market, and unstable changes to customer expectations, moreover digital transformation includes digital capabilities implementation to support business model transformations, it has an impact on the entire organization, particularly operational processes, resources, and internal and external users. This is a significant shift in employee's habits and working methods, which are based on collaboration and intensified interactions.

Verina & Titko (2019) claimed that digital transformation definition that can be accepted is the inclusion of digital technology into all aspects of a business, actually resulting to a radical change in how businesses operate as well as provide value to customers, also author identified the digital transformation categories: Technologies, Management /Processes and People, categories and elements withing identified by author illustrated the Table 1:

Technologies	Management / Processes	People
• Data • Big data • Cloud • Mobile devices • Social media • Software • Analytics • Embedded devices • Artificial intelligence • The Internet of Things • Cybersecurity	• Business models • Operating models • Operational processes • Strategies • Business activities • Organizational structure • Organizational culture • Coordination mechanism • Products	• Customers • Employees / workforce / people Managers • Executives • Talents • Owners • Suppliers • Partners • Stakeholders • Competencies

• App marketplaces	• New Services	

Table 1: Digital transformation categories and elements within (adapted from Varina & Titko 2019, p.723)

2.1.1 Digital Transformation in Public Sector

Corydon, Ganesan & Lundqvist (2016) claimed that Government agencies can enhance services, save money and the same time improve the quality of resident's life by digitizing processes and making organizational changes, also many government entities have discovered that the digital transformation of a government is difficult however, it is extremely lucrative for residents and government officials. The first step is to commit to a broad, ambitious vision of digital government which should specify clearly state goals, such as increasing citizen engagement, improving government productivity, or improving the economy.

International Association of Public Transport (2017) report pointed out that the daily operations of public transportation involve an infinite number of routines and processes in the background, which can also be improved using new technologies, at the end it will improve quality of services, reliability, and effectiveness of services, also the report argued that digital transformation is changing the customer relationship and, in many cases, causing entities to rethink the customer relationship. Nowadays, public transportation not only connects places, but it also connects with its customers directly via mobile devices and in real time and the use of Data exploitation can enable operators and governments to providing more efficient services that are tailored to the demands of individual consumers, such as route planning optimization or providing personalized real-time information services.

2.1.1 Digital Transformation in UAE

As highlighted by the GovTech Maturity Index issued recently in 2021 (Dener et al. 2021); The UAE is one of the most evolved countries in the Middle East and North Africa for citizen-centric online public services as illustrated in figure2, the Digital Emirates website contains information on digital government strategies such as the Fourth Industrial Revolution Strategy, the Artificial Intelligence Strategy, the National Innovation Strategy, and the Emirates Blockchain Strategy 2021. According to this report; By 2021, the government of Dubai is expected to become completely paperless, eliminating over one billion pieces of paper used for government transactions each year. The digital national identification for all citizens, residents and visitors allows users to access the services of federal government agencies and other service providers. Ongoing GovTech initiatives also include the establishment of the Digital Wellbeing Council of the Emirates and the transition to 5G standards. Digital Transactions Strategy 2021 aims to adopt advanced technologies and use them to convert 50 percent of the transaction's government into a blockchain platform by 2021. It is also expected that Dubai's blockchain strategy will help transform Dubai into the first city to be fully managed by the blockchain platform. Dubai Blockchain Strategy is also intended to help Dubai become the first city to be completely governed by a blockchain platform.

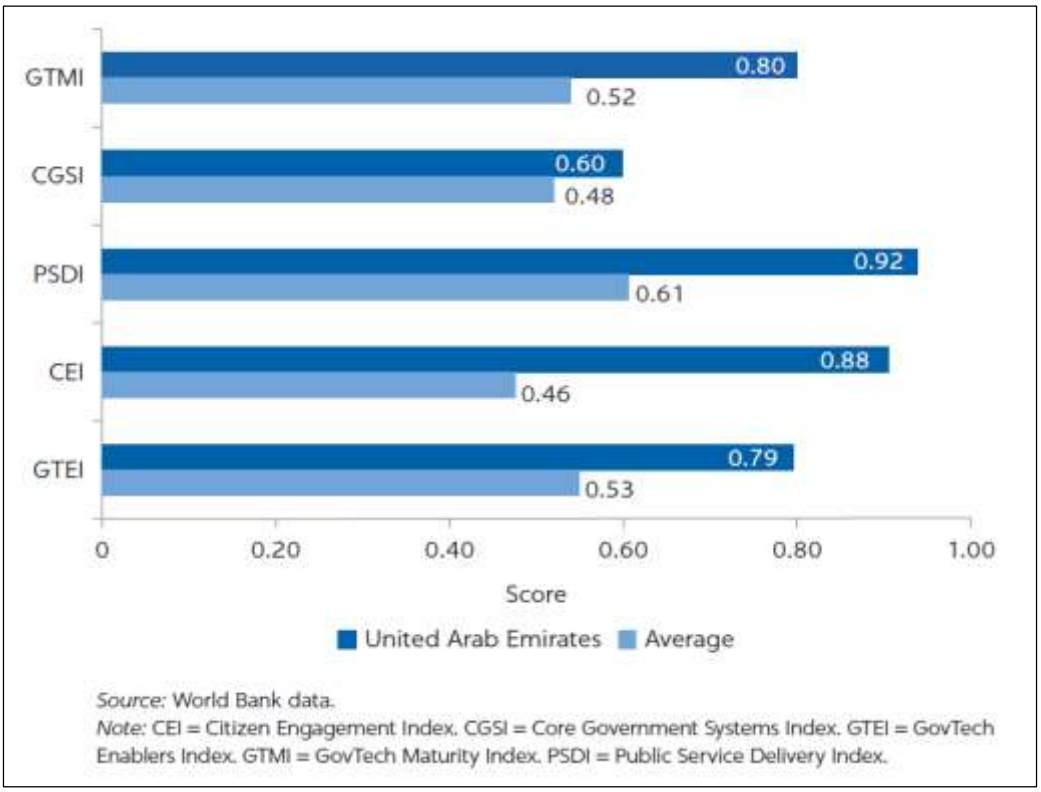


Figure 2:GovTech Maturity Index and component scores for the United Arab (Dener et al. 2021, p. 70)

Abu Dhabi , Dubai and Sharjah hold more than 90% of UAE population (Wikipedia 2020), and no references found related to digital transformation initiatives in Sharjah Roads and Transport Authority (Sharjah RTA 2021), accordingly, in the following section will go through some initiatives implemented by Integrated Transport Center in Abu Dhabi and Roads and Transport Authority in Dubai.

2.1.2 Integrated Transport Center - Abu Dhabi

On November 2016, in amendment of Law no. 19 of 2006 regarding Taxi regulation in the Emirate of Abu Dhabi, Integrated Transport Center (ITC) is established, ITC is the entity responsible for operating public transportation and managing carparks, traffic control centers, axle weights stations, and freight surface transportation logistical facilities, and roads sector in accordance with approved

transport plans, thereby improving the quality of services provided in the sector. In addition to assisting the Abu Dhabi Government's efforts to achieve a balanced and comprehensive development that fosters an intelligent, integrated, and sustainable transportation sector in the Emirate of Abu Dhabi (Abu Dhabi Government 2021a), to support Abu Dhabi digital transformation, Abu Dhabi Digital Authority (ADDA) is guiding Abu Dhabi's digital future by helping Abu Dhabi government partners in delivering services and developing ecosystems that improve quality of life and Increase government effectiveness through expanding chances for business and personal growth through strategies, regulations, standards, and enterprise architecture. (Abu Dhabi Digital Authority 2020).

TAMM is a smart service portal that serves 12 sectors in Abu Dhabi government utilizes cutting-edge technologies and digital solutions to This ecosystem, which is managed by the Abu Dhabi Digital Authority (ADDA), aims to give customers with seamless service experiences, offers its customers a comprehensive range of government services through a single point of access at any time and from any location, customers can use TAMM to have immediate access to government services and information without the need to visit each government agency (Abu Dhabi Government 2021b).

2.1.3 Roads and Transport Authority – Dubai

Roads and Transport Authority founded by the Decree No. 17 of 2005, to provide an advanced transportation network for the people of Dubai as its one of the government's top priorities, as evidenced by initiatives to improve public transportation and roads throughout the emirate to make travel safer and more comfortable, Roads and Transport Authority manage and maintain transport, roads, and traffic requirements in Dubai, as well as between Dubai and other Emirates of the UAE and surrounding countries, in order to achieve Dubai's goal and serve its strategic interests by providing optimal transport system integration (Roads and Transport Authority in Dubai 2020a).

In terms of digital transformation and according to RTA annual report 2019, the authority has adopted a digital strategy that includes a road map for integrating fourth industrial revolution technologies into the Dubai transportation sector. This strategy aims to strengthen the RTA's leadership in advanced technologies to serve the Dubai transportation sector as well as provide customers with best-in-class services, RTA digital strategy (2019 – 2023) has 6 pillars: Innovation pioneering, Excellence in service delivery, Increasing operational efficiency, information centricity, Asset sustainability and people happiness, the report highlighted that RTA digital transformation maturity level reached to level 2.7 by end of 2019 and targeting level 4 by 2023 (Roads and Transport Authority in Dubai 2020b).

2.2 Digital Transformation of Business Models

Alexander & Pigneur (2012, p.14) stated that the business model *"describes the rationale of how an organization creates, delivers, and captures value"* and Schallmo & Williams (2018, p. 11) defined business model as " *the basic, underlying logic of a company which describes what benefits are provided to customers and partners*.

In order to describe interactions and relationships between stakeholders in the value network of the firm, practitioners quickly adopted the business model concept, although the business model comes from a competitive business environment, however all organizations providing services and goods having to a certain extent the business model's essential components, these elements of the business model are also relevant in the public sector (Ranerup, Henriksen & Hedman 2016).

Business model components summarized by Ranerup, Henriksen & Hedman (2016, p.7) in figure 3.

Component	Characteristics
Value Proposition (VP)	Factors related to the offer of services, products, and activities that create value for users.
Value Architecture (VA)	Factors related to how resources (tangible or intangible) are constructed in order to create value for users (e.g., technological configurations and organizational structure).
Value Network (VN)	Factors related to actors (internal and external) and their roles in the transactions in actor-to-actor collaboration.
Value Finance (VF)	Factors related to finance, ownership, and costs.

Figure 3: Business models and their core components (Al-Debei & Avison 2010, cited in Ranerup, Henriksen & Hedman 2016).

The way of digitally Transforming business model can be implemented through digital business modification by adding digital content to existing products and services and introducing new digital solutions (Schwertner 2017).

In order to assess the impact of digital transformation on business model components, a frameworks should be established, Business Model Canvas (Alexander & Pigneur 2012) considered as the most commonly used business model (Kotarba 2018), also Business Model Canvas has more distinct structural blocks and can be adaptive to any industry and simple to understand and implement (Tolboom 2016), in addition to that Ovan (2015) claimed that Business Model Canvas built the most detailed blueprint from which these theories could be constructed, Business Model Canvas which had been built based on nine blocks as a structured way to lay out organization assumptions which includes key resources, key activities, value proposition, customer relationships, channels, customer segments, cost structures, and revenue streams as illustrated in Figure 2.

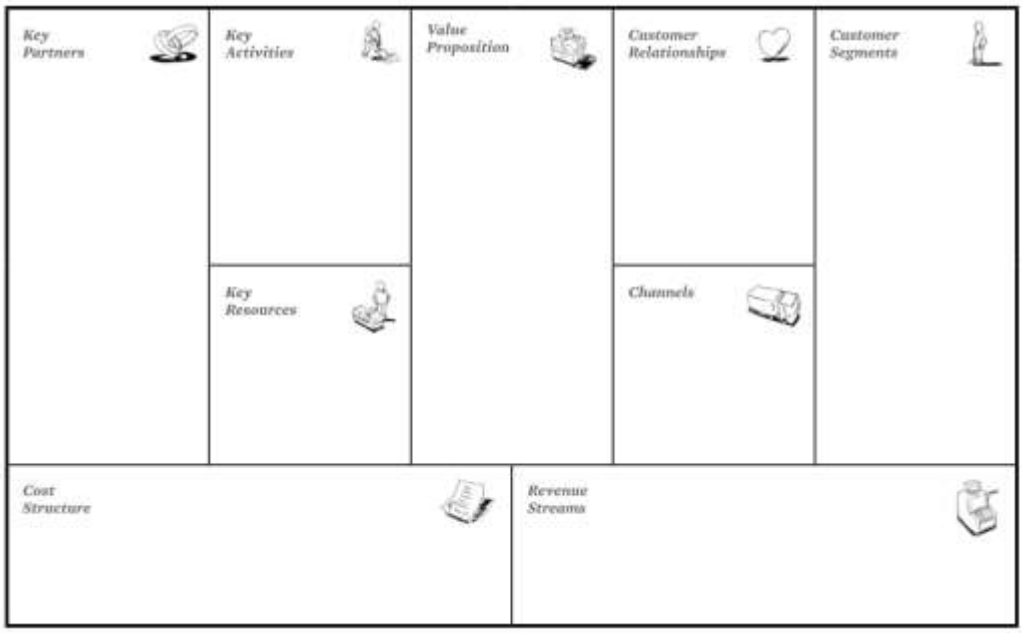


Figure 4: The Business Model Canvas (Alexander & Pigneur 2012, p. 44)

The business model canvas can be used to reflect an organization's digital transformation of its business model (Kotarba 2018), also The business model canvas's holistic approach allows for a thorough consideration and assessment of the impact of reaching a new level of digital maturity (Heinze et al. 2018).

Table 1 illustrates the nine building blocks and associated elements for each block:

Building Block	Elements Contributes to the Block
Customer Segments: defines the different groups of people or organizations an enterprise aims to reach and serve.	• Customer Needs • Customer behaviors • Customer attributes
Value Propositions: describes the bundle of products and services that create value for a specific Customer Segment.	• Newness • Performance • Customization • "Getting the job done" • Design • Brand/status • Price • Cost reduction • Risk reduction • Accessibility • Convenience/usability

Customer Channels: describes how a company communicates with and reaches its Customer Segments to deliver a Value Proposition	• Awareness • Evaluation • Purchase • Delivery • After sales
Customer Relationships: describes the types of relationships a company establishes with specific Customer Segments	• Personal assistance • Dedicated personal assistance • Self-service In • Automated services • Communities • Co-creation
Revenue Streams: represents the cash a company generates from each Customer Segment (costs must be subtracted from revenues to create earnings)	• Asset sale • usage fees • subscription fee • licensing • renting/lending/leasing • brokerage fees • advertising
Key Resources: describes the most important assets required to make a business model work	• Physical • Human • Intellectual • Financial
Key Activities: describes the most important things a company must do to make its business model work	• production creation • problem solving • network/platform activities
Key Partnerships: describes the network of suppliers and partners that make the business model work	• Optimization and economy of scale • Reduction of risk and uncertainty • Acquisition of particular resources and activities
Cost Structure: describes all costs incurred to operate a business model	• Cost-driven • Value-driven

Table 2: Canvas Building Blocks and related elements (Alexander & Pigneur 2012)

As the aim of this research to identify the impact of digital transformation of public transportation business model on customer relationship, we should identify the variables that would directly impact customer relationship.

According to Alexander & Pigneur (2012), there are four building blocks in Canvas business model that have direct touch with customers, the first one is Customer Segments, in order to better serve customers, organizations may divide them into discrete segments based on comparable needs, habits, or other factors, a corporate model may specify one or more large or small customer segments, the organization must determine which sectors it will service and which it will ignore, accordingly, a

business model may be carefully built on a thorough understanding of unique client requirements, as seen of the characteristics of this building block, it’s the responsibility of an organization to decide which customer segments to be served and end customers will not have any inputs to that, accordingly it will not be measurable from customer’s point of view.

The second building block is Value Propositions which contributes to customer experience as customers are always co-creators of value by the way customers interact with, consume, and understand the advantages provided by the company's value propositions. Customers evaluate the company's services and products based on how well they supply customers with expected experiences, meaning that customer experiences are one-of-a-kind offers that each consumer interprets differently (Mohd-ramly & Omar 2017), as value proposition is contributing to customer experience so it can be measured by customers.

The third building block is customer channels, as communication, distribution, and sales are all important aspects of any business and considered as touch points that play an essential part in the customer experience and form a company's relationship with consumers, channels serve many roles, which might include : customers' awareness of a company's products and services is being raised, assisting clients in determining the value proposition of a business, providing clients with the ability to acquire particular goods and services, providing customers with a compelling value proposition , customer service after the sale, accordingly it can be measured by customers.

the fourth and final building block is customer relationships were mostly recognized as the main factors that contribute to the customer experience and accordingly it can be measured by customers.

According to the above, three building blocks will be discussed in the following sections: value proposition, customer channels and customer relationship.

2.2.1 Value Propositions

Cutting costs through digitizing the processes of producing, testing, and researching and developing new goods is crucial, digital business transformation disrupts companies through removing obstacles between people, businesses and things in all industries, accordingly, they are able to develop new goods, services, and business models that are more efficient, these inventions take place in all forms of organizations, in all industries (Schwertner 2017).

According to Reinartz, Wiegand & Imschloss (2019) study on retail industries found that digital transformation disrupts retail's considerable influence on the customer interaction points , allowing new facilities to emerge .It decentralizes traditional retail functions, making it difficult to create a competitive advantage based on these functions, however, digital transformation creates new sources of value creation could more effectively meet long-standing client demands than was previously feasible.

José & Rocha (2019) concluded that the primary consequences of the increasing widespread usage of technology in the framework of Industry 4.0 are: lower labor costs, better flexibility and quicker product delivery times, productivity growth, higher quality goods, safer procedures, and increased quality of life for the aged people and people of determination, in order to provide personalized products and services, businesses must be more adaptable and agile, with shorter time to market, as a result, some businesses embark on one or more business processes transformation , indeed, digital transformation of business processes refers to the development and automation of current business processes in order to increase the quality of delivered products and services (Henriette 2016).

Digital technologies also enable the creation of design configurations as well as personalized products and services depending on the demands and configurations of individuals. Mass customization, in particular, can combine traditional manufacturing's low-cost units with the flexibility of individual

customization, furthermore, digital technology can be leveraged to cut costs, increase product quality, or simply provide updated functionality, compatibility, or add-ons. (Pousttchi et al. 2019).

Gimpel et al. (2018) pushed firms to reconsider their operational methods, business processes, and supplier networks as the digital and physical worlds continue to merge. Smart factories in the manufacturing sector can tailor production processes and products to meet individual customer needs on short notice and at a low cost. This goal necessarily involves an integrated yet adaptable IT infrastructure, in addition to digital operations, delivery systems, and manufacturing capacity.

Direct interaction with other users still has the risk of purchasing a low-quality file or committing copyright violations by accepting an illegal digital copy, when a digital platform mediates this transaction, it has the ability to absorb transaction costs by ensuring that certain rules for economic behavior, product quality, and legality are followed. While this is an important advantage of a platform business model, there is one more component to the platform strategy value proposition that makes it even more powerful (ZACHARIADIS & OZCAN 2017).

Tolboom (2016) highlighted that organization's products and services are becoming more customized and easily accessible as a result of the digital transformation of business. Companies will develop new products and services while improving existing ones. Convenience will very likely go up as products and services become more personalized to client preferences and accessible through digital devices and channels, as part of the digital transformation objectives. (Ebert & Duarte 2018).

2.2.2 Customer Channels

Shifting to the technology-based customer information management sector, where relational communication technologies are used, such as email, blogs, content management systems, and collaborative technologies, like as social media, are used to exchange knowledge and manage customer connections that are active participants in the communication process (Castagna et al. 2020).

Customers are not only less open and accepting of mistakes and less loyal to a single company; they are also more informed, communicate with other customers more frequently, and have increasingly high expectations for digital service provision across all channels and industries (von Leipzig et al. 2017), due to digital transformation , customers are becoming more informed, evaluating value propositions, as well as decide how and what to purchase. customers in the digital economy are typically well-informed, self-assured, connected, and convenience-obsessed (Gimpel et al. 2018). The end result of a transformation is a rational and long-term improvement in business performance, it may result in new value propositions in the form of products and services, new consumer interactions in terms of offers distribution and provision, as well as new organizational forms to provide these offers to customers (Goerzig & Bauernhansl 2018).

Priyono & Moin (2020) determined that digital transformation is more of a continuous mission than a single point process, as in many cases, digital transformation leads to customer alignment and, as a result, increased efficiency. However, if competitors go through a similar change to communicate with consumers in new and better ways, the company may lose market share and revenues. As a result, a continuous digital transformation is essential to ensure that the company's value delivery to consumers is better compared to its competitors.

According to Niraula & Kautish (2019) study on insurance sector in Nepal highlighted that Customers can obtain insurance services through a secure delivery channel without having to interact directly

with insurance intermediaries; it also helps to remodel business procedures in order to deliver the best insurance services while also facilitating easy communication between customers and the insurance industry.

Reinartz, Wiegand & Imschloss (2019) adopted a wide definition of customer value is an interactive relativistic preference experience that characterizes a subject's interaction with an object. The item may have been anything or an exhibition, as at all phases of the customer selection process, value creation at customer level might take place, the five value creation sources evolve in customer interactions as they took place in the pre-purchase phase (need recognition, information seeking, consideration or alternatives evaluation), the purchase phase (selection, purchase, payments), and the post-purchase phase (consumption, use, interaction, and service issues), digital transformation has expanded the corporate value chain into customer decision making, making business transformation to match shifting consumer expectations a competitive imperative for innovation. The shifting environment of service technology innovation, which influences consumers' desire to explore, choose, purchase, and continually analyze their decisions post-purchase, has made it vital for businesses to comprehend client decision concepts (Tanniru & Sandhu 2018).

2.2.3 Customer Relationships

Recent developments in relationship marketing have resulted in the need for retailers to analyze customer experience and loyalty while building customer relationships. Customers may take an active role in creating a unique customer experience through participation and personal engagement, which begins and promotes consumer loyalty with the organization (Mohd-ramly & Omar 2017).

Organizations must acknowledge the importance of digital transformation and how IT capacity has an impact on the production and promotion of corporate performance, by adopting Digital transformation, organizations would be able to align customer's digital insights by putting in place

new procedures and investments that will result in a better customer experience and performance (Nwankpa & Roumani 2016).

According to Zaharia & Pietreanu (2018) study related to digital transformation challenges in airports; Digital transformation has various effects on the airport business partners and customers, with the benefits relating to operational efficiency, automation of activities, real-time monitoring of processes, passenger self-services, guidance, and real-time trip information, accordingly this will help reduce waiting times and minimize travelers queues, which lead to ensuring a continuous flow and improving traveler perception while giving them more time to spend in airport facilities such as shops and restaurants , resulting in higher income for the airport from non-aviation revenues, on the other hand Cuesta et al. (2015) highlighted that banking institutes that's have a well-developed digital strategy could be presumed to have better utilization and adaption od changes occurred due to digital transformation such as the change in banks interacts with their customers and changes expected in the consumer experience, for example the shifting of customer facing services which to "self-service" basis rather than the traditional customer services, moreover the change of backs branches formats according to transaction business automation, branches will become hubs for marketing products and adding value for customers.

The nature of digital technology is a significant differentiator that is creating significant change inside enterprises and in the competitive environment. Today, we are at a tipping point where the impact of digital technologies is manifesting with "great strength" and enabling of "unprecedented things", nowadays, many technologies such as smartphone, location-based augmented reality, smart sensors, blockchains, AI, wearable technologies, chatbots, neuroscience, and business process automation, as well as machine-to-machine interactions via the Internet of Things (IoT), are being integrated (Zaki 2019).

Automation has been a critical component of business process management since its inception in the manufacturing, financial, and health care industries, with a primary focus on productivity, efficiency, and quality improvement. Robotics process automation in the services industry is defined as the use of technology to automate business processes, in which an organization promotes and deploys applications, to obtain and adopt the same steps in processing transactions, manipulation of data, response triggering, but also communicating with other digital systems as a typical employee (Kedziora & KIVIRANTA 2018).

Siderska (2020) concluded that Process automation prompts strong emotions for a variety of reasons, some authors argue that robotics is a socially beneficial revolution, comparable to the Information Age or the Industrial Age, the primary goals of business process automation are to increase efficiency and revenue while decreasing overhead, without robots and automation, digital transformation in the twenty-first century would be impossible, as a result, in business environment, robotic process automation looks to be gaining popularity as a concept and class of information technologies, where information is handled on a never-before-seen scale.

Automation and robotics are not new developments in the context of digital transformation, I n recent years, robotic process automation has got a huge amount of corporate attention in specific instances of automation initiatives (Hofmann, Samp & Urbach 2020).

Digital transformation will occur when companies embrace the possibilities of social learning in the design and distribution of information, including social components embedded within digital material, informal problem solving, knowledge sharing, communities of practice, and user-generated content. (José & Rocha 2019), Hansen & Sia (2015) in their study on the digital transformation of “Hummel” (European sports fashion company) found how they successfully transformed to an omnichannel retailing (combination of a company's various channels of communication or contact

with its customers. The goal is for customers to have a consistent shopping experience regardless of the channel through which they access the product (Carlota, Andres-Martínez & Mondejar-Jimenez 2020) by slowly but steadily expanded its relationships with customers, accordingly customers became strong advocates for the business after being drawn to business online channels , for example, by sharing hash-tagged images across platforms, posting on blogs or customer forums, and taking part in community initiatives, and so on, moreover many e-commerce companies have created online customer communities to allow their companies to access tips, report bugs, and advocate for changes. Such customers had also effectively served as companies product development teams (Piccinini, Gregory & Kolbe 2015).

Co-creation is a collaborative process in which actors work together to develop a mutually valued outcome based on risk and benefit evaluations of suggested set of actions and decisions based on discourse, access to knowledge, and visibility. Its core components, which span a wide variety of co-creation concepts and theories, include defining and producing value through iterative processes such as value propositions, resource integration, and learning processes. Co-creation is appropriate for public sector services because they are discrete and intangible, concentrating on the people who use the service as it is generated or supplied (Dugstad et al. 2019) , co-creation with user participation is the process of designing a product or service with users; it is primarily a user-centric approach, it is the most powerful feature in developing innovative solutions, and it offers increased motivation for working on innovative solutions (Androutsos & Brinia 2019). Customer engagement refers to the cognitive process that a customer goes through when interacting with a brand, and it is linked to value co-creation between a company and a customer (Hönigsberg, Dinter & Wache 2020).

Chapter 3: Methodology

In this chapter will go through the research methodology, business model operationalization to identify measurement tool and variables, development of survey and survey distribution and specifying the number of responses that should be collected to generalize the research results on the research population.

3.1 Research Methodology

Quantitative research is the process of gathering and interpreting numerical data. It may be used to find patterns and averages, make predictions, evaluate causal links, and generalize findings to broader groups (Bhandari 2021).

In order to answer the raised research question, the relationship across multiple variables need to be assessed and due to the fact that this research results should be generalized on large population, quantitative research methodology has been adopted.

3.2 Business Model Selection and Operationalization

Business Model Canvas (Alexander & Pigneur 2012) had been adopted to assess the impact of digital transformation on public transportation business model and assess the elements related to customer relationship.

Business model canvas is adaptable because it can be used to reflect an organization's digital transformation of its business model. Business model canvas considered as the most commonly used business model (Kotarba 2018).

Business model canvas has more distinct structural blocks and can be adaptive to any industry and simple to understand and implement (Tolboom 2016) and built the most detailed blueprint from which these theories could be constructed (Ovan 2015).

Business Model Canvas elements that contribution to customer relationship can summarized as below:

1- Customers are always co-creators of value through experiencing, consuming, and perceiving the advantages provided by the company's value propositions, so **Value Propositions** contribute to customer experience (Alexander & Pigneur 2012)
2- **Customers Channels** are consumer touch points that have an impact on the customer experience (Alexander & Pigneur 2012).
3- **Customer Relationships** deemed necessary by a company's business model therefore have significant impact on the overall customer experience (Alexander & Pigneur 2012)

It is crucial in quantitative research to explicitly describe the variables that will be researched. If operational definitions are not explicit and precise, researchers may measure unimportant topics or apply methodologies inconsistently. The operationalization decreases subjectivity while enhancing research dependability (Bhandari 2020).

Table 3 illustrates the operationalization of adopted business model blocks and related elements, on the following section hypotheses will be developed, some of business block elements have not any reference in the literature, accordingly they will be exempted.

Business Model Block	Elements	References
Value Propositions	• New Services • Services Performance • Services Customization • Services Price/Cost reduction • Services procurement Risk reduction • Services Accessibility • Services Convenience/Usability	(Schwertner 2017) (Reinartz , Wiegand & Imschlossn 2019) (José & Rocha 2019) (Henriette 2016) (Pousttchi et al. 2019) (Gimpel et al. 2018) (ZACHARIADIS & OZCAN 2017) (Tolboom 2016) (Ebert & Duarte 2018)
	• "Getting the job done" • Design • Brand/status	No references found through literature review
Channels	• Services Awareness • Services Evaluation • Services Purchase • Services Delivery • Services post-purchase support	(Castagna et al. 2020). (von Leipzig et al. 2017) (Gimpel et al. 2018) (Goerzig & Bauernhansl 2018) (Priyono & Moin 2020) (Niraula & Kautish 2019) (Reinartz, Wiegand & Imschloss 2019) (Tanniru & Sandhu 2018)
Customer Relationships	• Self-service Services • Automated Services • Communities • Co-creation	(Mohd-ramly & Omar 2017) (Belleghem 2016) (Nwankpa & Roumani 2016) (Zaharia & Pietreanu 2018) (Cuesta et al. 2015) (Zaki 2019) (Kedziora & KIVIRANTA 2018) (Siderska 2020) (Hofmann, Samp & Urbach 2020) (José & Rocha 2019) (Hansen & Sia 2015) (Carlota, Andres-Martínez & Mondejar-Jimenez 2020) (Piccinini, Gregory & Kolbe 2015) (Dugstad et al. 2019) (Androutsos & Brinia 2019) (Hönigsberg, Dinter & Wache 2020) (Mergel et al. 2018)
	• Personal assistance • Dedicated personal assistance	No references found through literature review

Table 3: Business Model Operationalization

3.3 Hypotheses Development

As per the literature review conducted in chapter 2 and the operationalized model highlighted in section 3.2, hypotheses have been developed for the elements that need to be tested related to Value Propositions, Channels and Customer Relationships which have been presented in the reviewed literature.

Value Propositions Hypotheses

Due to digital transformation of Public Transportation Business Model:

> *Null Hypothesis, $H1_0$: Value propositioned by public transportation provider will have no impact on customer relationship*
>
> *Alternative Hypothesis, $H1_a$: Value propositioned by public transportation provider will have an impact on customer relationship*

Channels Hypotheses

Due to digital transformation of Public Transportation Business Model:

> *Null Hypothesis, $H2_0$: Customers Channels provided by public transportation provider will have no impact on customer relationship*
>
> *Alternative Hypothesis, $H2_a$: Customers Channels provided by public transportation provider will impact customer relationship*

3.4 Research Population

In order to test the developed hypotheses in the previous section, a survey had been built according to the operationalized model to test the relationship between identified variables.

The targeted population for this research would be public transportations users in UAE , according to Roads and Transport authority in Dubai; public transportation riders during 2020 is about 947 thousand riders per day (Roads and Transport Authority in Dubai 2021) and public bus passengers in Abu Dhabi are about 180 thousand riders per day (Puri-Mirza 2020), however no information found related to the total number of public transportation across all public transportation modes in all UAE emirates, according to United Nations (2019) statistics , the total population of UAE in 2020 is about 9,890,000 and the total population for the above age of 19 is 8,036,000 accordingly for the purpose of this study, public transportation users will be considered as 8,036,000.

The key objective of survey research is to acquire data that is representative of a population. Within the limitations of random error, the researcher uses survey data to generalize results from a drawn sample back to a population; nonetheless, many organizational researchers face the problem of establishing sample size. Inadequate or excessive sample sizes continue to have an influence on study quality and accuracy (Bartlett II, Kotrlik & Higgins 2001), one of the most significant advantages of quantitative techniques is their capacity to utilize smaller groups of individuals as samples to reach study results on larger groups that would be extremely expensive to research (Halim & Hasnita 2017).

Taherdoost (2017) suggested a formula for to determine the size of a population sample in social and information system researches, the formula is presented in figure 6.

$$n = \frac{p(100 - p)z^2}{E^2}$$

Figure 5: Sample calculation formula (Taherdoost 2017, p. 237)

Where n is the required sample size, P is the percentage occurrence of a state or condition, E is the percentage maximum error required, Z is the value corresponding to level of confidence required, 95 percent level of confidence is an industry standard (Hunter 2016), also its agreed across many researchers that confidence level of 95 percent and a margin of error of 5% are adequate and sufficient for researches (The Research Advisors 2006).

Table 4 illustrates the sample size should be considered with confidence level 95 % and margin error 5% using the above formula:

Population Size	Sample Size	Population Size	Sample Size
50	44	1,000	278
75	63	1,500	306
100	79	2,000	322
150	108	3,000	341
200	132	5,000	357
250	151	10,000	370
300	168	25,000	378
400	196	50,000	381
500	217	100,000	383
600	234	250,000	384
700	248	500,000	384
800	260	> 1,000,000	384

Table 4: Sample Size according to population (Taherdoost 2017, p. 238)

Tejada & Punzalan (2012) argued that researches prefer to use Slovin's formula , especially when the population size is huge, also author highlighted that Slovin's formula is simple to use, moreover it is extremely useful when there is no prior knowledge of the population other than its size, (Talukder et al. 2016), Slovin's formula is illustrated in Figure 6.

$$n = \frac{N}{1 + Ne^2}$$

Figure 6: Slovin's formula (Tejada & Punzalan 2012, p. 129)

Where *N* represent the total number of population and *e* is error margin, the use of Slovin's formula for estimating a population proportion considering the confidence coefficient is 95% (Tejada &

Punzalan 2012) and a margin of error of 5%, Accordingly the representative sample that can be used as per the population targeted is illustrated in table 5.

Population Size	Sample Size		Population Size	Sample Size
75	63		1,000	286
100	80		1,500	316
150	109		2,000	333
200	133		3,000	353
250	154		5,000	370
300	171		10,000	385
400	200		25,000	394
500	222		50,000	397
600	240		100,000	398
700	255		250,000	399
800	267		> 500,000	400

Table 5: Sample calculation as per Slovin's Formula

According to the above, the needed sample size will be calculated using a Slovin's formula which is will be equals to 400.

3.5 Research Variables

As per the developed hypothesis; three variables will be tested: Value Proposition, Customer Channels and Customer Relationship, table 6 illustrates the codes that will be used to represent each variable and related elements.

Variables Code	Variables Elements Codes
Value Propositions (VP)	VP_1: New Services VP_2: Services Performance VP_3: Services Customization VP_4: Services Price/Cost reduction VP_5: Services procurement Risk reduction VP_6: Services Accessibility VP_7: Services Convenience/Usability
Customer Channels (CCH)	CCH_1: Services Awareness CCH_2: Services Evaluation CCH_3: Services Purchase CCH_4: Services Delivery CCH_5: Services post-purchase support
Customer Relationships (CR)	CR_1: Self-service Services CR_2: Automated Services CR_3: Communities CR_4: Co-creation

Table 6: Variables and Variable's elements codes

3.6 Research Survey

For the purpose of collecting numerical data to test the developed hypothesis a Likert scale survey has been built for this purpose as the Likert scale is one of the most often used answer scales in survey design (Chyung et al. 2017).

According to the developed hypothesis and the Business Model Operationalization in Chapter 3 section 3.2, the following survey illustrated in table 7 had been developed to cover the three variables that need to be tested, the Likert scale used in the survey is a five level scale: Strongly Disagree, Disagree, Neutral, Agree, Strongly Agree.

The survey designed to have 3 sections; the first section as an introduction to the survey purpose and research topic, the second section for the collection of demographic information as follows: gender,

age group and educational background, and another two questions for collecting information related to frequency of public transportation use and what type of public transportation mode is used: Buses, Taxi, Water Taxi, Metro and Tram, the third and last part of the survey has 3 sections , and each section is having questions related to each variable the will be tested.

Demographic and Public Transportation information	
Question	**Choices (select one)**
Gender	Male , Female
Age Group	Less than 25 , 26-30, 31-35, 36-40, 41-45, 46-50, 51 or above
Educational Background	No formal education, High school, College degree, Bachelor's degree , Master's degree, Professional degree, Doctorate degree
How often you are using public transportation in UAE	Daily , Weekly , Monthly , Occasionally
Do you use or Did you use Buses	YES, NO
Do you use or Did you use Taxi	
Do you use or Did you use Water Taxi	
Do you use or Did you use Metro	
Do you use or Did you use Tram	

Questions Related to Variables		
Variable	**Question**	**Choices (select one)**
Value Propositions (VP)	Due to digital transformation in public transportation services in UAE, to what extent do you agree or disagree with the following statements VP_1: Introducing more new public transportation services by public transportation provider. VP_2: Increase in public transportation services performance. VP_3: Public transportation operators have increased ability to provide customized public transportation services. VP_4: Public transportation service providers are able to offer public transportation services at a lower price/cost. VP_5: Public transport operators have achieved better capability in mitigating or reducing risks related to public transport services through Service level agreements and service guarantee VP_6: Public transportation providers have enhanced Accessibility of Public transportation services to commuters/passengers. VP_7: More Convenient (Easy to Use) Public transportation services.	(1) Strongly Disagree (2) Disagree (3) Neutral (4) Agree (5) Strongly Agree

Customer Channels (CCH)	Due to digital transformation in public transportation services in UAE, to what extent do you agree or disagree with the following statements CCH_1: Customers are more aware of Public transportation services through Marketing Campaigns. CCH_2: Customers have increased ability of evaluating Public transportation services. CCH_3: Availability of different channels/options to purchase Public transportation services. CCH_4: Availability of different channels/options to deliver Public transportation services. CCH_5: Customers have better communication channels and support features for Public transportation services purchased or received.	(1) Strongly Disagree (2) Disagree (3) Neutral (4) Agree (5) Strongly Agree
Customer Relationships (CR)	Due to digital transformation in public transportation services in UAE, to what extent do you agree or disagree with the following statements CR_1: Public transportation providers offer Self-Services features for customers where all necessary procedures can be done by customers. CR_2: Public transportation providers have Increased the use of automated services. CR_3: Increase the use of user communities for knowledge exchange related to public transportation services and solving other user's problems. CR_4: Increase in Co-creation of Public transportation services where customers feedback's, suggestions being considered in the design of new services.	(1) Strongly Disagree (2) Disagree (3) Neutral (4) Agree (5) Strongly Agree

Table 7: Developed Survey Questions

An enhanced version with summary translation in Arabic for each item in the survey were introduced to ease the understanding of survey questions, detailed screenshots for the developed survey will be provided in Appendix 1.

3.6.1 Survey Tool and Distribution

In order to distribute the survey and collect required details and numerical data required to measure the correlation between variables; an online survey tool had been used, the tool hosted on QuestionPro https://www.questionpro.com, the tool provide capabilities required to analyze survey results and visualize the information related to the survey such as response rate, and the ability to export the data in many forms such as : Excel, CSV, PDF and PowerPoint, moreover the survey published through QuestionPro is responsive to the device used to access the survey from, either it is a PC's , laptop, tablet or mobile.

The survey was published in two phases; the initial phase the survey published for one week (from 11th of May 2021 until 18th of May 2021) , the targeted population is a closed group consist of 31 public transportation users and the purpose of this piloting is to conduct validity and reliability tests for the survey items, the full publish for survey started on 1st of June 2021 and lasted for four months (until 1st of October 2021) , there was some challenges in achieving the targeted responses and accordingly the survey took this period to be finalized.

Worth to mention that all statistical analysis and tests concluded and found in this research is done using IBM SPSS Statistics (version 23).

3.6.2 Survey Validation and Reliability

In a quantitative research, survey validity is defined as the degree to which a concept is properly assessed; for example, a survey aiming to explore sadness but measuring anxiety would not be deemed valid, and the accuracy of an instrument, or survey reliability, is the second measure of quality in quantitative research. In other words, the degree to which a study instrument generates consistent findings when used in the same scenario multiple times (Heale & Twycross 2015).

Heale & Twycross (2015) summarized that content validity defined as examination if the instrument sufficiently provides all of the content that the variable requires, by way of explanation, does the instrument cover the whole domain relevant to the variable or construct being measured, additional to that , face validity is a subset of content validity in which experts are questioned if an instrument measures the idea intended, author explained that there are three main types for survey validity; content validity, construct validity and criterion validity.

In order to conduct validity for our developed survey; the initially developed survey had been derived from the literature review conducted in chapter 2 , after that the survey had been shared with seven experts that covers the areas of the research , two resources are experts in public transportation , two resource are experts in customer services , two resources experts in digital transformation and finally shared with my dissertation supervisor to provide his opinion from academic point of view.

The result of the review is summarized in table 8.

Number of Resources	Aria of Experience	Suggested Modification
2	Public Transportation	The two resources responded with the following: • Suggested to rephrase all questions to reflect the subject of the research. • Suggested to rephrase all questions to reflect the meaning of question properly.
2	Customer Services	Only one resource responded with the following: • Suggested to rephrase to be easier and understandable from customers perspective.
2	Digital Transformation	The two resources responded with the following: • Suggested to merge two questions that covers the same topic. • Suggested a rephrase of survey questions to be more understandable from customers perspective in the subject of digital transformation in public transport.
1	Academic Research	Dissertation supervisor suggested to add a definition for Digital Transformation before each set of questions.

Table 8: Validation process by Experts

According to the provided feedbacks, some responses have been reflected on the initially developed survey, and some were ignored as these suggestions would not be an added value to the research subject and would affect the statistical analysis of survey results.

In terms of survey reliability; reliability testing is essential since it refers to the consistency of a measuring instrument's parts, the Cronbach alpha coefficient is the most commonly used internal consistency measure ,a scale is said to have high internal consistency reliability if the items of the scale "hang around each other" and measure the same construct, especially when using Likert scales, it is regarded as the most acceptable measure of reliability (Taherdoost 2018).

In order to test the reliability of the survey; the final version of the survey had been published online to a closed group consist of 31 public transport users for one week (11^{th} of May 2021 – 18^{th} of May 2021), according to the results received, reliability test analysis have been conducted to check Cronbach Alpha coefficient.

According to (Mohamad et al. 2015), the value of Cronbach alpha coefficient in relation to the reliability is as follows: <0.67 the reliability is poor, 0.67-0.80 the reliability is fair, 0.81-0.90 the reliability is good, 0.91-0.94 the reliability is very good and finally >0.95 the reliability is excellent, however , majority of researchers agreed that Cronbach alpha coefficient value of 0.7 and above is sufficient (Taherdoost 2018).

According the analysis conducted the Cronbach Alpha coefficient value is 0.944, accordingly the survey can be considered as reliable, reliability test results illustrated in table 9.

Case Processing Summary

		N	%
Cases	Valid	31	100.0
	Excluded[a]	0	.0
	Total	31	100.0

a. Listwise deletion based on all variables in the procedure.

Reliability Statistics

Cronbach's Alpha	N of Items
.944	16

Table 9: Reliability test results (Cronbach Alpha)

As a support for the validity of the piloted survey, a correlation test had been executed to test the correlation between tested variables, table 10 illustrate that correlation test results

Correlations

		VP_Mean	CCH_Mean	CR_Mean
VP_Mean	Pearson Correlation	1	.674**	.781**
	Sig. (2-tailed)		.000	.000
	N	31	31	31
CCH_Mean	Pearson Correlation	.674**	1	.788**
	Sig. (2-tailed)	.000		.000
	N	31	31	31
CR_Mean	Pearson Correlation	.781**	.788**	1
	Sig. (2-tailed)	.000	.000	
	N	31	31	31

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

Table 10: Correlation between tested variables

In the correlation table below three values are generated; Pearson Correlation (r) which indicate the correlation association either its positive or negative between variables which ranged between -1 and 1, the P-value (p) indicates the likelihood that this strength will occur by chance and if there is a statistically significant association between the tested variables, which is agreed across most researchers that the accepted value is < 0.05, and the final value *N* represent the total number of inputs used for the correlation test.

Mukaka (2012) provide a rule of thumb for Pearson Correlation (r) values interpretation according to the correlation size, as illustrated in table 11.

Correlation size	Interpretation
0.9 to 1 (-0.9 to -1)	Very high positive (negative) correlation
0.7 to 0.9 (-0.7- to -0.9)	High positive (negative) correlation
0.5 to 0.7 (-0.5 to -0.7)	Moderate positive (negative) correlation
0.3 to 0.5 (-0.3 to -0.5)	Low positive (negative) correlation
0.0 to 0.3 (0.0 to -0.3)	Negligible correlation

Table 11: Interpreting the size of a correlation values (Mukaka 2012, p.71)

According to the correlation results , there is a significat corrlation between the tested variables.

Chapter 4: Results

The purpose of this research is answering the following answer:

> *How is digital transformation of public transportation business model in UAE would impact customer relationship?*

In order to answer the research question, and test the developed Hypotheses, the correlation between identified variables must be examined, and because the findings of this study should be generalizable to a wide population, a quantitative survey was used.

As mentioned earlier, the final survey had been published after validation and reliability tests completed, the target responses that need to be achieved is 400 responses to be able to generalize the research results on the targeted population as mentioned in Chapter 3 section 3.4, accordingly the survey had been shared across social media tools; Facebook, LinkedIn and WhatsApp in order to maximize the response, the survey kept opened for four months , starting from 1st of June 2021 until 1st of October 2021, the total responses received are 583 responses , however after going through data cleaning process and removing the incomplete responses; the final completed responses that will be subject to the analysis become 404 responses.

The following sections will be discussing the results as per the completed responses received.

4.1 Demographic and Public Transportation information

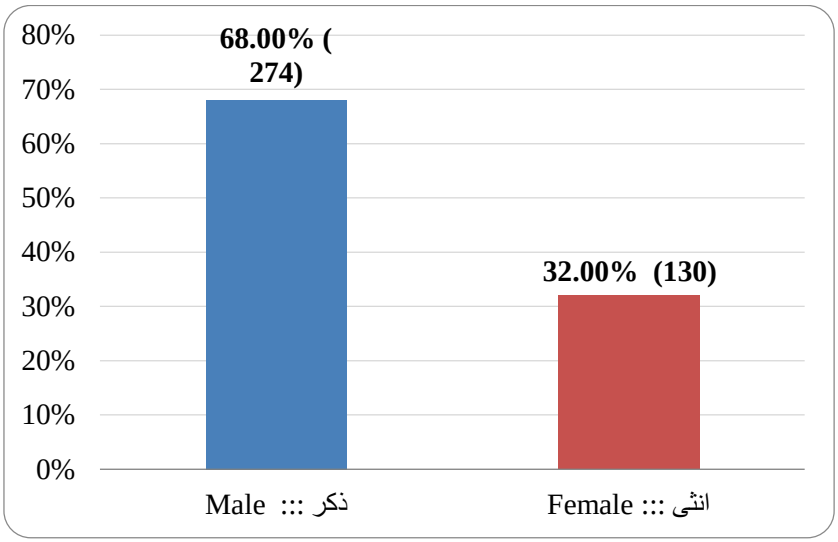


Figure 7: Gender

According to figure 7 which illustrates the response rate according to the gender; the majority of responses are from males as 274 responses (68 %) are from males and 130 responses (32%) are from females.

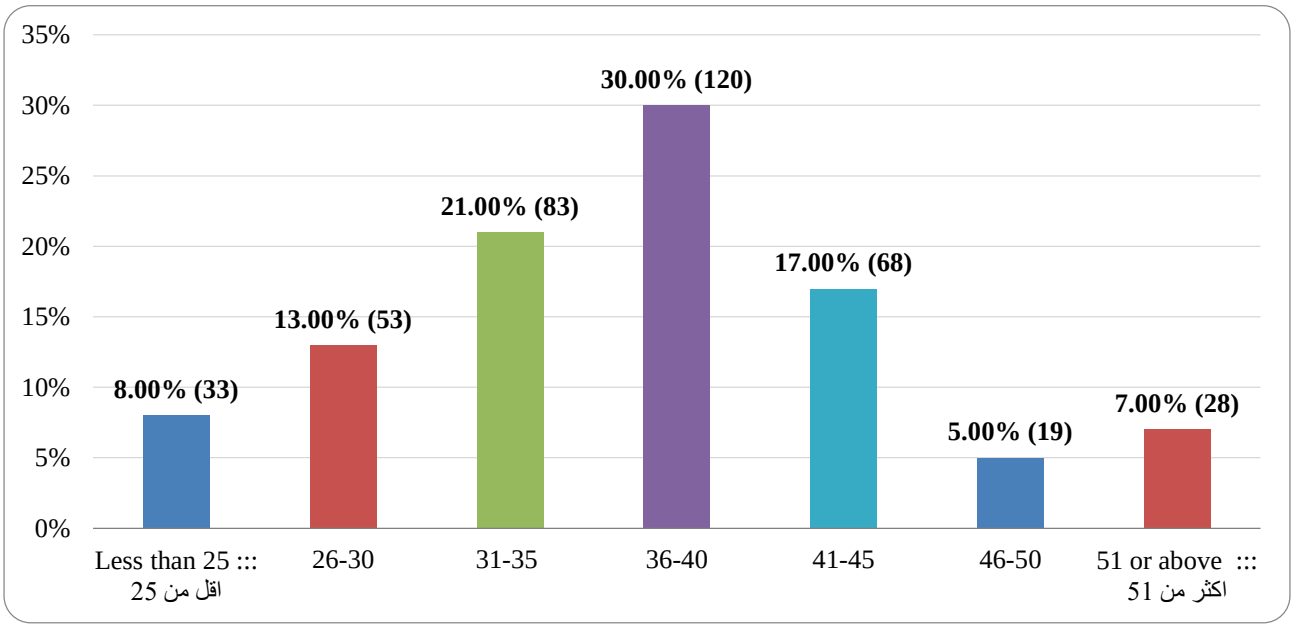


Figure 8: Age Group

The most responses received according to age group found from the age groiup 36-40 with 120 response (30%) as illustrated in Figure 8, after that age group 31-35 with 83 responses (21%), then age group 41-45 with 68 responses (17%) , then age group 26-30 with 53 responses (13%), then age group “Less than 25” with 33 responses (8%), then age group “51 or above” with 28 responses (7%) and finaly age group 46-50 with 19 responses (5%).

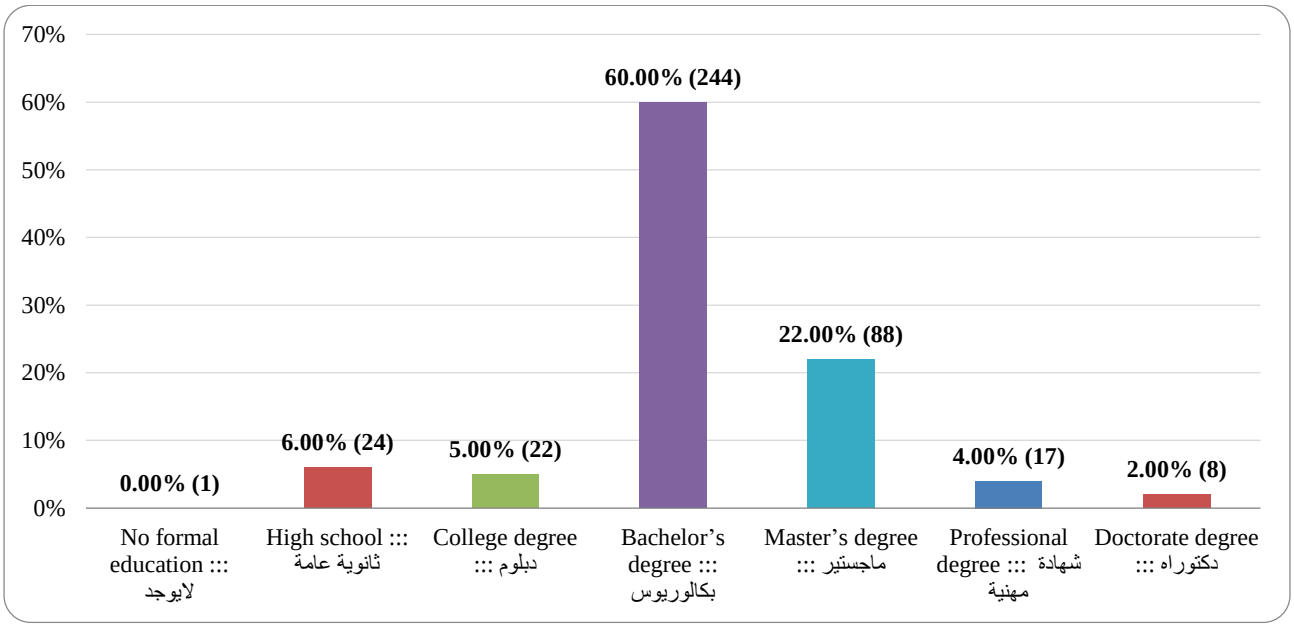


Figure 9: Educational Background

According to the educational background, the highest responses received by a bachelor degree holders with 244 responses (60 %) of received responses as illustrated in figure 9 , and the lowest response received by non-formal educated person which is only 1 responses (almost 0%), the remained educational background are mentioned in descending order as follows: Masters degree with 88 responses (22%), High school with 24 responses (6%), collage degree with 22 response (5%) , professional degree with 17 responses (4%) and finally Doctorate degree with 8 responses (2%).

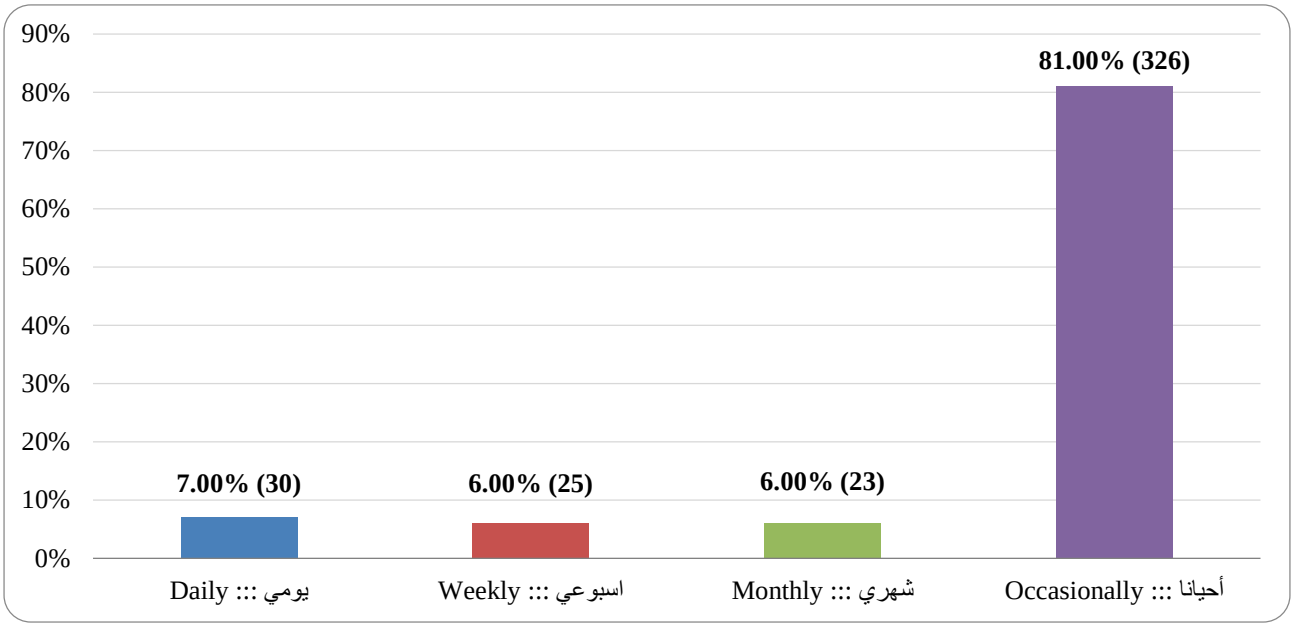


Figure 10: Usage of Public Transportation in UAE

In terms of public transportation usage in UAE and according to figure 10, majority of the survey respondents are using the public transportation occasionally with 326 responses (81%), however , 30 respondents are using public transportation in a daily bases (7%), and 6% of respondents are using public transportation weekly (25 respondents) and monthly (23 respondents).

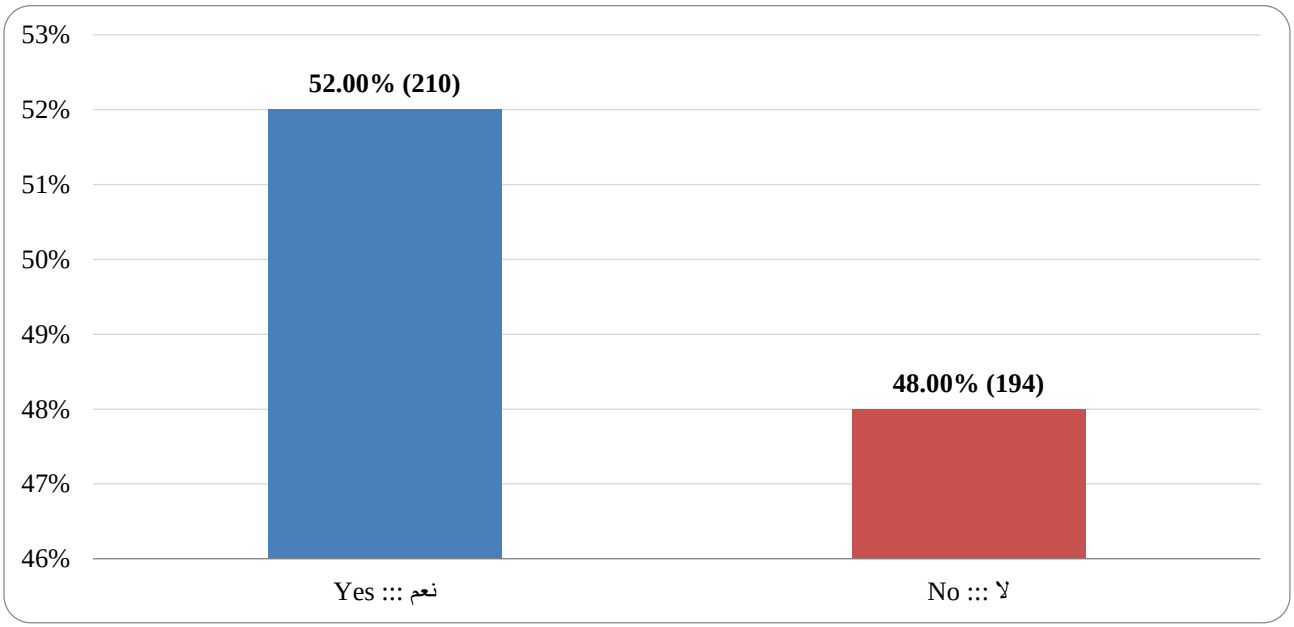


Figure 11: Bus Usage

As illustrated in figure 11, 210 (52%) respondents are already used or still using Buses, however, 194 (48%) respondents had never used buses.

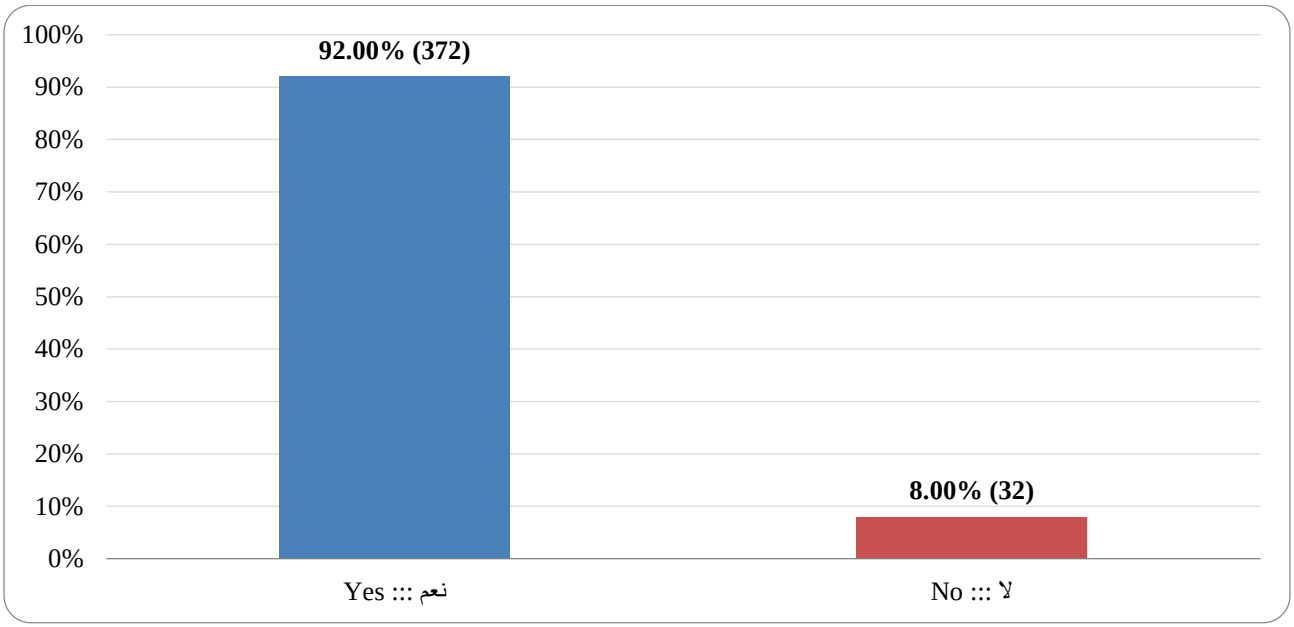


Figure 12: Taxi Usage

For Taxies and as shown in figure 12, 372 (92%) respondents already used or still using Taxies, where 32 respondents (8%) did not used Taxies

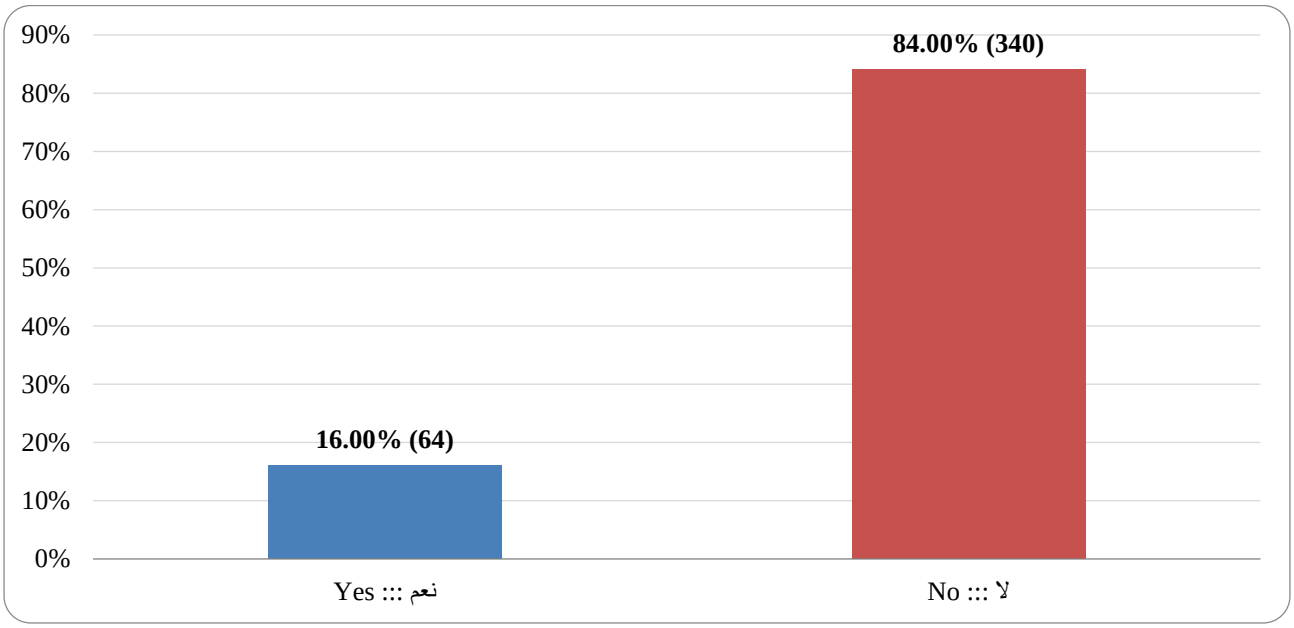


Figure 13: Water Taxi Usage

According to figure 13, Water taxi is being used or already used by 64 respondents (16%), while 340 (84%) respondents did not use Water taxi.

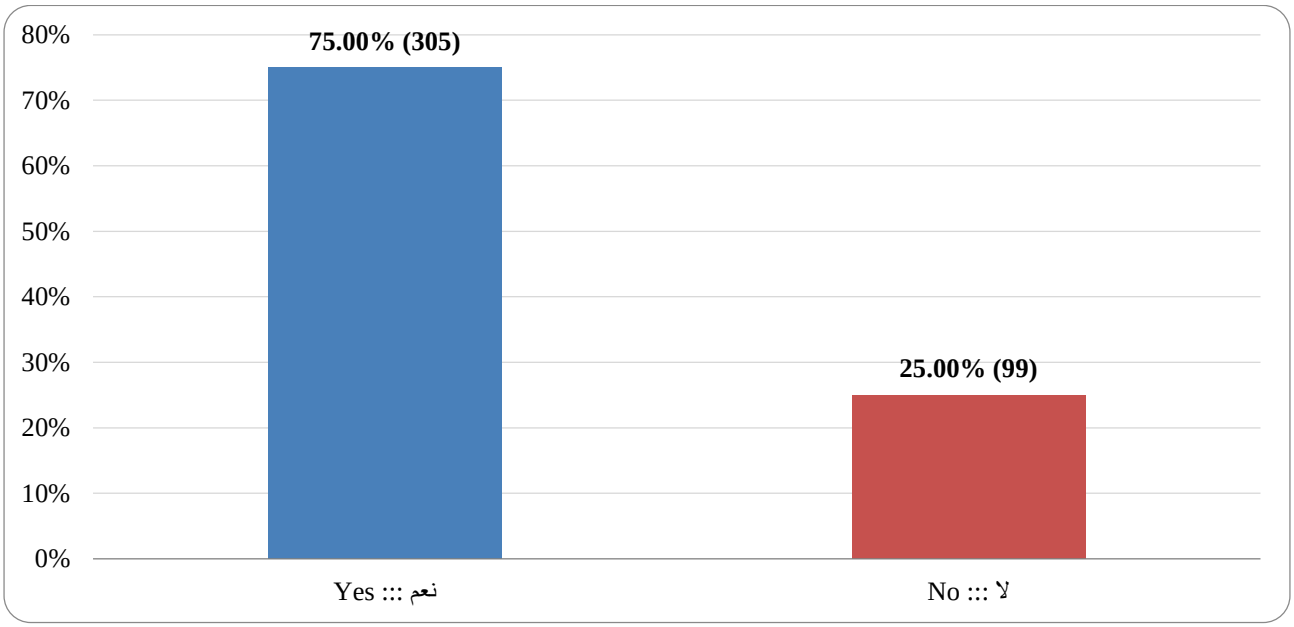


Figure 14: Metro Usage

As illustrated in figure 14, 305 respondents (25%) already using or used the metro, and 99 respondents (25%) did not use the Metro.

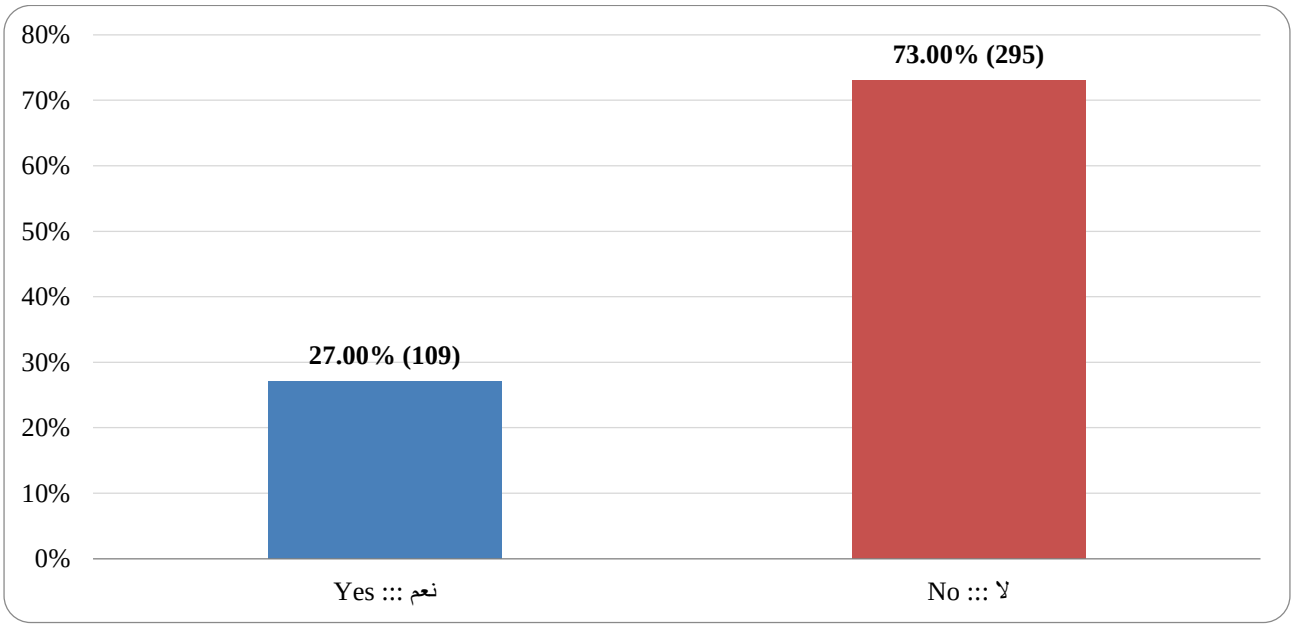


Figure 15: Tram Usage

As shown in figure 15, 265 respondents (37%) reported that they did not use Tram, however 109 respondents (27%) reported that they are using Tram or already used it.

Going through the above results related to the public transportation mode usage its clearly that the highest public transportation mode being currently used or already used is the Taxies where 92 % of respondents confirmed the use of Taxi, and the lest used public transportation mode is the Water Taxi where only 16 % confirmed the use of Water Taxi, for the remained public transportation mode below is the usage percentages in descending order; Metro 57 %, Buses 52% and finally Tram 27 %.

4.2 Value Proposition

Value proposition variable has seven elements as highlighted in Chapter 3 section 3.6 as follows:

VP_1: Introducing more new public transportation services by public transportation provider.
VP_2: Increase in public transportation services performance.
VP_3: Public transportation operators have increased ability to provide customized public transportation services.
VP_4: Public transportation service providers are able to offer public transportation services at a lower price/cost.
VP_5: Public transport operators have achieved better capability in mitigating or reducing risks related to public transport services through Service level agreements and service guarantee
VP_6: Public transportation providers have enhanced Accessibility of Public transportation services to commuters/passengers.
VP_7: More Convenient (Easy to Use) Public transportation services.

Table 12 illustrates the descriptive analysis for Value proposition elements.

	N	Minimum	Maximum	Mean
VP_1	404	1	5	3.75
VP_2	404	1	5	3.85
VP_3	404	1	5	3.76
VP_4	404	1	5	3.69
VP_5	404	1	5	3.70
VP_6	404	1	5	3.90
VP_7	404	1	5	3.94
Valid N (listwise)	404			

Table 12: Value Propositions Descriptive Analysis

According to the descriptive analysis done for value proposition elements, it's found that the highest mean value is for VP_7 (More Convenient (Easy to Use) Public transportation services), which means that most public transportation users participated in the survey agreed that due to digital transformation in public transportation business model, public transportation providers were able to provide more convenient (Easy to Use) Public transportation services.

4.3 Customer Channels

Customer Channels variable has five elements as highlighted in Chapter 3 section 3.6 as follows:

CCH_1: Customers are more aware of Public transportation services through Marketing Campaigns.
CCH_2: Customers have increased ability of evaluating Public transportation services.
CCH_3: Availability of different channels/options to purchase Public transportation services.
CCH_4: Availability of different channels/options to deliver Public transportation services.
CCH_5: Customers have better communication channels and support features for Public transportation services purchased or received.

Table 13 illustrates the descriptive analysis for Customer Channels elements.

	N	Minimum	Maximum	Mean
CCH_1	404	1	5	3.50
CCH_2	404	1	5	3.75
CCH_3	404	1	5	3.87
CCH_4	404	1	5	3.84
CCH_5	404	1	5	3.82
Valid N (listwise)	404			

Table 13: Customer Channels Descriptive Analysis

According to the descriptive analysis done for Customer Channels elements, it's found that the highest mean value is for CCH_3 (Availability of different channels/options to purchase Public transportation services), which means that most public transportation users participated in the survey agreed that due to digital transformation in public transportation business model, public transportation providers were able to provide different channels/options to purchase Public transportation services.

4.4 Customer Relationship

Value proposition variable has seven elements as highlighted in Chapter 3 section 3.6 as follows:

CR_1: Public transportation providers offer Self-Services features for customers where all necessary procedures can be done by customers.
CR_2: Public transportation providers have Increased the use of automated services.
CR_3: Increase the use of user communities for knowledge exchange related to public transportation services and solving other user's problems.
CR_4: Increase in Co-creation of Public transportation services where customers feedback's, suggestions being considered in the design of new services.

Table 14 illustrates the descriptive analysis for Customer Relationship elements.

	N	Minimum	Maximum	Mean
CR_1	404	1	5	3.80
CR_2	404	1	5	3.82
CR_3	404	1	5	3.76
CR_4	404	1	5	3.78
Valid N (listwise)	404			

Table 14: Customer Relationship Descriptive Analysis

According to the descriptive analysis done for Customer Relationship elements, it's found that the highest mean value is for CR_2 (Public transportation providers have Increased the use of automated services), which means that most public transportation users participated in the survey agreed that due to digital transformation in public transportation business model, public transportation providers were able to increase the use of automated services.

4.5 Variables Correlation

To study the correlation between the three variables; and test our developed hypotheses using SPSS, a correlation test had been implemented to identify Pearson Correlation (r) which indicate the correlation association, and correlation significance P-value (p) which indicate if statistically there is a significant association between variables, table 15 illustrates the correlation matrix.

Correlations

		VP_Mean	CCH_Mean	CR_Mean
VP_Mean	Pearson Correlation			
	Sig. (2-tailed)			
	N			
CCH_Mean	Pearson Correlation	.607**		
	Sig. (2-tailed)	.000		
	N	404		
CR_Mean	Pearson Correlation	.669**	.652**	
	Sig. (2-tailed)	.000	.000	
	N	404	404	

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

Table 15: Correlation Matrix

The Hypotheses related to Value Propositions are as follows:

Due to digital transformation of Public Transportation Business Model:

> *Null Hypothesis, $H1_0$: Value propositioned by public transportation provider will have no impact on customer relationship*
>
> *Alternative Hypothesis, $H1_a$: Value propositioned by public transportation provider will have an impact on customer relationship*

According to table 15, the correlation significance value between value proposition (VP) and Customer relationship (CR) is <0.05 which means that null hypothesis can be rejected and the

alternative hypothesis can be accepted (Value propositioned by public transportation provider will have an impact on customer relationship), Pearson Correlation can provide indicate the correlation association and either its positive or negative between variables, according to table 15; Pearson Correlation between value proposition (VP) and customer relationship (CR) is 0.669, according to the highlighted values in table 11 related to interpreting the size of a correlation values , the correlation between the two variables is moderate positive.

The Hypotheses related to customer channels are as follows:

Due to digital transformation of Public Transportation Business Model:

> *Null Hypothesis, $H2_0$: Customers Channels provided by public transportation provider will have no impact on customer relationship*
>
> *Alternative Hypothesis, $H2_a$: Customers Channels provided by public transportation provider will impact customer relationship*

According to table 15, the correlation significance value between customer channels (CCH) and customer relationship (CR) is <0.05 which means that null hypothesis can be rejected and the alternative hypothesis can be accepted (Customers Channels provided by public transportation provider will impact customer relationship), Pearson Correlation can provide indicate the correlation association and either its positive or negative between variables, according to table 15; Pearson Correlation between customer channels (CCH) and customer relationship (CR) is 0.652, according to the highlighted values in table 11 related to interpreting the size of a correlation values , the correlation between the two variables is moderate positive.

In order to visualize the correlation between variables, figure and figure provide scatter plot for value proposition (VP) and Customer relationship (CR) correlation, and customer channels (CCH) and customer relationship (CR) correlation.

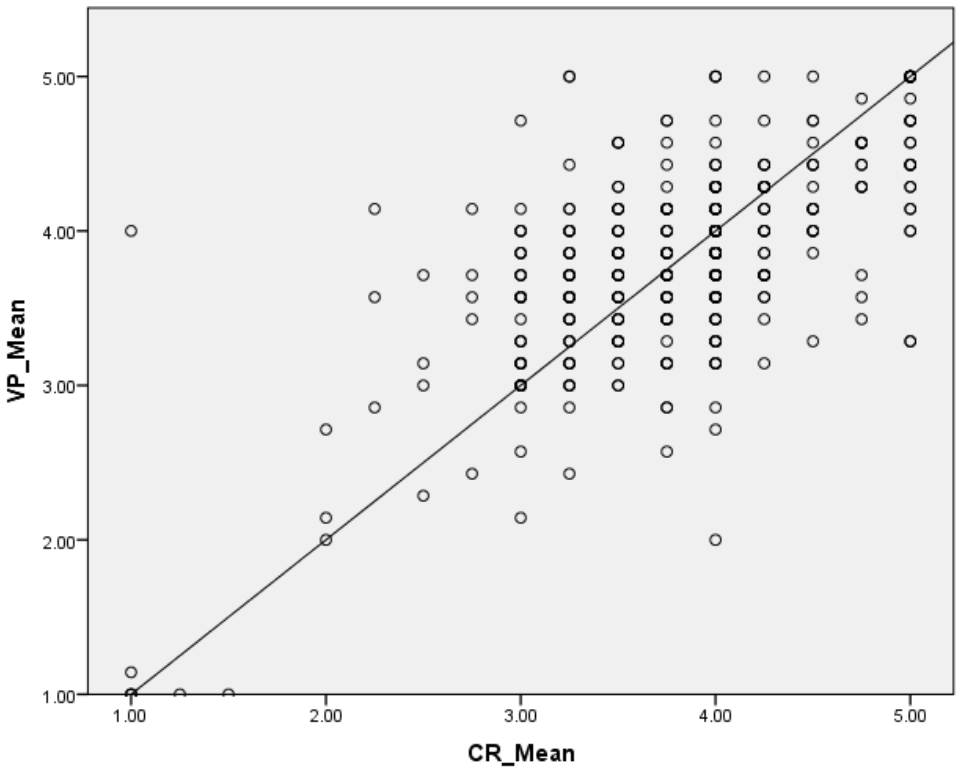


Figure 16: Scatter plot for VP and CR correlation

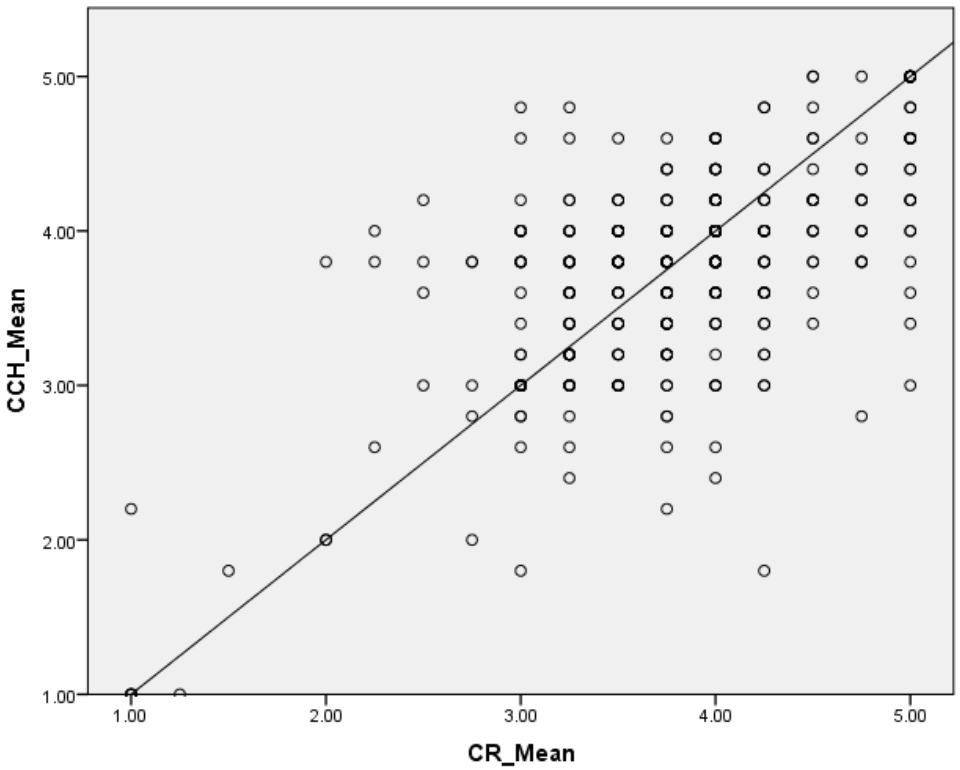


Figure 17: Scatter plot for CCH and CR correlation

Chapter 5: Conclusion

5.1 Results

To conclude; the answer to our research question, *How is digital transformation of public transportation business model in UAE would impact customer relationship?* as noticed from the analysis done in chapter 4, that digital transformation of public transportation business model will have a positive impact on customer relationship.

As per the identified variables, impact on customer relationship would be increased through the following:

Value Proposition to public transportation customers due to digital transformation in public transportation business model would be:

- New public transportation service
- Enhanced public transportation services performance
- Availability of public transportation services
- Reduction in public transportation services prices
- Reduction of risks related to public transport services
- Enhanced Accessibility of public transportation
- More Convenient (Easy to Use) public transportation services

Public transportation services customers reported that due to digital transformation in public transportation business model; more convenient and easier to use public transportation services is introduced, however, the reduction in public transportation services prices is the least agreed element across public transportation services customers

Customers Channels due to digital transformation in public transportation business model would contribute to the public transportation customer relationship through:

- Awareness of Public transportation services through Marketing Campaigns
- Provides the ability for customers for evaluating public transportation services
- Provide different channels/options to purchase public transportation services
- Provide different channels/options to deliver public transportation services
- Provide customers with better communication channels and support features for public transportation services purchased or received

Public transportation services customers reported that due to digital transformation in public transportation business model, different channels/options to purchase public transportation services where provided, however, the awareness of public transportation services through marketing campaigns is the least agreed element across public transportation services customers.

Finally, **Customer Relationship** elements that had been measured in this research:

- Availability of Self-Services features for customers
- Increasing in the use of automated services
- Increase the use of user communities for knowledge exchange related to public transportation services
- Increase in Co-creation of Public transportation services.

Public transportation services customers reported that due to digital transformation in public transportation business model, they noticed the increasing in the use of automated services, however, the availability of user communities for knowledge exchange related to public transportation services is the least agreed element across public transportation services customers.

According to the above and in order to increase the positive impact on customer relationship, **Value Proposition** and **Customers Channels** should be positively increased.

5.2 Limitations of the research

During this research, the main limitations faced are as below:

1- Lack of literature related to digital transformation in public sector, especially the public transportation in UAE.
2- Most of the researches conducted in this area does not consider the customers point of view.
3- Challenges in collecting the required response to achieve the required response rate.

5.3 Further Research

Most of the collected data are the publicly available data, accordingly if research is established in coordination of public transportation providers in UAE would provide more useful information which reflect the actual use of public transportation and measure the impact of digital transformation more accurately, accordingly additional factors can be identified to measure the impact on customer relationship.

This research adopt the quantitative research methodology to understand and measure customer relationship impact du to digital transformation of public transportation business model, a qualitative research methodology can be adapted in order to get more understanding about the relationship between customer relationship and digital transformation of public transportation business model, also it will help in formalizing a framework for implementing digital transformation focused on customer relationship.

References

Abu Dhabi Digital Authority. (2020). *About Us* [online].Available at: https://www.adda.gov.ae/About-Us.

Abu Dhabi Government. (2021a). *About ITC* [online]. [Accessed 30 April 2021]. Available at: https://itc.gov.ae/About-ITC#publications_e=0.

Abu Dhabi Government. (2021b). *TAMM - About TAMM* [online]. [Accessed 30 April 2021]. Available at: https://www.tamm.abudhabi/en/about-tamm.

Agostino, D., Arnaboldi, M. & Lema, M. D. (2020). New development: COVID-19 as an accelerator of digital transformation in public service delivery. *Public Money and Management*. Taylor & Francis, vol. 0(0), pp. 1–4.

Alexander, O. & Pigneur, Y. (2012). *Business Model Generation: A Handbook for Visionaries, Game Changers, and Challengers*. *Journal of Product Innovation Management*.

Androutsos, A. & Brinia, V. (2019). education sciences Developing and Piloting a Pedagogy for Teaching Innovation , Collaboration , and Co-Creation in Secondary Education Based on Design Thinking ,. *Education Sciences*, vol. 9, pp. 1–11.

Bartlett II, J. E., Kotrlik, J. W. & Higgins, C. C. (2001). Determining appropriate sample size in survey research. *Information Technology, Learning, and Performance Journal*, vol. 19(1), pp. 43–50 [online].Available at: https://www.opalco.com/wp-content/uploads/2014/10/Reading-Sample-Size1.pdf.

Belleghem, S. Van. (2016). When digital becomes human. *Journal of Direct, Data and Digital Marketing Practice*, vol. 17(1), pp. 2–4.

Bhandari, P. (2020). *Operationalization | A Guide with Examples, Pros and Cons*. *scribbr.com* [online].Available at: https://www.scribbr.com/dissertation/operationalization/.

Bhandari, P. (2021). *What Is Quantitative Research? | Definition, Uses and Methods*. *https://www.scribbr.com/* [online].Available at: https://www.scribbr.com/methodology/quantitative-research/.

Carlota, L., Andres-Martínez, M.-E. & Mondejar-Jimenez, J.-A. (2020). Omnichannel in the fashion industry: A qualitative analysis from a supply-side perspective. *Heliyon*, vol. 6(June).

Castagna, F., Centobelli, P., Cerchione, R., Esposito, E., Oropallo, E. & Passaro, R. (2020). Customer Knowledge Management in SMEs Facing Digital Transformation, pp. 1–16.

Chyung, S. Y. Y., Roberts, K., Swanson, I. & Hankinson, A. (2017). Evidence-Based Survey Design: The Use of a Midpoint on the Likert Scale. *Performance Improvement*, vol. 56(10), pp. 15–23.

Corydon, B., Ganesan, V. & Lundqvist, M. (2016). Digital by default : A guide to transforming government. *New York: McKinsey \& Company*, (November), pp. 1–13.

Cuesta, C., Ruesta, M., Tuesta, D. & Urbiola, P. (2015). The digital transformation of the banking industry. *BBVA Research*.

Deloitte. (2018). *National Transformation in the Middle East - A Digital Journey*.

Dener, C., Nii-Aponsah, H., E. Ghunney, L. & Kimberly, D. J. (2021). *2021. GovTech Maturity Index : The State of Public Sector Digital Transformation. International Development in Focus*. Washington, DC: World Bank [online].Available at: https://openknowledge.worldbank.org/handle/10986/36233.

Department of Economic and Social Affairs. (2020). *E-Government Survey 2020 - Digital Government in the Decade of Action for Sustainable Development: With addendum on COVID-19 Response* [online].Available at: https://publicadministration.un.org/egovkb/en-us/Reports/UN-E-Government-Survey-2020.

Dugstad, J., Eide, T., Nilsen, E. R. & Eide, H. (2019). Towards successful digital transformation through co-creation : a longitudinal study of a four-year implementation of digital monitoring technology in residential care for persons with dementia. *BMC health services research*. Springer, vol. 19, pp. 1–17.

Ebert, C. & Duarte, C. (2018). Digital transformation. *IEEE Softw*, (16–21).

Fitzpatrick, M., Gill, I., Libarikian, A., Smaje, K. & Zemmel, R. (2020). The digital-led recovery from COVID-19: Five questions for CEOs. *Mckinsey Digital*, (April), p. 9.

Gebayew, C., Hardini, I. R., Panjaitan, G. H. A., Kurniawan, N. B. & Suhardi. (2018). A Systematic Literature Review on Digital Transformation. *2018 International Conference on Information Technology Systems and Innovation, ICITSI 2018 - Proceedings*. IEEE, pp. 260–265.

Gimpel, H., Hosseini, S., Huber, R., Probst, L., Röglinger, M. & Faisst, U. (2018). Structuring Digital Transformation : A Framework of Action Fields and its Application at ZEISS. *JOURNAL OF INFORMATION TECHNOLOGY THEORY AND APPLICATION*, vol. 19(1), pp. 31–54.

Goerzig, D. & Bauernhansl, T. (2018). Enterprise Architectures for the Digital Transformation in Small and Medium-sized Enterprises. *Procedia CIRP*. The Author(s), vol. 67, pp. 540–545.

Halim & Hasnita. (2017). Determining Sample Size for Research Activities : The Case of Organizational Research. *Selangor Business Review*, vol. 2(1), pp. 20–34 [online].Available at: http://sbr.journals.unisel.edu.my/ojs/index.php/sbr/article/view/12/20.

Hansen, R. & Sia, S. (2015). Hummel ' s Digital Transformation Toward Omnichannel Retailing : Key Lessons Learned. *MIS Quarterly Executive*, vol. 14(2).

Heale, R. & Twycross, A. (2015). Validity and reliability in quantitative studies. *Evidence-Based Nursing*, vol. 18(3), pp. 66–67.

Heinze, A., Griffiths, M., Fenton, A. & Fletcher, G. (2018). Knowledge exchange partnership leads to digital transformation at Hydro - X Water Treatment , Ltd.

Henriette, E. (2016). Digital Transformation Challenges.

Henriette, E., Feki, M. & Boughzala, I. (2015). The Shape of Digital Transformation: A Systematic Literature Review. *MCIS 2015 proceedings*, vol. 10, pp. 431–443.

Hofmann, P., Samp, C. & Urbach, N. (2020). Robotic process automation. *Electronic Markets*. Springer, vol. 30, pp. 99–106.

Hönigsberg, S., Dinter, B. & Wache, H. (2020). The Impact of Digital Technology on Network Value Co-creation. *Proceedings of the 53rd Hawaii International Conference on System Sciences*,

pp. 5233–5242.

Hunter, P. (2016). Margin of Error and Confidence Levels Made Simple. *ISIXSIGMA*, pp. 1–4.

International Association of Public Transport. (2017). *Digitalisation in Public Transport* [online].Available at: https://www.uitp.org/sites/default/files/documents/News/UITP_Digitalisation_Report_2017.pdf%0Ahttp://www.flexmail.eu/dyn/tpl_attributes/user_documents/user_5013_documents/UITP_Digitalisation_Report_Final_compressed.pdf?utm_source=flexmail&utm_medium=e-mai.

José, M. & Rocha, Á. (2019). Digital learning : Developing skills for digital transformation of organizations. *Future Generation Computer Systems*. Elsevier B.V., vol. 91, pp. 327–334.

Kedziora, D. & KIVIRANTA, H. (2018). Digital Business Value Creation with Robotic Process Automation (rpa) in Northern and Central Europe. *Management*, vol. 13(2), pp. 161–174.

Kotarba, M. (2018). Digital transformation of business models. *Foundations of Management*, vol. 10(1), pp. 123–142.

von Leipzig, T., Gamp, M., Manz, D., Schöttle, K., Ohlhausen, P., Oosthuizen, G., Palm, D. & von Leipzig, K. (2017). Initialising Customer-orientated Digital Transformation in Enterprises. *Procedia Manufacturing*. Elsevier B.V., vol. 8(October 2016), pp. 517–524.

Mergel, I., Kattel, R., Lember, V. & McBride, K. (2018). Citizen-Oriented Digital Transformation in the Public Sector. *Proceedings of the 19th Annual International Conference on Digital Government Research: Governance in the Data Age*, pp. 1–3.

Mohamad, M. M., Sulaiman, N. L., Sern, L. C. & Salleh, K. M. (2015). Measuring the Validity and Reliability of Research Instruments. *Procedia - Social and Behavioral Sciences*. Elsevier B.V., vol. 204(November 2014), pp. 164–171.

Mohd-ramly, S. & Omar, N. A. (2017). Exploring the influence of store attributes on customer experience and customer engagement International Journal of Retail & Distribution Management Article information :, (October).

Mukaka, M. M. (2012). Statistics corner: A guide to appropriate use of correlation coefficient in medical research. *Malawi Medical Journal*, vol. 24(3), pp. 69–71.

Niraula, P. & Kautish, S. (2019). Study of The Digital Transformation Adoption in The Insurance Sector of Nepal. *LBEF Research Journal of Science, Technology and …*, vol. 1(1), pp. 43–60 [online].Available at: http://www.academia.edu/download/61162041/1-1-43-60_Study_of_The_Digital_Transformation_Adoption_in_The_Insurance_Sector_of_Nepal20191108-14533-1yke4i0.pdf.

Nwankpa, J. K. & Roumani, Y. (2016). IT capability and digital transformation: A firm performance perspective. *Thirty Seventh International Conference on Information Systems*, pp. 1–16.

Ovan, A. (2015). What is a business model? *Harvard Business Review*, (January), pp. 1–9 [online].Available at: https://hbr.org/2015/01/what-is-a-business-model.

Piccinini, E., Gregory, R. W. & Kolbe, L. M. (2015). Changes in the Producer – Consumer Relationship – Towards Digital Transformation. *12th International Conference on Wirtschaftsinformatik*, pp. 1634–1648.

Pousttchi, K., Gleiss, A., Buzzi, B. & Kohlhagen, M. (2019). Technology Impact Types for Digital Transformation. *2019 IEEE 21st Conference on Business Informatics (CBI)*, vol. 1, pp. 487–494.

Priyono, A. & Moin, A. (2020). Identifying-digital-transformation-paths-in-the-business-model-of-smes-during-the-covid19-pandemic2020Journal-of-Open-Innovation-Technology-Market-and-ComplexityOpen-Access.pdf. *Journal of Open Innovation: Tecnology, Market, and Complexity*, vol. 6(4), p. 104.

Puri-Mirza, A. (2020). *UAE: number of public bus passengers in Abu Dhabi by region 2018*. *www.statista.com* [online].Available at: https://www.statista.com/statistics/1067815/uae-number-of-public-bus-passengers-in-abu-dhabi-by-region/#:~:text=As of 2018%2C the total,Dhabi Emirate was 65.8 million.

Ranerup, A., Henriksen, H. Z. & Hedman, J. (2016). An analysis of business models in Public Service Platforms. *Government Information Quarterly*. The Authors, vol. 33(1), pp. 6–14.

Reinartz, W., Wiegand, N. & Imschloss, M. (2019). The impact of digital transformation on the retailing value chain. *International Journal of Research in Marketing*. Elsevier B.V., vol. 36(3), pp. 350–366.

Reis, J., Amorim, M., Melao, N. & Matos, P. (2018). 'Digital transformation: a literature review and guidelines for future research'. , in *World conference on information systems and technologies*, pp. 411–421.

Roads and Transport Authority in Dubai. (2020a). *Roads & Transport Authority - About RTA. Roads and Transport Authority in Dubai (RTA)* [online]. [Accessed 30 April 2021]. Available at: https://www.rta.ae/wps/portal/rta/ae/home/about-rta/.

Roads and Transport Authority in Dubai. (2020b). *RTA Annual Report 2019* [online].Available at: https://indd.adobe.com/view/a65d8b12-a28e-4311-846f-b0a56afcd510.

Roads and Transport Authority in Dubai. (2021). *Press Releases* [online].Available at: https://www.rta.ae/wps/portal/rta/ae/home/news-and-media/all-news/NewsDetails/346-million-riders-used-mass-transit-means-shared-transport-and-taxis-in-2020-despite-covid-19-challenges.

Sahu, N., Deng, H. & Mollah, A. (2018). Investigating The Critical Success Factors Of Digital Transformation For Improving CustomerExperience. *CONF-IRM 2018 Proceedings*, vol. 18(May), p. 1.13 [online].Available at: http://aisel.aisnet.org/confirm2018http://aisel.aisnet.org/confirm2018/18.

Schallmo, D. R. A. & Williams, C. A. (2018). *Digital Transformation Now! Guiding the Successful Digitalization of Your Business Model*. *Springer Briefs in Business* [online].Available at: https://books.google.com.bd/books/about/Digital_Transformation_Now.html?id=gL5GDwAAQBAJ&redir_esc=y.

Schallmo, D., Williams, C. A. & Boardman, L. (2017). Digital transformation of business models-best practice, enablers, and roadmap. *International Journal of Innovation Management*, vol. 21(8), pp. 1–17.

Schwertner, K. (2017). Digital transformation of business. *Trakia Journal of Science*, vol. 15(Suppl.1), pp. 388–393.

Sharjah RTA. (2021). *Sharjah RTA*. *Sharjah RTA* [online].Available at: https://www.srta.gov.ae/en-us/About-Us/About-Sharjah-RTA.

Siderska, J. (2020). Robotic Process Automation — a driver of digital transformation ? *Engineering Management in Production and Services*, vol. 12(2), pp. 21–31.

Taherdoost, H. (2017). Determining sample size; how to calculate survey sample size. *International Journal of Economics and Management Systems*, vol. 2.

Taherdoost, H. (2018). Validity and Reliability of the Research Instrument; How to Test the Validation of a Questionnaire/Survey in a Research. *SSRN Electronic Journal*, vol. 5(3), pp. 28–36.

Talukder, A., Alam, M. G. R., Bairagi, A. K., Abedin, S. F., Nguyen, H. T. & Hong, C. S. (2016). Threshold Estimation Models for Influence Maximization in Social Network, pp. 888–890.

Tanniru, M. & Sandhu, K. (2018). Engagement leading to empowerment-digital innovation strategies for patient care continuity. *ACIS 2018 - 29th Australasian Conference on Information Systems*.

Tejada, J. & Punzalan, J. (2012). On the misuse of Slovin's formula. *The Philippine Statistician*, vol. 61(1), pp. 129–136.

The Research Advisors. (2006). *Sample Size Table*.

Tolboom, I. H. (2016). Organizational Impact of Digital Transformation. *Delft University of technology*.

UAE Government. (2020). *Digital UAE - The Official Portal of the UAE Government*. *UAE Government Portal* [online]. [Accessed 28 April 2021]. Available at: https://u.ae/en/about-the-uae/digital-uae.

UAE Government. (2021). *Happiness* [online].Available at: https://u.ae/en/about-the-uae/the-uae-government/government-of-future/happiness.

United Nations. (2019). *World Population Prospects*. *World Population Prospects 2019* [online].Available at: https://population.un.org/wpp/Download/Standard/Population/.

Verina, N. & Titko, J. (2019). Digital transformation: conceptual framework. *Proceedings of 6th International Scientific Conference Contemporary Issues in Business, Management and Economics Engineering '2019*. Vilnius Gediminas Technical University.

Vial, G. (2019). Understanding digital transformation: A review and a research agenda. *Journal of Strategic Information Systems*, vol. 28, pp. 118–144.

Wikipedia. (2020). *Emirates of the United Arab Emirates*. *Wikipedia* [online].Available at: https://en.wikipedia.org/wiki/Emirates_of_the_United_Arab_Emirates#cite_note-4.

Worku, G. B. (2013). Demand for Improved Public Transport Services in the UAE: A Contingent Valuation Study in Dubai. *International Journal of Business and Management*, vol. 8(10).

ZACHARIADIS, M. & OZCAN, P. (2017). The API Economy and Digital Transformation in Financial Services: The Case of Open Banking.

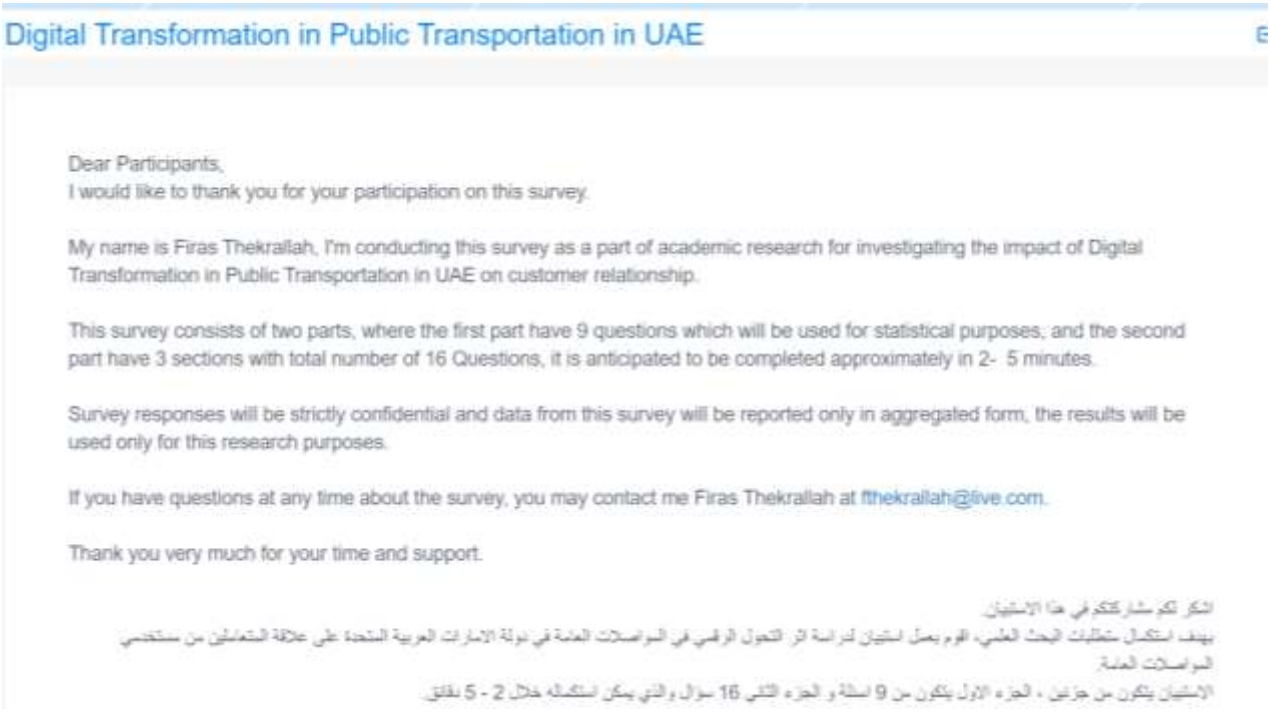
Zaharia, S. E. & Pietreanu, C. V. (2018). Challenges in airport digital transformation. *Transportation Research Procedia*. Elsevier B.V., vol. 35, pp. 90–99.

Zaki, M. (2019). Digital Transformation: Harnessing Digital Technologies for the Next Generation of Services. *Journal of Services Marketing*.

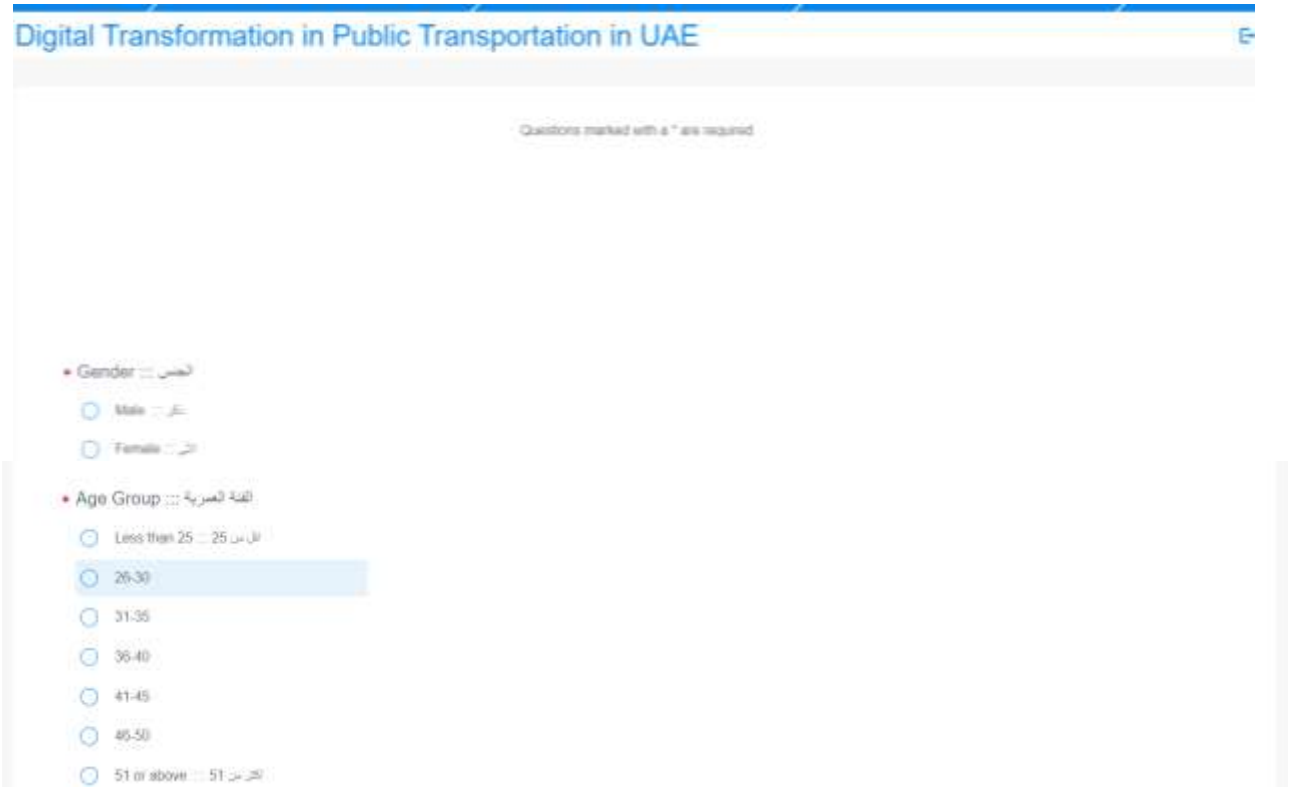
Appendix

1. Survey Screenshots

- **Introduction Section**



- **Demographic and Public Transportation Information Section**



* Educational Background ::: التحصيل العلمي

- ○ No formal education ::: امي
- ○ High school ::: ثانوية عامة
- ○ College degree ::: دبلوم
- ○ Bachelor's degree ::: بكالوريوس
- ○ Master's degree ::: ماجستير
- ○ Professional degree ::: شهادة مهنية
- ○ Doctorate degree ::: دكتوراة

* How often you are using public transportation in UAE ::: دورية استخدام المواصلات العامة في دولة الإمارات

- ○ Daily ::: يومي
- ○ Weekly ::: اسبوعي
- ○ Monthly ::: شهري
- ○ Occasionally ::: أحيانا

* Do you use or Did you use Buses ::: هل تستخدم او استخدمت الباص

- ○ Yes ::: نعم
- ○ No ::: لا

* Do you use or Did you use Taxi ::: هل تستخدم او استخدمت التاكسي

- ○ Yes ::: نعم
- ○ No ::: لا

* Do you use or Did you use Water Taxi ::: هل تستخدم او استخدمت التاكسي المائي

- ○ Yes ::: نعم
- ○ No ::: لا

* Do you use or Did you use Metro ::: هل تستخدم او استخدمت المترو

- ○ Yes ::: نعم
- ○ No ::: لا

* Do you use or Did you use Tram ::: هل تستخدم او استخدمت الترام

- ○ Yes ::: نعم
- ○ No ::: لا

- **Value Proposition Section**

• Value Proposition

Considering Digital transformation as the inclusion of digital technology into all aspects of a business, resulting in a radical change in how businesses operate and how to provide value to customers. For example, the introduction of new mediums or tools (such as smart applications, online services and kiosks) to get the services without /or with minimal direct face to face interaction

باعتبار ان التحول الرقمي هو استخدام التكنولوجيا الرقمية في جميع جوانب الأعمال ، مما يؤدي إلى تغيير جذري في كيفية عمل الشركات وكيفية تقديم قيمة للعملاء. على سبيل المثال ، إدخال وسائط أو أدوات جديدة (مثل التطبيقات الذكية والخدمات عبر الإنترنت والأكشاك) للحصول على الخدمات بدون / أو بأقل قدر من التفاعل المباشر وجهاً لوجه

Due to digital transformation in public transportation services in UAE, to what extent do you agree or disagree with the following statements:

بسبب التحول الرقمي في خدمات المواصلات العامة في دولة الإمارات العربية المتحدة ، إلى أي مدى توافق أو لا توافق مع ما يلي:

	(1) Strongly Disagree :: لا أوافق بشدة	(2) Disagree :: لا أوافق	(3) Neutral :: محايد	(4) Agree :: أوافق	(5) Strongly Agree :: أوافق بشدة
1. Introducing more new public transportation services by public transportation provider :: تقديم خدمات مواصلات عامة جديدة أكثر	○	○	○	○	○
2. Increase in public transportation services performance :: تحسن في أداء خدمات المواصلات العامة	○	○	○	○	○
3. Public transportation operators have increased ability to provide customized public transportation services :: زيادة في خدمات المواصلات العامة بحسب طلب المتعاملين	○	○	○	○	○
4. Public transportation service providers are able to offer public transportation services at a lower price/cost :: تقديم خدمات المواصلات العامة بتكلفة أقل	○	○	○	○	○
5. Public transport operators have achieved better capability in mitigating or reducing risks related to public transport services through Service level agreements and service guarantee :: القدرة على تخفيض المخاطر المتعلقة بخدمات المواصلات العامة من خلال اتفاقيات مستوى الخدمة	○	○	○	○	○
6. Public transportation providers have enhanced Accessibility of Public transportation services to commuters/passengers :: سهولة الوصول إلى خدمات المواصلات العامة	○	○	○	○	○
7. More Convenient (Easy to Use) Public transportation services :: سهولة استخدام خدمات المواصلات العامة	○	○	○	○	○

- **Customer Channels Section**

• Channels

Considering Digital transformation as the inclusion of digital technology into all aspects of a business, resulting in a radical change in how businesses operate and how to provide value to customers. For example, the introduction of new mediums or tools (such as smart applications, online services and kiosks) to get the services without /or with minimal direct face to face interaction

اعتبار ان التحول الرقمي هو استخدام التكنولوجيا الرقمية في جميع جوانب الأعمال ، مما يؤدي إلى تغيير جذري في كيفية عمل الشركات وكيفية تقديم قيمة للعملاء. على سبيل المثال ، إدخال وسائط أو أدوات جديدة (مثل التطبيقات الذكية والخدمات عبر الإنترنت والأكشاك) للحصول على الخدمات بدون / أو بأقل قدر من التفاعل المباشر وجهاً لوجه

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بسبب التحول الرقمي في خدمات المواصلات العامة في دولة الإمارات العربية المتحدة ، إلى أي مدى توافق أو لا توافق مع ما يلي:

	(1) Strongly Disagree :: لا أوافق بشدة	(2) Disagree :: لا أوافق	(3) Neutral :: محايد	(4) Agree :: أوافق	(5) Strongly Agree :: أوافق بشدة
1. Customers are more aware of Public transportation services through Marketing Campaigns :: عملائي المواصلات العامة أكثر وعيًا بالخدمات المتوفرة من خلال الحملات الإعلانية	○	○	○	○	○
2. Customers have increased ability of evaluating Public transportation services :: إمكانية أكثر للمتعاملين في تقييم خدمات المواصلات العامة	○	○	○	○	○
3. Availability of different channels/options to purchase Public transportation services :: توفر المزيد من الوسائط والخيارات للحصول على خدمات المواصلات العامة	○	○	○	○	○
4. Availability of different channels/options to deliver Public transportation services :: توفر المزيد من الوسائط والخيارات لتوصيل خدمات المواصلات العامة	○	○	○	○	○
5. Customers have better communication channels and support features for Public transportation services purchased or received :: يوجد قنوات اتصال أفضل وميزات أفضل لخدمات المواصلات العامة	○	○	○	○	○

- **Customer Relationship Section**

• Customer Relationships

Considering Digital transformation as the inclusion of digital technology into all aspects of a business, resulting in a radical change in how businesses operate and how to provide value to customers. For example, the introduction of new mediums or tools (such as smart applications, online services and kiosks) to get the services without /or with minimal direct face to face interaction

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بسبب التحول الرقمي في خدمات المواصلات العامة في دولة الإمارات العربية المتحدة ، إلى أي مدى توافق أو لا توافق مع ما يلي:

	(1) Strongly Disagree :: لا أوافق بشدة	(2) Disagree :: لا أوافق	(3) Neutral :: محايد	(4) Agree :: أوافق	(5) Strongly Agree :: أوافق بشدة
1. Public transportation providers offer Self Services features for customers where all necessary procedures can be done by customers :: تقديم خدمات مواصلات عامة ذاتية بحيث يمكن للمتعاملين استكمال كافة الإجراءات المطلوبة	○	○	○	○	○
2. Public transportation providers have increased the use of automated services :: الزيادة في توفير الخدمات المؤتمتة	○	○	○	○	○
3. Increase the use of user communities for knowledge exchange related to public transportation services and solving other user's problems :: الزيادة في تداول المعرفة بين مستخدمي المواصلات العامة والمساعدة في حل المشاكل التي تواجه الآخرين	○	○	○	○	○
4. Increase in Co-creation of Public transportation services where customers feedback's, suggestions being considered in the design of new services :: الاعتماد بشكل أكبر على آراء العملاء واقتراحاتهم في تصميم خدمات المواصلات العامة	○	○	○	○	○