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Contribution of Emerging Technologies (Artificial Intelligence, Big Data) in the Development of Intelligent Public Transportation Systems - A Case Study of YASSIR Company in Algeria-

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Abstract:
The utilization of advanced information technology systems in the field of land transportation in the Arab region is still limited or absent, despite the significant advancements achieved by foreign countries such as Japan, South Korea, China, and Dubai.
The diverse and extensive applications of information and communication technology haveenabled the development of smart transportation systems across various modes and infrastructures. It is expected that this technology will continue to evolve further, as evident in the planning and implementation efforts in Europe, Asia, Australia, and the United States.
Already, technologies like Blockchain have been utilized to streamline export procedures,
reduce the processing of key documents, and enhance efficiency and reliability. Therefore, this study aims to shed light on the role of information technology and communication in the development of intelligent public transportation systems. It will examine experiences from various Arab and foreign countries, with a specific focus on analyzing the case of YASSIR Company in Algeria as a model, while highlighting the potential benefits from different international experiences.
Keywords: Information and Communication Technology, Smart Transportation, Artificial Intelligence, Blockchain, Internet of Things.
JELClassificationCodes : H32 ; L84 ; L14 ; O33.

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1. INTRODUCTION

The field of information and communication technology has witnessed rapid advancements in recent years, with the direct effects of the digital revolution on various aspects of human life, including the economy, society, and culture. This has led to a strong link between economic development and a country's ability to keep pace with these transformations and effectively control them to capitalize on the available and renewable potentials.

Information technology, or IT, is a broad domain that deals with technology and its various aspects related to information processing, management, research, development, design, implementation, and support of computer-based systems.

It relies on extensive research and applications and has become a key driver of production and growth in many countries worldwide, enhancing productivity across diverse sectors. It allows individuals to replace complex and cumbersome traditional systems with modern, user-friendly technologies, leading to reduced effort, time, and workforce requirements. It finds applications in fields such as medicine, administration, banking, and education.

The term "information technology" emerged globally in the 11th century, starting with simple data collection, organization, and classification. Over time, it evolved to establish logical connections between pieces of information, resulting in systems that facilitate data input, review, and storage, leveraging databases and their massive systems.

Artificial Intelligence and Big Data, as part of Information and Communication Technology, are of significant importance due to their impact on economic activities. They have grown and evolved to dominate all sectors, becoming the foundation of every operation, capable of driving economic sectors and various other activities, while also saving effort and time.

Therefore, this study aims to shed light on the role of these emerging technologies, namely Artificial Intelligence and Big Data, in the development of intelligent public transportation systems for public transportation. It explores the experiences of various countries in utilizing smart technologies, focusing on the pioneering experience of the United Arab Emirates in this field, as well as the case of YASSIR Company in Algeria.

The study addresses the following questions:

1. The importance of emerging technologies (Artificial Intelligence and Big Data) in developing intelligent public transportation systems for public transportation.
2. The extent of benefits derived from studying the experiences of some Arab and foreign countries.
3. Does YASSIR's Algerian experience reflect the effectiveness of these technologies?

To achieve these objectives, the research is divided into the following main axes:

1. The evolution of investment in information and communication technology.
2. Big Data and Artificial Intelligence.
3. Concepts related to intelligent transportation systems.
4. Experiences of some Arab and foreign countries in developing intelligent transportation systems.
5. A case study of YASSIR Company in Algeria.

1.2. IMPORTANCE OF RESEARCHI:

The topic of information and communication technology holds significant importance across all levels, especially with the rapid growth witnessed in urban areas. Additionally, there is a noticeable surge in interest from individuals, companies, and governments, coupled with an increasing focus on sustainability in recent years.

Research Objectives: Through our research, we aim to achieve the following benefits:

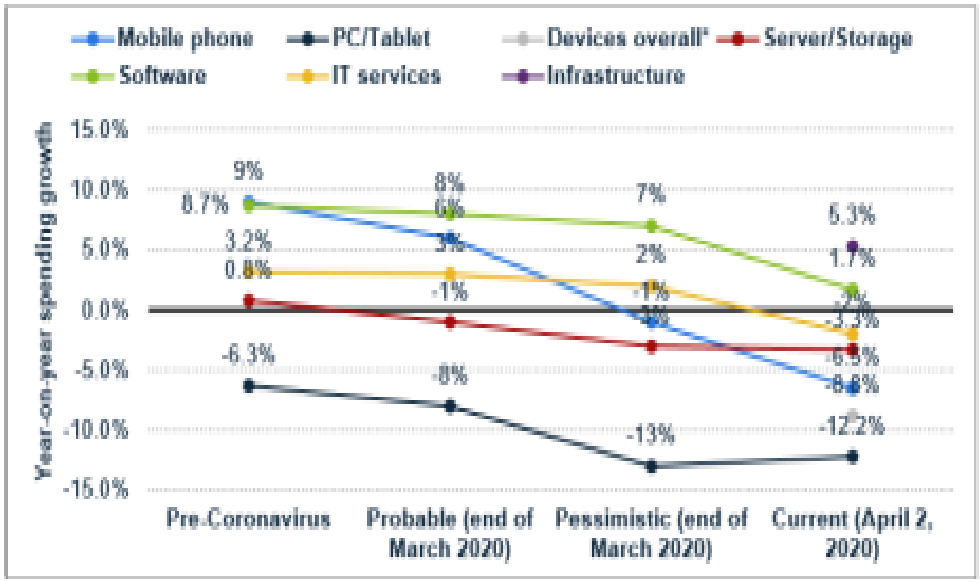
- Understanding the various applications of Artificial Intelligence and Big Data and their role in enhancing organizational performance.
- Uncovering the challenges that lie ahead in the development of intelligent public transportation systems, specifically in the context of Artificial Intelligence and Big Data applications and their prospects.
- Identifying key international experiences in using emerging technologies in the domain of public transportation.
- Presenting the case study of YASSIR Company in Algeria concerning public transportation and assessing its utilization of information and communication technology.

1.2.EVOLUTION OF INVESTMENT IN INFORMATION AND COMMUNICATION TECHNOLOGY :

The world was gripped by fear following the outbreak of the COVID-19 pandemic, leading to the adoption of the concept of social distancing. Consequently, life came to a complete halt from March 2020 to July 2020. Amid these circumstances and their repercussions, applications of information and communication technology (ICT) became prevalent in most economic activities.

These challenges positively impacted the significant increase in global investment in telecommunications and information technology.

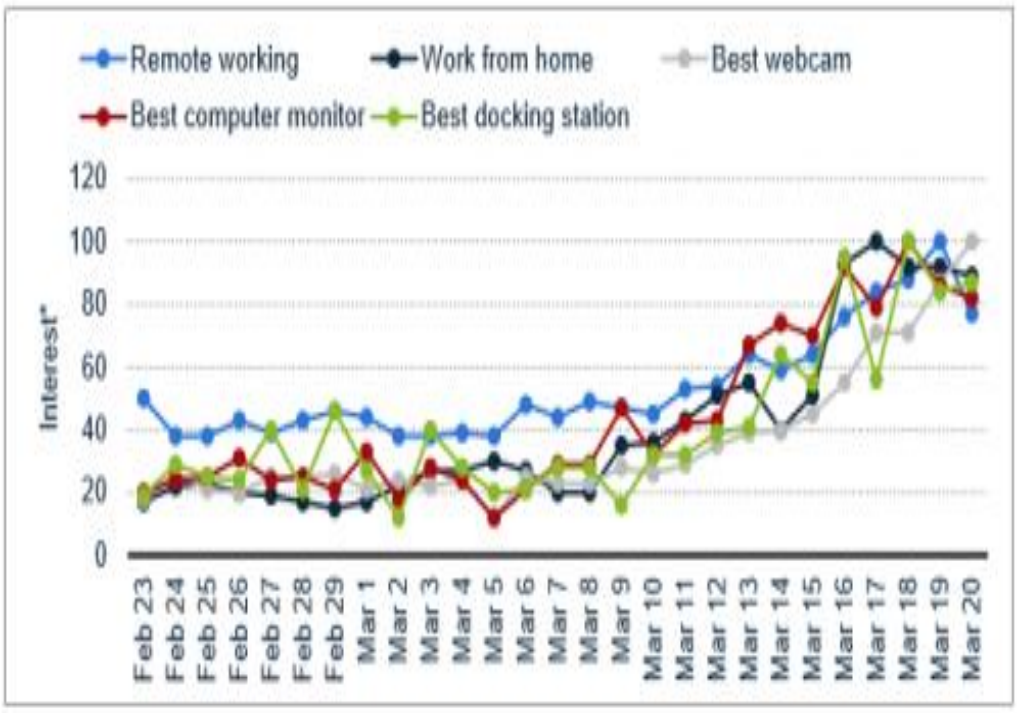
Figure 01: Increase in Investment in Information Technology.



Source: (2023). Retrieved from https://www.statista.com

As most companies closed down, work shifted online during the COVID-19 pandemic.

Figure 02: Percentage of Businesses Transitioning to Remote Work



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Amidst the COVID-19 pandemic, all traditional business methods became rejected, coinciding with the compulsory lockdowns imposed by governments, forcing reliance on technology for communication.

2.EVOLUTION OF INVESTMENT IN THE INTRNET OF THINGS (LOT)

2.1. Definition of Internet of Things (IoT):

The Internet of Things (IoT) is a collection of interconnected devices or systems through the Internet, enabling devices to gather data from the environment and share it among themselves (Pujar & Satyanarayana, 2015, p. 188). IoT links heterogeneous and decentralized devices on a large scale, such as home appliances, engines, sensors, and wireless communication platforms, facilitating their connection to achieve certain objectives.

It is also defined as a "network of digitally connected physical devices with monitoring, sensing, and interacting capabilities within an organization and between its external supply chain, generating flexibility and information-sharing to facilitate timely planning, coordination, and control of all processes" (Khan & Javaid, 2021, p. 528).

Furthermore, IoT is described as a "new technological paradigm that enables smart machines and devices to communicate over the internet" (Hashim & Al-Sulami, 2020, p. 3).

Moreover, IoT is known as an "extended version of the internet, by integrating mobile networks, the internet, social networks, and smart things to provide better services and applications for users" (Almgrashi, 2020, p. 257).

2.2. Characteristics of the Internet of Things (IoT):

The Internet of Things (IoT) possesses a set of important characteristics, including (Gill & et al., 2019, p. 107):

- Data Sensing: The fundamental element of IoT is data, which represents the first step towards understanding and perceiving reality to initiate necessary actions and responses.
- Device Connectivity: IoT enables devices and equipment to connect with each other to collect and analyze data.
- Intelligence: IoT utilizes algorithms, software, and interconnected devices to create a smart network, facilitating intelligent responses and interactions between users and devices through user interfaces.
- Energy Efficiency: Refers to the efficient use of energy and the ability of devices to operate with minimal energy consumption, ensuring the continuity of IoT networks.
- Security: IoT is designed with data security in mind, ensuring the protection of personal and device-related data and securing data transmission within networks through an expanding security model.

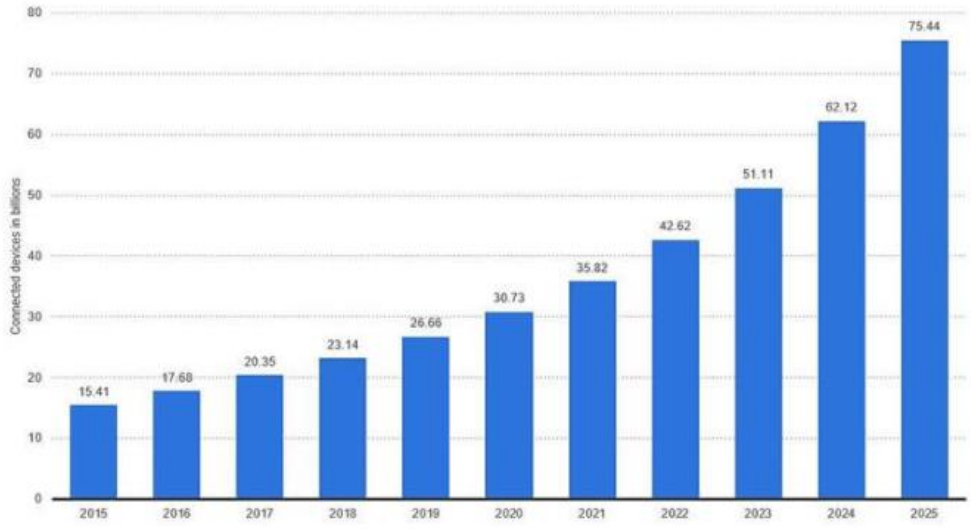
2.3. Benefits of Using the Internet of Things (IoT):

The utilization of the Internet of Things (IoT) contributes to the following advantages (Ghandoura, 2019, p. 541):

- **Access to Information Anytime, Anywhere**: IoT enables access to information from any device at any time and location.
- **Time, Effort, and Cost Savings**: IoT leads to time, effort, and cost savings through increased efficiency and automation.
- **Reduced Human Intervention and Error Rate**: IoT reduces the need for human intervention, leading to a decrease in error rates.
- **Enhanced Production, Operations, Distribution, and Control in Industries**: IoT improves processes across various industrial sectors.
- **Resource Optimization**: IoT helps in reducing resource waste by effectively managing resources and minimizing instances of waste.
- **Effective Decision-Making**: IoT facilitates effective decision-making by providing real-time data and insights.

The following figures illustrate the global base of IoT devices and the corresponding spending on them.

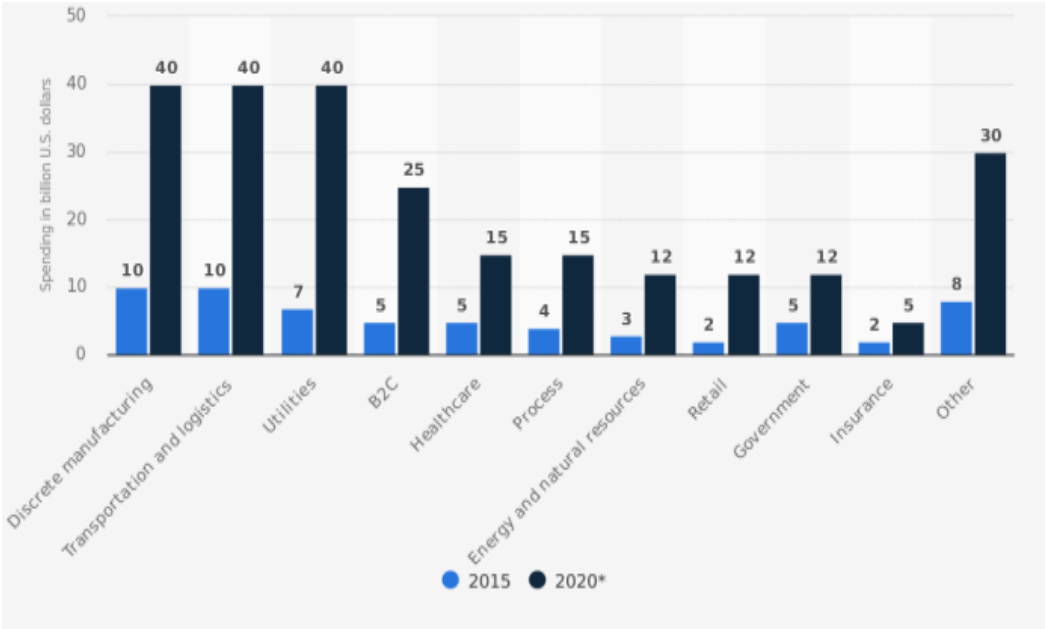
Figure 03: Global Base of Internet of Things Devices



Source: (2023). Retrieved from https://www.statista.com

This statistic illustrates the global spending on the Internet of Things (IoT) across various sectors in the years 2015 and 2020. For example, in 2015, the spending on IoT in discrete manufacturing reached 10 billion US dollars, and the same value applied to the transportation sector. However, it is expected to reach 40 billion US dollars for both sectors by the year 2020.

Figure 04: Global Internet of Things (IoT) Spending between 2015-2020 in Billion Dollars.



Source: (2023). Retrieved from https://www.statista.com

2.1. Concepts of Artificial Intelligence:

2.1.1. Definition of Artificial Intelligence:

Financial technology can be applied to any financial innovation in how individuals conduct business, make payments, and use ATMs in their current traditional form.

As for Artificial Intelligence (AI), since its inception in 1956, it has been known as the intelligence displayed by machines and software that simulates human mental capabilities, such as learning, reasoning, and reacting. AI refers to the ability of machines to simulate human-like intelligence, including thinking, discovering, and leveraging past experiences. (Crawford, 2016, p. 6)

"Artificial Intelligence is the process of designing a computer or developing a program to make computers think intelligently like humans" (Rukmini, 2019, p. 68).

AI is also viewed as "a combination of cognitive automation, machine learning, reasoning, hypothesis generation and analysis, natural language processing, and deliberate algorithmic breakthroughs, resulting in insights and analytics beyond human capability" (Alice Saldanha, 2021, p. 74).

2.1.2. Importance of Artificial Intelligence: The importance of Artificial Intelligence is manifested in several points, including the following (Rabbaa, 2018, p. 12):

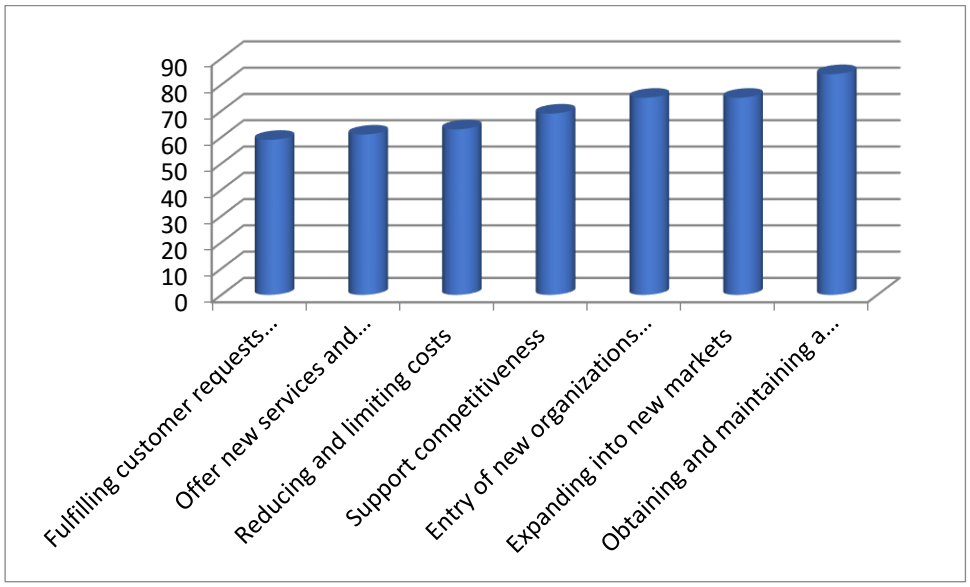
- Changing the quality of life and developing social and organizational systems, fostering progress in all areas of life, and facilitating innovation.
- Safeguarding information and knowledge associated with AI, enabling organizations to protect their data from leaks and losses.
- Creating mechanisms that are not subject to human emotions such as anxiety, fatigue, or exhaustion, especially in tasks that involve physical or mental risk.
- Generating solutions for complex problems, as analyzing and addressing these problems in a timely and efficient manner is challenging for an average individual.
- Achieving economic prosperity by creating new markets and more efficient logistics services, improving the quality of services and goods provided.

2.1.3. Objectives of Artificial Intelligence: Artificial Intelligence aims to achieve several objectives, including the following (Portany, 2012, p. 7):

- Working on storing and analyzing knowledge, establishing methodological rules to deal with it, and accessing its facts.
- Acquiring basic accumulated knowledge, updating it, maintaining it, and using it to solve problems.
- Optimal use of knowledge and expertise, storing information and knowledge associated with AI.
- Utilizing scientific methods and overcoming damage, deficiencies, and oblivion.
- Generating or developing new knowledge and expertise and activating computerized knowledge for decision-making.

2.1.4. Reasons for adopting Artificial Intelligence:

Figure 5: Reasons for adopting Artificial Intelligence.



Source: (2023).Retrieved from https://www.statista.com

The figure illustrates the multiple reasons for adopting Artificial Intelligence in organizations, as it contributes to cost reduction, thereby supporting competitiveness.

Global Artificial Intelligence in the FinTech market was estimated at approximately $7.91 billion in 2020 and is expected to reach $26.67 billion by 2026. The market is also projected to experience a compound annual growth rate of 23.17% during the forecast period (2021 - 2026) (Blanc, La Fabriqued'Assurance Live, 2019, p. 20).

2.2.1. Big Data Concepts:

Among the definitions mentioned for Big Data, we can state the following:

Big Data is defined as "vast amounts of high-velocity, complex, and variable data that require advanced techniques to capture, store, distribute, manage, and analyze" (Smeda, 2015, p. 23).

It is also referred to as "a new generation of technologies and architectures designed to extract value from extremely large volumes and varieties of data" (Anagnostopoulos & al, 2016, p. 1501).

Additionally, it can be described as "datasets that surpass the ability of typical database software to capture, store, manage, and analyze" (Matthias & al, 2017, p. 42).

Moreover, Big Data is considered "information assets with large volume and high-velocity flow coming from diverse sources, requiring innovative and cost-effective forms of information processing for enhanced insight and decision making" (Gandomi&Haider, 2015, p. 137).

2.2.2. Characteristics of Big Data:

Big Data is characterized by the following features (Saeed&Husamaldin, 2021, p. 279):

- Volume: Refers to the massive quantity of data continuously growing in every sector, providing better predictive insights for the future.
- Variety of Sources: Involves diverse types of data, ranging from structured, semi-structured, to unstructured data.

- Velocity: This signifies that data flows at high speed, demanding real-time processing and analysis upon arrival.
- Veracity: Indicates the ability of Big Data to handle biases, noise, and inconsistencies in the data, with evolving tools and techniques to reduce distrust, inaccuracy, delays, and incongruence.
- Value: Emphasizes the added value inherent in Big Data, contributing to formulating strategies, drawing plans, policymaking, and continuous performance evaluation.

2.2.3. Importance of Big Data:

The importance of big data lies in its structured processing, advanced analytical tools, and utilization, which offer numerous benefits, including (Bertie & al, 2015, p. 99):

- Making better decisions based on insights from big data analysis, identifying faults, and improving processes across all organizational units.
- Discovering untapped opportunities and potential weaknesses in various business functions based on data analysis results.
- Empowering stakeholders to find solutions to potential problems revealed by big data analysis, enabling better service for customers and stakeholders.
- Integrating big data as part of business intelligence systems to develop products, introduce new offerings, reduce production costs, avoid errors, and enhance competitiveness and innovation.

Despite the significant progress made in big data, its true potential is only just beginning to be realized. Cloud computing has expanded the realm of big data further, providing real scalability and enabling developers to create specialized sets for testing subsets of data. Graph databases have also gained increasing significance due to their ability to display vast amounts of data quickly and comprehensively (Bragazzi, 2019, p. 3).

2.2.4. Types of Big Data:

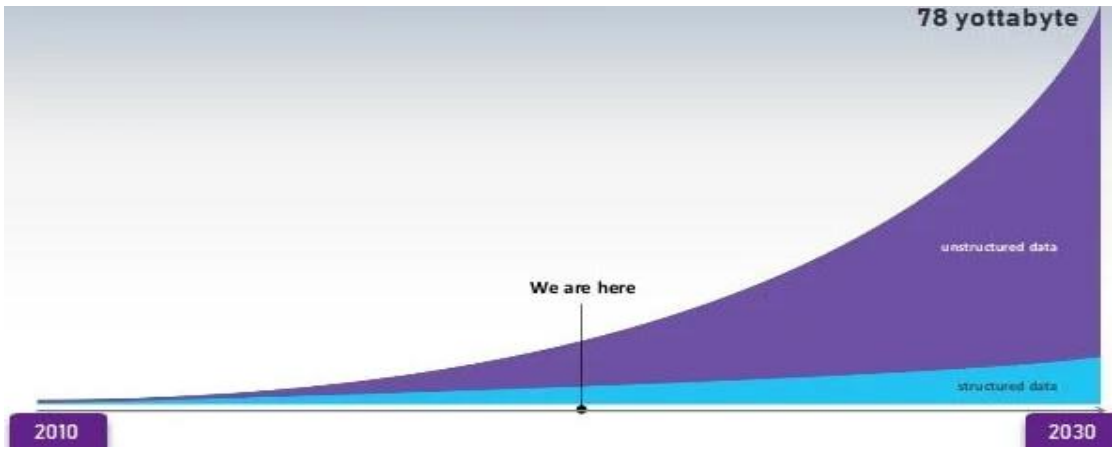
Big data is classified into three types (Kshetri , 2016, p. 304):

- **Structured Data:** Organized data often presented in the form of tables or databases for processing.
- **Unstructured Data:** Represents the largest portion of big data and includes unorganized data like text, images, videos, messages, and web clicks that people add daily.
- **Semi-Structured Data:** A blend of structured and unstructured data, closer to structured data but still designed in tables or databases.

2.2.5. The Future of Big Data and Major Players:

The big data sector has attracted various industries. In the IT sector, major providers like Oracle, HP, SAP, and IBM play significant roles. Web representatives such as Google, Facebook, and Twitter are also involved. Specialized big data experts include MapR, Teradata, EMC, Hortonworks, Cap Gemini, Sopra, Accenture, Atos, which are key players in the big data domain. In the analytics industry, BI SAS, Micro-Strategy, and Qliktech are leading editors. Additionally, smaller and medium-sized companies have emerged in the big data domain throughout the value chain. In France, Hurence and Dataiku are pioneers in big data equipment and software. Other companies like Criteo, Squid, CaptainDash, Tiny Clues focus on data analytics, and Ysance offers consultation services (Brauer, 2012, p. 508).

Figure 6: The Future of Big Data



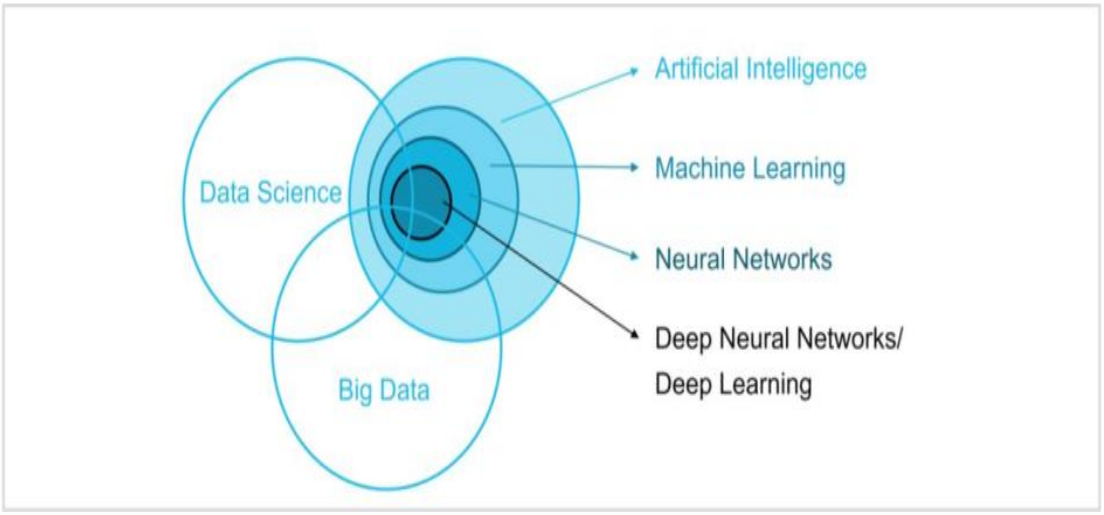
Source: IDC Data Age 2025

2.3 .The Relationship between Artificial Intelligence and Big Data:

The inseparable link between artificial intelligence (AI) and big data arises from AI's ability to keep up with the demands of big data analysis. In many applications, big data serves as the lifeblood of AI. The AI system learns from big data to enhance its intelligence and perform its functions effectively. On the other hand, big data's value increases when utilized in AI algorithms.

As the world found itself submerged in vast amounts of data, the concept of big data emerged, drawing attention to the immense wealth of stored data that holds untapped potential. Utilizing big data in AI algorithms has allowed businesses to gain new insights and make more informed decisions, benefiting various industries. Consequently, there was a need to develop AI algorithms capable of processing and utilizing such vast data (Bragazzi, 2019, p. 3).

Figure 7: The Relationship between Artificial Intelligence and Big Data



Source :Bragazzi, N. L., Damiani, G., & Martini, M. (2019).From Rheumatology 1.0 to Rheumatology 4.0 and beyond the contributions of Big Data to the field of rheumatology. Mediterranean Journal of Rheumatology, 30(1),

3.Concepts of Smart Transportation Systems

3.1. Definition of Smart Transportation Systems:

Smart Transportation Systems are defined as "systems that improve transportation safety, reduce environmental impact, and enhance productivity through the integration of advanced communication technologies that rely on information technology and electronic technologies in transportation infrastructure and vehicles" (Barbarossa, 2014, p. 1).

It is also defined as "systems that primarily rely on the use of computer, electronics, communication, and control technologies to obtain information related to the performance of transportation facilities, and sometimes weather, environmental conditions, etc., to address many challenges that individuals may face during transportation" (Shibata & all, 1997, p. 222).

The term "smart transportation" is also used to refer to the integrated applications of sensor devices, computers, communication technologies, and electronics to provide individuals with necessary information and increase the efficiency of transportation systems, and enhance traffic safety (Nicos, 2002, p. 7).

3.2. Objectives of Smart Transportation Systems:

The objectives of smart transportation systems can be summarized as follows (Robert & al, 2008, p. 35):

- Increase operational efficiency and capacity of transportation systems through measures such as increasing speeds and reducing stops.
- Reduce delays at intersections and improve road network management by activating the absorptive capacity of the road network.
- Improve mobility and comfort levels for travelers by reducing travel time, increasing reliability, and lowering costs, as well as enhancing safety and personal security.
- Enhance traffic safety by reducing the number and severity of accidents and their costs, leading to a reduction in fatalities and increased personal security.
- Reduce energy consumption and minimize harmful environmental effects by reducing emissions and fuel consumption due to congestion, mitigating pollution, and reducing traffic noise in residential areas.
- Improve economic productivity by increasing coordination, integration, and investment in network operations and management, enhancing the system's adaptability, and adopting advanced technologies.

3.3. Areas of Application for Smart Transportation Systems:

Areas of application for smart transportation systems include (Correia& W-nstel, 2011, p. 25):

- Demand management: Reducing personal vehicle use and increasing public and shared transportation. This involves allocating dedicated lanes for public transportation and controlling parking facilities.

- Emergency vehicles: Reducing response time for emergency vehicles by monitoring vehicle and road conditions, determining locations, making quick decisions, and coordinating routes and prioritization.

- Traffic management: Monitoring vehicle movements and sending information to control centers for effective management, such as finding suitable routes in emergencies and controlling traffic signals. Also, provides travelers with information such as travel time, selecting suitable routes, and identifying alternative routes during congestion.

- Efficient parking services: Guiding drivers to available parking spaces and displaying data inside vehicles. This requires location-based information to reduce the time spent searching for parking spaces.
- Pollution reduction: Installing sensors to monitor air quality and implementing appropriate strategies to reduce harmful emissions.
- Automated safety inspection: Examples include driver's license checks and vehicle weight inspection.
- Electronic toll collection services: Using electronic cards for road toll payments.

3.4. Types of Smart Transportation Services:

Smart transportation systems are generally classified into various services, and their hierarchical sequence may vary from one country to another. For example, the National ITS Architecture in the United States includes 31 services grouped into 7 types of services, as shown in Table 01:

Table 01: Types of Smart Transportation Services

Service	**Services**
1- Traffic Management and Traveler Behavior	- Pre-Trip Travel Information - In-Vehicle Signing - Traffic Management - Traffic Incident Management - Traveler Information - Traffic Control - Cooperative Driving and Maneuvering - Traveler Information Services - Roadway Speed Management - Traffic Signal Control - Traffic Hazard Protection - Traveler Reservation/Confirmation - Traffic Metering - Work Zone Traffic Management - Reserved Parking Management - Security Monitoring - Accessible Trip Reservation
2- Public Transportation Management	- Public Transportation Operations - In-Vehicle Transit Information - Transit Management - Transit Vehicle Operator - Transit Signal Priority - Transit Fare Payment

3- Electronic Payment	- Electronic Payment Services
4- Commercial Vehicle Operations	- Commercial Vehicle Check - Electronic Clearance - Commercial Vehicle Safety
5- Emergency Management	- Emergency Vehicle Management - Emergency Routing - Evacuation and Reentry Management - Disaster Response and Recovery
6- Vehicle Safety Systems	- Longitudinal Collision Avoidance - Side Collision Avoidance - Intersection Collision Avoidance - Vision for Collision Avoidance - Safety Monitoring - Pre-Crash Restraint Deployment - Automated Driving
7- Information Management	- Stored Data Processing

Source: Robert et al(2008), Intelligent Transportation Systems Benefits Costs, Department of Transportation, Research and Innovative Technology Administration, Washinton, DC, USA,p1

3.5. Components of Intelligent Transportation Systems : *(Correia& W-nstel, 2011, p. 25):*

- **Data Collection Devices:** These include various devices responsible for gathering all traffic-related data, such as traffic volume, speed, and capacity. These devices mainly comprise traffic counting cameras, vehicle surveillance cameras on roads, parking surveillance cameras, public transportation surveillance, and other sensing devices.
- **Data Processing Technologies:** These encompass software and hardware that process the collected data to manage transportation systems in response to changing conditions. They adapt to real-world situations and provide diverse information to users, ensuring safety and efficiency in using various transportation modes.
- **Control and Information Transmission Technologies:** These involve various technologies responsible for transmitting the information extracted from the analyzed data to the real world of traffic management. It includes different control mechanisms like traffic signals, guidance, warning signals, coordination with public transportation, and transportation-related entities. It also entails establishing control centers and traffic information banks, as well as methods to disseminate information to transportation system users, such as in-vehicle technologies like radios and mobile phones during travel.

4. Experiences of Some Arab and Foreign Countries in Developing Intelligent Transportation Systems:

4.1. United Arab Emirates Experience: Experts confirm that the United Arab Emirates (UAE) possesses a strategic vision aimed at accelerating the achievement of sustainable development goals, inspiring the world in the fields of green buildings, smart cities, and

expanding clean energy networks. This is particularly noteworthy as the UAE is set to host the 28th Conference of the Parties (COP28) of the United Nations Framework Convention on Climate Change in 2023.

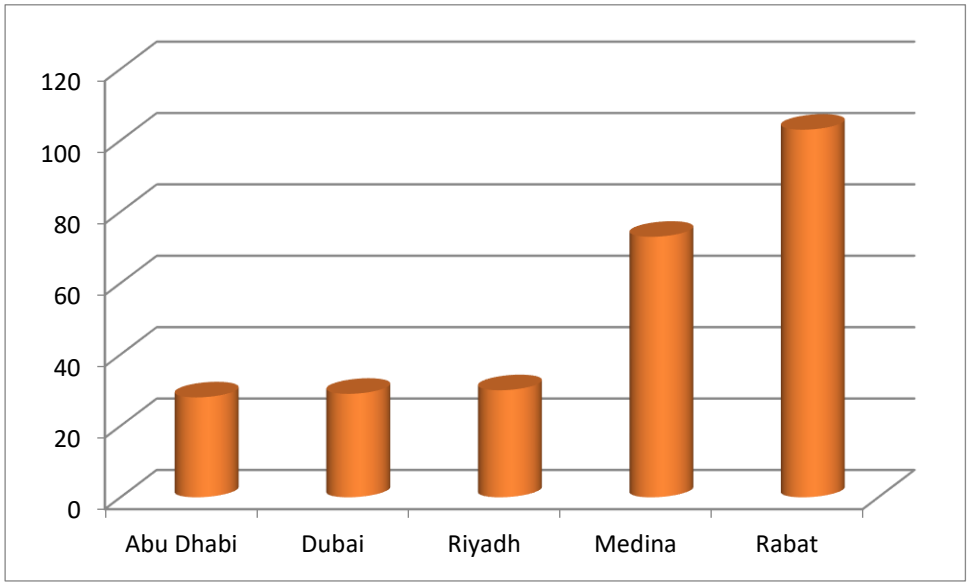
Abu Dhabi and Dubai have also topped the list as the smartest cities in the Middle East and North Africa for the year 2021, for the second consecutive time, according to the IMD Smart City Index. This highlights the continuous efforts to raise awareness through initiatives, focusing on renewable energy and investing more than 50 million dollars in clean energy, as well as expanding smart networks for sustainable buildings.

Table 2: Top 5 Arab Cities in the 2021 Smart City Index

Ranking	City	Country	Global Ranking
1	Abu Dhabi	United Arab Emirates	28
2	Dubai	United Arab Emirates	29
3	Riyadh	Saudi Arabia	30
4	Medina	Saudi Arabia	73
5	Rabat	Morocco	103

Source: Compiled by the researcher based on statistics from the World Tourism Organization.

Figure 8: Graphical representation of the top five Arab cities in the 2021 Smart City Index.



Source: Compiled by the researcher based on statistics from Table 2.

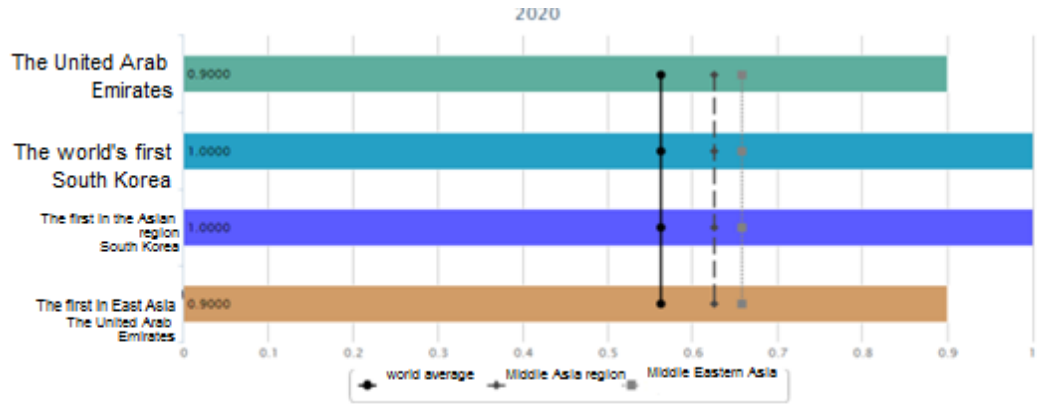
4.1.1. Analysis of Improving E-Government Development Indicators:

The United Arab Emirates (UAE) has made a significant leap in the overall E-Government Development Index, moving from the 29th position in 2016 to the 21st position in 2020. This index reflects the level of progress in the digital transformation of governments worldwide.

***OSI E-Services Index**: The UAE ranked first among Arab and Gulf countries and eighth globally in the OSI E-Services Index. This index comprises four levels of service maturity,

starting with emerging information services, including the government's provision of information online to the public.

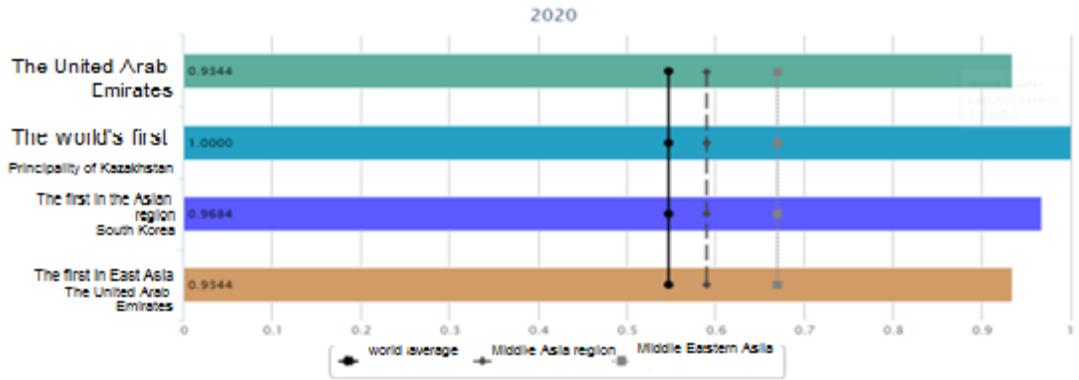
Figure 9: OSI E-Services Index for the UAE in 2020 compared to other countries worldwide.



Source: United Nations. (2021). e-Government Knowledgebase. Retrieved April 5, 2021, from United Nations: https://publicadministration.un.org/egovkb/en-us/Data/Country-Information/id/181-United-ArabEmirates/dataYear/2020

***Telecommunications Infrastructure Index (TII):** The UAE made a remarkable jump from the 25th to the 7th position globally in 2020 in terms of the Telecommunications Infrastructure Index. The 2020 E-Government Development Index study praised the strong telecommunications and information technology infrastructure of the UAE.

Figure 10: TII for the UAE in 2020 compared to other countries worldwide.



Source: United Nations. (2021). e-Government Knowledgebase. Retrieved April 5, 2021, from United Nations: https://publicadministration.un.org/egovkb/en-us/Data/Country-Information/id/181-United-ArabEmirates/dataYear/2020

4.1.2. Dubai Smart Initiatives 2021

Dubai has become a central hub in the global economy, providing opportunities for growth and expansion for investors across strategic sectors focused on the future, including financial services, logistics, hospitality, trade, and cutting-edge "Industry 4.0" technologies. This has accelerated the digital transformation across all sectors, industries, and smart city services in Dubai.

The "Dirham Smart App" (Mubashir):

The "Dirham Smart App" (Mubashir) enables payment for government services through smartphones using the latest security technologies. It ensures enhanced security with two-factor authentication and contactless transactions, contributing to maintaining public health standards and supporting the continuity of government services in all situations.

The Mubashir app offers three payment methods for completing transactions:

1. In-person payment at sales points.
2. Online payment using a one-time password (OTP).
3. Online payment using two-factor authentication.

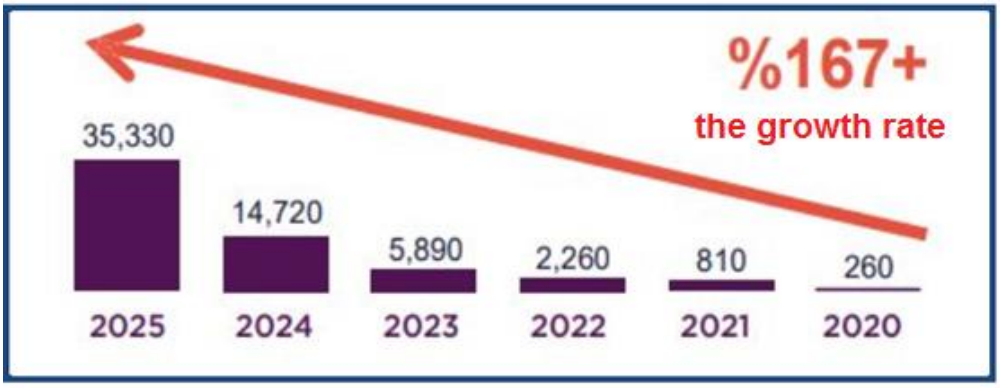
***Internet of Things (IoT)*:** The Internet of Things opens up new horizons for growth and enhances the efficiency of various sectors in Dubai, including the tourism sector. Dubai's digital wealth relies on data, it's storage, processing, and the transition to smart technologies and non-paper transactions, such as blockchain, digital signatures, and identity verification. This transformation is complemented by smart living and clean energy initiatives, supported by 121 smart initiatives, 200 databases, and 1129 smart services. Digital wealth is expected to yield significant economic results, with the value added from open data reaching AED 12 billion by 2022.

***Blockchain Technology*:** Dubai is adopting a new technology, Blockchain, and plans to become the first city to manage its services using this technology. The successful implementation of this initiative is expected to save AED 5.5 billion annually by digitizing document processing, equivalent to the yearly operational cost of the Burj Khalifa. The initiative was launched in collaboration with IBM on October 30, 2018, to transform and digitize government operations and services provided to citizens.

***Happiness Agenda*:** Dubai Smart City has introduced the Happiness Agenda initiative to measure individuals' happiness and create a conducive environment to increase it. The agenda aims to raise the happiness level in Dubai from 89% to 95% by 2021.

Roads and Transport Authority (RTA) Project: This project aims to create a single smart application that offers various public transportation services in Dubai, including metro, buses, maritime transport, and taxis. Additionally, Dubai announced the Self-Driving Smart Mobility Strategy, aiming to introduce electric autonomous vehicles to the region. The strategy targets converting 25% of total trips in Dubai to self-driving trips by 2030, leading to a 44% reduction in transportation costs (AED 900 million), a 12% decrease in environmental pollution, and AED 18 billion savings in transportation efficiency.

Figure 11: Evolution of Autonomous Vehicles in Dubai



Source: "Modern Economy Insights Report, September 2019" issued by Smart Dubai. Available at: https://www.smartdubai.ae

The Flying Taxi "Drone": *It is a project of small helicopter-like vehicles that can transport 03 individuals through the air to the airport*

4.2. iMile Startup for Smart Transport:

iMile, the startup that specialized in logistics and express courier services, has secured $40 million in funding in its Series A financing round, raising the company's valuation to approximately $350 million. The company, headquartered in Dubai, United Arab Emirates, previously received $10 million in March 2020 during its pre-seed funding round. iMile Delivery was founded in September 2017 by Rita Huang, the co-founder, and CEO, who had previously worked with reputable companies such as Ali Baba, Huawei, Naveen Joseph, JaouWinli, and Nancy Shin. Initially launched in the UAE and China, the startup expanded to Saudi Arabia in 2018, just one year after its establishment.

5.3. Chinese DiDi for Smart Transport Service:

Chinese ride-hailing service Didi, known for its smart transportation solutions, officially launched its services in Egypt in December. The company has been working on final preparations to activate its services in the Egyptian capital, Cairo, as stated by Munis Amin, the company's economic and financial advisor. Didi, founded in 2012 by Chinese entrepreneur Cheng Wei, operates its main headquarters in Beijing, China. It offers users an online ride-hailing service through its website and smartphone application, utilizing both modern communication channels and traditional methods. Didi has recently expanded its services to Egypt, starting from the coastal city of Alexandria, and has received significant interest from users, achieving positive results for both customers and drivers, which encouraged the company to further expand to other governorates.

5.4. E-ticketing Project for Public Transport in Tunisia:

The E-ticketing project aims to establish an electronic ticketing system for all segments, enabling the purchase of digital smart transport vouchers without the need to visit physical locations, using modern communication channels alongside traditional sales channels. The system provides diverse services, including:

- Electronic purchase and recharge of transport vouchers through the Internet.
- Recharge of transport vouchers via SMS using mobile phone networks.
- Recharge of transport vouchers using voice service through fixed and mobile phone networks.

The project falls within the framework of developing commercial services for passenger transport companies, utilizing modern communication and information technology to improve services provided by companies and enhance their commercial management. Progress of the project includes an international tender issued on December 3, 2008, related to the procurement and installation of the e-ticketing system. An agreement was signed on December 29, 2010, with the ACS/SMLTP/MEDIELEC consortium. The project is currently awaiting funding, with a work session held on February 8, 2012, regarding the change of the financing bank. The completion date for the project is expected to be by late 2014 or early 2015.

6. A Look into Yassir's Experience in Algeria

6.1. Establishment of Yassir Application:

Yassir was founded at the end of 2016 and the beginning of 2017, quickly becoming a prominent name in the smart ride-sharing market in the Maghreb region. The company has attracted over two million users by providing on-demand transportation services. During this period, Yassir generated profits for more than 40,000 subscribers, including drivers, delivery personnel, merchants, and warehouses.

It's worth noting that Yassir is the first Algerian application to join the global startup accelerator Y Combinator in 2020, securing $150,000 in funding.

6.2. Expansion and Growth:

Currently, Yassir operates in 25 cities worldwide, spanning Algeria, Morocco, Tunisia, France, and Canada. The company has plans to expand further to include more cities globally and establish a stronger presence in the region.

According to NoureddineTaïbi, the co-founder of Yassir, the company aims to strategically invest the funding to further develop its local presence in Algeria and expand regionally in the Maghreb, with ambitious plans to eventually go global.

In its pursuit of customer comfort and safety, Yassir provides users with detailed information about the drivers, including their full names, contact numbers, and vehicle information. The application also estimates the expected arrival time for the ride. On the other hand, drivers also receive information about the customers.

To become a driver with Yassir, interested individuals need to have a car that is less than ten years old, along with a valid vehicle inspection document. They can register as partners/drivers through the dedicated "Yassir Driver" application, available for free download on Google Play and the Apple Store. This registration allows them to gain more customers, reduce waiting time, and take advantage of standard transport services. Yassir is also planning to launch new features to enhance its innovative transportation service.

Yassir introduced several new services to cater to specific needs, including a service for very important persons (VIPs), allowing companies, associations, and other institutions to book high-end cars for their clients. Additionally, Yassir introduced a pre-booking service, enabling customers to schedule their rides in advance through the mobile application. Furthermore, the company implemented a billing service, automatically sending invoices to customers' emails after each trip or every month.

Yassir's fare is calculated based on an algorithm that takes into account traffic density, the distance between the pickup and drop-off points, and the expected arrival time for the driver.

In response to the critical COVID-19 period, Yassir launched two new delivery services on March 26, 2020, involving home shopping and parcel delivery weighing more than 10 kg. These services were part of Yassir's development plan and aimed to help citizens comply with the guidelines issued by the World Health Organization and the Ministry of Health.

7. CONCLUSION:

In conclusion, telecommunications technology has become the foundation of modern life, constantly advancing and thriving. It encompasses all the modern technologies present in our current age, including wired and wireless networks. In recent times, information technology has played a significant role and has become indispensable, with applications of artificial intelligence and big data assisting in various fields. Technological progress is the weapon that

must be emphasized in our current time, as it penetrates minds and illuminates previously obscure areas, leading to the advancement and development of society in scientific aspects.

As it has proven to be the optimal solution that can be relied upon during times of challenges and crises, many countries that missed the initial wave are now devising plans and strategies to catch up, heavily relying on the technological aspect. International institutions like the World Bank are providing urgent aid to the neediest countries, leveraging the experiences of leading nations.

Dubai's 2021 plan includes six key axes: individuals, society, living experience, place, economy, and government. Various experiences we discussed aimed to develop smart transportation systems to improve life in various domains and harness technology to create a new reality. This interconnected environment will ensure a seamless relationship between citizens and the city while enabling different entities to work together to provide better, faster, and more cost-effective services.

Numerous programs, projects, initiatives, and applications have been launched, along with the development of policies and strategies, integrating information and communication technology across various fields. All these efforts contribute to achieving the goals and objectives set forth. Technology has undoubtedly become the driving force behind progress and development, shaping a brighter future for societies worldwide.

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