Benha Journal of Applied Sciences (BJAS) **print: ISSN 2356–9751**
Vol. (9) Issue (5) (2024), (253- 279) **online: ISSN 2356–976x**
http://bjas.bu.edu.eg
computer and technology sciences

The Use of Intelligent Robots and Automation Technologies to Improve Data Management and Organization Processes in Administrative Information Systems

Ghada M. Oraif
Department of Management Information Systems, College of Business, King Abdulaziz University (KAU)
E-Mail: goraif@kau.edu.sa

Abstract

This study explores the role of smart robots and automation technologies in enhancing data management and organization processes within administrative information systems. The primary objective is to examine how these advanced technologies improve operational efficiency and support decision-making. Using an analytical descriptive approach, the study integrates both secondary data from academic literature and primary data collected through surveys targeting 312 professionals in administrative information systems in Egypt.

The results demonstrate that smart robots and automation technologies significantly enhance data processes. Automation technologies had the highest impact on improving data management efficiency ($\beta = 0.434$, $p < 0.01$), while intelligent robots were shown to substantially enhance data organization ($\beta = 0.447$, $p < 0.01$). The findings highlight the potential of these technologies in streamlining administrative tasks, reducing errors, and providing real-time access to organized data. The study concludes by emphasizing the importance of adopting advanced tools and techniques to optimize data management and organization. It provides actionable recommendations, including investing in automation infrastructure, training staff on robotics systems, and fostering research and development in smart technologies. These findings offer practical insights for organizations seeking to leverage artificial intelligence to improve administrative performance and decision-making capabilities.

Key words: Intelligent Robots, Automation Technologies, Data Management, Organization Processes, Administrative Information Systems

Introduction:

Smart robots represent one of the most significant developments in modern technology, as they possess a unique ability to learn and make intelligent decisions based on their surrounding environment. Thanks to artificial intelligence techniques, smart robots can continuously improve their performance by interacting with the data they collect through advanced sensors. These robots are capable of analyzing information in real-time and taking automatic actions characterized by efficiency and flexibility, allowing them to adapt to rapid changes in their environment. With the increasing applications across various industries, from healthcare to manufacturing, smart robots have become a vital element that enhances productivity and reduces operational costs (1).

Data management and organization are the cornerstone of smart robots' success, as these systems heavily rely on the data collected and analyzed to make precise decisions. In today's digital environment, the volume of data is rapidly increasing, requiring effective solutions to organize, store, and analyze this data. Artificial intelligence algorithms play a crucial role in processing big data and converting it into usable information to enhance the performance of robots. By integrating modern data management techniques, such as big data and predictive data analytics, smart robots can improve their ability to adapt to different variables and achieve higher levels of accuracy and efficiency in task performance (2).

Automation has become a key factor in optimizing data management processes, reducing manual intervention, and increasing efficiency. With the rise of automation technologies, organizations can streamline the collection, processing, and storage of vast amounts of data. Automated systems ensure data consistency, minimize human errors, and speed up data-related tasks. In the context of management information systems (MIS), automation allows for real-time data processing and decision-making, which improves the overall performance and responsiveness of an organization. Automation tools such as robotic process automation (RPA) and artificial intelligence (AI) have enabled businesses to handle large datasets effectively while ensuring that the data is accurate, organized, and accessible for strategic decision-making. (3)

Effective data organization and management are critical to the success of any organization, particularly in today's data-driven world. Proper data management involves storing, categorizing, and structuring data in a way that is both accessible and actionable. Data organization ensures that information is easily retrieved, analyzed, and utilized to drive business decisions. Management information

systems (MIS) rely on well-organized data to support day-to-day operations and strategic planning. Key aspects of data management include data governance, security, backup, and accessibility (4). By ensuring that data is consistently organized and well-maintained, organizations can leverage their data to gain insights, optimize processes, and improve overall operational efficiency.

The integration of smart robots with automation technologies significantly enhances the efficiency and effectiveness of data management and organization processes within management information systems. Smart robots, equipped with AI and machine learning capabilities, can perform complex tasks such as data sorting, data analysis, and even predictive analytics, all while interacting with automated systems. This combination allows for more intelligent data handling, as smart robots can adapt to changing data environments and continuously improve their processes through learning algorithms. The synergy between automation and smart robots ensures that data is not only organized but also intelligently processed, enabling faster and more accurate decision-making across various departments and improving the overall functioning of the management information system.

The Previous Studies that Dealt with Smart Robots in Data Management and Organization.

The study by **(5)** aimed to develop an AI-driven system known as the Spatial Reasoner (SR) to enhance human-robot interaction in complex urban environments. The system processes data collected from sensors mounted on ground and aerial platforms or in static locations to provide accurate and real-time insights into human-robot, human-human, and human-environment interactions. The SR seeks to deliver evidence-based recommendations to support human operator decision-making, emphasizing explainability and traceability. This makes it an advanced tool for addressing the complexities inherent in human-robot interaction systems.

The study concluded that the Spatial Reasoner demonstrates high efficiency in observing and processing human-robot interactions within crowded and complex environments. The system proved its ability to support human-controlled AI systems by delivering accurate and reliable information, even under uncertain conditions. During hundreds of hours of live testing, the SR successfully processed hundreds of thousands of interactions, showcasing its effectiveness in providing valuable data to facilitate AI-driven decision-making.

The study by **(6)** aimed to explore the transformative impacts of smart robotics, focusing on the synergy between advanced technologies and big data. It also addressed how the integration of big data shapes the dynamics of smart robotics, highlighting its role in enhancing adaptability, efficiency, and real-time decision-making. The study examined how smart robots interact with this data, using advanced sensing capabilities and cognitive learning to improve performance in complex scenarios.

The study concluded that integrating big data with smart robotics significantly enhances the ability of these systems to improve performance across various industries such as manufacturing and healthcare. The study also confirmed that smart robots have become flexible and responsive entities due to these data-driven dynamics. Additionally, the study addressed the ethical challenges associated with the use of big data in smart automation, reflecting the need to consider social and ethical dimensions when applying these technologies.

The study by **(7)** aimed to examine recent research on the Internet of Robotic Things (IoRT) and explore how remote big data management tools, sensing and computing technologies, along with visual perception and environment mapping algorithms, influence coordination between different systems in robotic manufacturing processes. The study also addressed questions on how IoRT devices communicate independently and predict events using machine learning algorithms, and how this technology improves product quality and task coordination in IoRT systems.

The study concluded that the use of modern tools and technologies in IoRT enhances coordination between devices and improves system performance in manufacturing and data management. The results of the systematic review emphasized the importance of applying machine learning algorithms and edge computing techniques in enhancing the ability of these systems to process data independently and efficiently. The review also showed that using tools such as Shiny, AMSTAR, and VOSviewer helped analyze the literature and provided accurate and reliable results, thereby enhancing the overall understanding of the role of IoRT in improving industrial processes.

The study by **(8)** aimed to explore a new management framework and innovative models for organizing, managing, and measuring knowledge work in smart societies, where future management focuses on knowledge workers and the products they generate. The study concentrated on developing a comprehensive management system that integrates virtual human interactions in social space, robots in physical space, and digital humans in cyberspace. It also sought to achieve advanced levels of descriptive, predictive, and prescriptive intelligence to support management processes through the integration of scenario engineering with foundational artificial

intelligence models and cyber-physical-social systems.

The study concluded by formulating an integrated management model based on decentralized organizations and self-operating processes to enhance operational intelligence and ecological harmony. Additionally, new management operating systems were developed, characterized by simple intelligence, provable security, flexible scalability, and ecological harmony, contributing to improving management efficiency in smart organizations. The study offered innovative insights into integrating modern technologies with management principles to develop models capable of addressing future challenges and enhancing the sustainability of management operations.

The study by **(9)** aimed to develop and introduce an integrated data management system based on the use of smart search and rescue robots to reduce the informational burden and improve the efficiency and effectiveness of search and rescue operations during disasters. The focus was on designing a framework that allows for the integration of real-time data collected from a fleet of unmanned ground and aerial vehicles, providing the data in a way that is easily usable by human search and rescue teams. The study also aimed to achieve seamless operation among different robotic systems and develop a mobile data center that supports the deployment of data via a Software-as-a-Service (SaaS) model, facilitating real-time access to critical information.

The study concluded that the proposed integrated data management system enhances the situational awareness of search and rescue teams and significantly contributes to improving the efficiency of relief operations. The system was validated in various environments, including a seismic exercise at a military test site and actual relief operations following floods in Bosnia, where it demonstrated a high capability to integrate data from multiple sources and present it securely and accessibly. Feedback from search and rescue teams indicated their satisfaction with the system, reflecting its potential to improve collaboration and provide support in their complex tasks.

Previous studies that addressed the relationship between automation and data management and organization processes.

The study by **(10)** aimed to explore the applications of Robotic Process Automation (RPA) in data management, focusing on the various RPA tools and techniques used to manage data effectively and efficiently. The study also discussed industry use cases as practical examples of RPA applications in data aggregation and organization. The goal was to provide valuable insights for many RPA users, especially in areas such as data cleaning, sorting, updating, and managing metadata efficiently.

The study concluded that Robotic Process Automation is an effective technology for improving the efficiency of repetitive daily tasks, helping individuals focus their time and efforts on more productive activities. It also showed that applying RPA in data management can significantly reduce the time spent on routine processes and increase productivity, thereby enhancing overall performance within organizations.

The study **by (11)** aimed to develop the Well Integrity Data Management System (WIDMS) for ADNOC Offshore, with the goal of closing the data management gap by consolidating all well integrity data into a unified database. The system aims to ensure data accessibility and accuracy through regular quality checks and analysis, contributing to the maintenance of well barriers and enhancing personnel safety. The system also seeks to improve decision-making processes in emergency situations by periodically analyzing data and providing inputs for mitigation measures.

The study concluded that the developed system enhances the effectiveness of well integrity data management by providing a comprehensive overview of barrier performance and ensuring data flow across the organization. The system demonstrated its ability to provide reliable and accurate data that helps monitor well safety and avoid risks. It also proved effective in improving interaction between engineers and stakeholders through alerts and notifications. Thanks to real-time data analysis, the system aids in the early detection and prediction of failures, reducing risk escalation and strengthening mitigation strategies.

The study by **(12)** aimed to develop specialized tools for mathematical and computational modeling to support decision-making processes in competitive electricity markets. The focus was on automating preparation and decision-making through appropriate Organizational Management Systems (OMS), using advanced tools to process meaningful data and user interfaces tailored for market participants. The study also analyzed the peculiarities of the electricity market, including the need for advanced computational simulation tools that assist market participants in formulating strategies to address risks and complex relationships. The development of information technology platforms to integrate these tools into Decision Support Systems (DSS) for energy companies was proposed.

The study concluded the importance of developing an integrated functional structure for the information technology platform for OMS, which

supports the interaction between decision-makers in the electricity market. It identified trends in the development of modern software tools for modeling, forecasting, and improving market operations, and presented a unified model for representing data structures in Decision Support Systems. Additionally, it proposed the classification of model processes for decision-maker interaction and the development of optimization and forecasting algorithms that support the mathematical models of related computational problems.

The study aimed **(13)** to develop a framework for operationalizing and automating data governance, addressing the challenge of managing data from multiple sources, particularly semi-structured data. The authors proposed a zoned data lake architecture and a set of governance processes to ensure the systematic ingestion, transformation, and integration of heterogeneous data sources, making them readily available for business users. Additionally, they introduced a set of metadata artifacts to automate the execution of data governance processes, thus addressing various data management challenges.

The study concluded that the proposed approach effectively supports the automation and operationalization of data governance processes. Through a real-world use case with the World Health Organization on the management of Neglected Tropical Diseases data, the authors demonstrated the practicality and usefulness of their framework. The study contributes to facilitating the adoption of data-driven strategies by organizations through a cohesive approach to automating and managing the data governance lifecycle .

Comment on the Previous Literature:

The previous studies cover a wide range of research related to the use of smart robots and automation technologies in improving data management and organization processes in various fields such as healthcare, manufacturing, emergency management, and more. One of the main areas of agreement between these studies and our study on "Using smart robots and automation technologies to improve data management and organization in administrative information systems at Saudi universities" is the shared focus on improving efficiency by integrating automation technologies and smart robots. For example, the study by Paul et al. (2023) and the study by Allam (2023) address the use of artificial intelligence and smart robots to improve data interaction and analysis in complex environments, which aligns with the goals of our study in Saudi universities, as it aims to improve efficiency in data management within an academic environment.

On the other hand, studies like Balta et al. (9) focus on applying automation technologies in emergency and industrial sectors, which differs from the context we are working in within universities. Additionally, some studies, such as Andronie et al. (2023), focus on technologies like the Internet of Things and big data, which is still in its early stages in administrative information systems at Saudi universities.

Differences between the studies:

- Academic focus versus industrial applications: Most previous studies are related to industrial applications or other non-academic contexts (such as healthcare and manufacturing), while our focus is on using these technologies in administrative information systems at Saudi universities.
- Use of automation technologies: While most studies deal with automation in industrial and production processes, our study focuses on automation in data management and organization within the academic and administrative systems in universities.
- Specific applications of smart robots: Some studies focus on the interaction of smart robots with humans in complex environments like cities (e.g., the study by Paul et al.), whereas our study focuses on the role of smart robots in data management and organization in universities.

Research Gap:

- The gap between the first independent variable (smart robots) and the first dependent variable (data management): Previous studies have not sufficiently focused on how smart robots affect improving data management processes in the context of administrative information systems in Saudi universities.
- The gap between the first independent variable (smart robots) and the second dependent variable (data organization): No previous studies specifically focus on the role of smart robots in data organization within administrative information systems at Saudi universities.
- The gap between the second independent variable (automation technologies) and the first dependent variable (data management): While there are studies related to the use of automation in data management, no study specifically links automation technologies with data management in administrative information systems at Saudi universities.
- The gap between the second independent variable (automation technologies) and the second dependent variable (data organization): The relationship between automation technologies and data organization within administrative information

systems at Saudi universities has not been explored in previous studies.

Statement of the problem

The use of intelligent robots and automation technologies to improve data management and organization processes in administrative information systems is an important field in our modern era, especially in academic institutions like universities. In Saudi universities, university libraries play a vital role in providing access to information resources and academic materials. With the increasing volume of data and knowledge, those responsible for managing libraries face significant challenges in efficiently organizing this data.

One of the main problems faced by university libraries is how to organize and manage large amounts of data and information, such as books, articles, research papers, and electronic resources. These libraries need innovative technological solutions to help streamline processes like searching, classification, and borrowing, thus improving the experience of the users. In this context, the importance of using intelligent robots and automation technologies comes into play, as they can help accelerate these processes and make them more efficient.

However, despite the benefits of these technologies, university libraries in Saudi Arabia still face significant challenges in implementing them effectively. There is still a lack of research and studies focusing on how to apply these technologies in administrative information systems within university libraries. While there are studies on the use of intelligent robots and automation technologies in other fields such as healthcare and industry, this field remains relatively new in university libraries.

The greatest challenge lies in integrating these technologies into the academic environment in line with the needs of university libraries. It is important for these libraries to strike a balance between using modern technology and achieving their academic and educational goals. The data managed in university libraries includes sensitive and academic information, making the accuracy of automation and data organization crucial.

In light of these challenges, there is an urgent need for research studies aimed at understanding how to effectively apply intelligent robots and automation technologies in Saudi university libraries. These studies should focus on improving the efficiency of data management and organization, and how these technologies can facilitate access to information and enhance the user experience in an academic environment.

Questions

How can smart robots and automation technologies be used to improve data management and organization processes in management information systems?

Sub-Questions:

- What is the impact of using smart robots on improving data management processes in management information systems?
- How do smart robots contribute to improving data organization in management information systems?
- What is the role of automation technologies in improving data management processes in management information systems?
- How can automation technologies enhance data organization and improve efficiency in management information systems?

Research Objectives:

The main objective of this study *is to explore how smart robots and automation technologies can be used to improve data management and organization processes in management information systems, with the aim of enhancing operational efficiency and supporting administrative decision-making.*

- To study the impact of using smart robots in improving data management processes within management information systems.
- To analyze the role of smart robots in enhancing data organization in management information systems environments.
- To explore the impact of automation technologies on data management and improving efficiency within management information systems.
- To identify the relationship between automation technologies and data organization and how they facilitate administrative processes and decision-making in management information systems.
- To propose solutions and recommendations for better utilizing smart robots and automation technologies to enhance data management and organization in management information systems.

Research Model

The following figure (1) shows the general framework for the study variables, as follows:

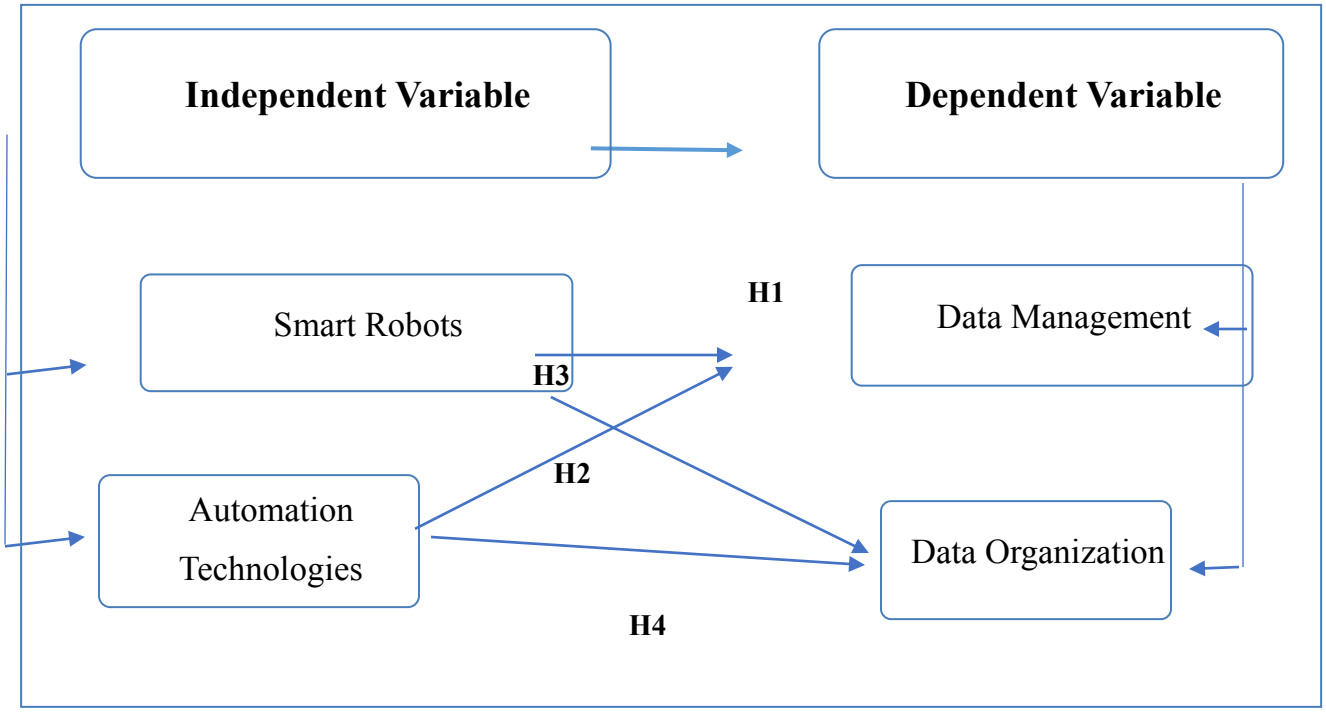

Figure No. (1): Study Framework.

Source: Prepared by the researcher.

Hypotheses

The research hypotheses are represented in the following hypotheses:

- **H2:** There is a statistically significant impact of using smart robots on enhancing data management processes in management information systems.
- **H2:** There is a statistically significant impact of using smart robots on enhancing data organization processes in management information systems.
- **H2:** There is a statistically significant impact of using automation technologies on enhancing data management processes in management information systems.
- **H2:** There is a statistically significant impact of using automation technologies on enhancing data organization processes in management information systems.

Research Methodology:

This study adopts the **analytical descriptive approach** to examine the impact of smart robots and automation technologies on data management and organization processes in management information systems. This approach is suitable as it allows for both theoretical exploration and empirical investigation, ensuring a comprehensive understanding of the subject matter.

The research methodology consists of two key components:

1. Secondary Data Collection (Theoretical Framework)

The secondary data will provide a foundation for understanding the role of smart robots and automation technologies in improving data management and organization. The study will review:

- **Books and academic papers**: Covering theories, frameworks, and empirical studies related to smart robotics, automation, and management information systems.
- **Previous research studies**: Examining global and regional applications of automation and AI-driven technologies in various industries, particularly in academic institutions.
- **Industry reports and government documents**: Providing insights into technological trends, policies, and strategies related to automation in Saudi universities.

This secondary data will help contextualize the research problem, establish research gaps, and support hypothesis formulation.

2. Primary Data Collection (Empirical Investigation)

The primary data will be collected through **a structured survey questionnaire** designed to assess the impact of smart robots and automation technologies on data management and organization.

Target Population and Sampling

- The study will focus on **IT specialists, administrators, and professionals** working in university libraries and management information systems in Saudi universities.
- A **purposive sampling technique** will be used to select respondents who have relevant experience with data management, automation, and digital transformation initiatives.
- The sample size will be determined based on feasibility and statistical significance.

Survey Design

The survey questionnaire will include:

- **Demographic Questions**: Age, job title, experience in IT and automation technologies.
- **Likert Scale Questions (1-5)**: To measure perceptions of smart robots and automation technologies on various aspects of data management and organization.
- **Open-ended Questions**: Allowing participants to share insights on challenges and opportunities related to implementing these technologies.

Data Analysis Techniques

To ensure reliability and validity, the collected data will be analyzed using:

- **Descriptive statistics**: Mean, standard deviation, and frequency distributions to summarize responses.
- **Inferential statistics**: Regression analysis and correlation tests to determine the strength of relationships between independent and dependent variables.
- **Reliability testing**: Cronbach's alpha will be used to measure internal consistency of survey items.

Ethical Considerations

- Participants' data will be kept confidential and anonymous.
- Participation will be voluntary, with informed consent obtained before data collection.
- The study will adhere to ethical research guidelines set by academic institutions.

Concept of Artificial Intelligence.

John McCarthy first coined the term "artificial intelligence" in 1956 when he invited a group of researchers from diverse fields, including language simulation, neural networks, complexity theory, and more, to a summer workshop called the Dartmouth Summer Research Project on Artificial Intelligence to discuss the potential prospects of the field. He defined artificial intelligence as "the science and engineering of making intelligent machines, especially intelligent computer programs."

Recently, artificial intelligence technologies have increasingly proliferated, encompassing a wide range of applications, such as expert systems, natural language processing, machine learning, pattern recognition, robotics, computer vision, artificial neural networks, and more. These fields are not separate; in many intelligent systems, two or more AI techniques may contribute simultaneously to solving a problem (14-15)

Concept of Smart Robots

The term Chatbot emerged from the combination of "Chat" (conversation) and "bot" (short for Robot). Studies reveal that researchers, both in Arabic and foreign literature, have used various terms to describe this technology, including digital or personal assistants, intelligent agents, virtual agents, interactive agents, fully automated conversational agents, intelligent conversation systems, artificial conversation entities, and interactive or smart chatbots. Some researchers also used transliterations like "shat bot" or "bots." However, the preferred term is "Chatbot," reflecting its literal translation and common use in modern studies (16-17)

Definition:

Researchers have provided various definitions for chatbots, ranging from simple to detailed, to describe their role and distinction from non-AI-based conversational technologies. Key definitions include:

- AI Application: Chatbots are AI-driven applications using natural language processing to communicate with users via voice or text, often utilized in customer service. Unlike human agents, they operate across time zones and can automate common inquiries. Examples include Apple's Siri and Amazon's Alexa.
- Gamble (17): Chatbots are AI-powered interfaces designed to mimic human conversations through automated systems. They process written language (including emojis) or translate speech to text, analyze inputs, and generate responses accordingly.

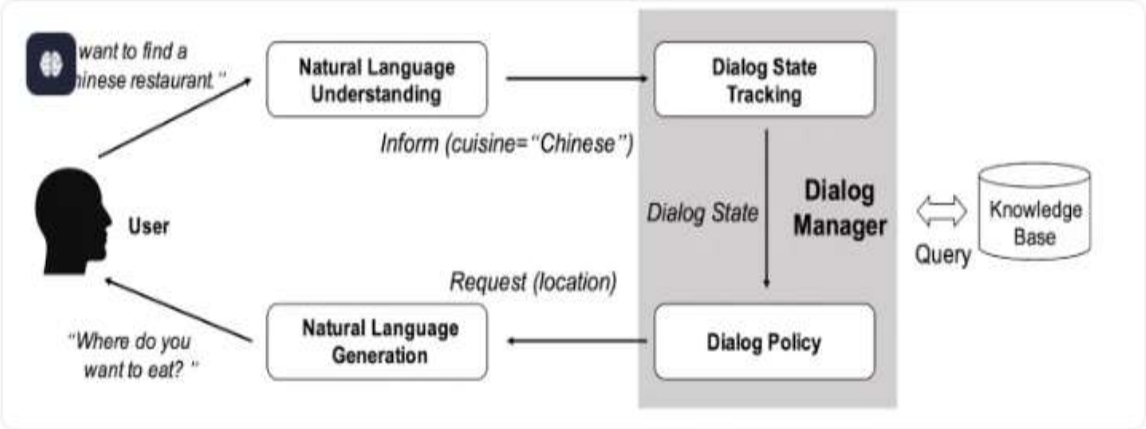

Figure No. (2): Components of Chatbots.
Source: (18)

Chatbots are software applications that allow machines to interact with humans in a natural, conversational way. They are widely used across various industries for tasks such as answering frequently asked questions, engaging with customers, and gaining deeper insights into customer needs.

Around 50% of large enterprises are considering investing in chatbot development. Therefore, understanding the core architecture of chatbots is crucial to fully harness their potential.

This article delves into how chatbots function, their key components, and the steps involved in building and developing their architecture.

Concept of Automation Technologies and their Types.

The term "automation" refers to the technology used to operate processes without human intervention. The tasks of automation range from simple, repetitive tasks to complex processes. Therefore, automation provides workers the opportunity to focus on other tasks, which is why professionals automate many processes to save time, resources, and costs across various industries (19).

Currently, many industries rely on automation when executing their operations to reduce the need for manual labor, thus improving the efficiency and productivity of each process while minimizing health and safety risks. It can be said that automation has become the main driver of digital transformation, as most solutions adopted by companies to upgrade and update their operations are automation solutions.

Types of Automation: There are three main types of automation:

1- **Flexible Automation** Flexible automation is also known as soft automation because it allows for reprogramming to produce multiple products easily. As a result, companies can manufacture a variety of products while maintaining time efficiency during the operation period (20).

The key feature of flexible automation is that it maintains a consistent level of productivity because it can easily adjust its physical setup. Flexible automation is ideal for companies and factories with medium demand that produce products that may undergo changes at any time.

2- **Programmable Automation** Programmable automation facilitates the modification of machines and equipment according to their uses, through a programmed control system that can rewrite the automation sequence (21) .

Programmable automation is widely used in industries that produce products in batches, such as the food industry, which relies on producing a variety of food items. Therefore, it is suitable for companies that work with low to medium demand for products, with a wide variety of products.

The advantages of programmable automation include the ability to use code to easily change the programming of the automation process. As a result, the user can choose how many products they want to manufacture before switching to another product. This type of automation is cost-effective, facilitates communication, and accelerates response time. Because this automation is programmable, it allows for troubleshooting during the operational process, which reduces the impact of such issues on the entire process.

3- Fixed Automation fixed automation refers to the continuation of the manufacturing or production process as it was originally designed, without any modifications. The advantage of fixed automation is that it increases production rates compared to other types. Although it is the most expensive type of automation, it has a lower cost per unit because the process is determined once, reducing the chances of human error (22).

This type of automation ensures the continuous production of high-quality products due to the efficiency of the operational method.

Fixed automation is commonly used by companies that produce products with significantly increasing demand and work on producing products that do not require modifications or changes.

Concept of Data Management and Organization.

Data management is considered a set of core features that a Database Management System (DBMS) must provide, including strategies such as data ingestion, storage, modeling, processing, querying, synchronization, and retrieval. Traditionally, these activities were confined within the scope of a database management system. However, with the advent of big data and the expansion of the concept of data lakes, it is now understood that these processes can extend to various software packages. In fact, the broadening of the data management concept is one of the main reasons why data governance has become a hot research topic today. Data architectures aim to separate different concerns and identify the related tasks that should be executed within successful data governance protocols. Therefore, the focus is on data architectures as a means to operationalize and manage data governance effectively (23).

Automating Data Governance

The challenge in automating data management and governance lies in organizing the execution of processes in a systematic manner to ultimately provide the required data to end users. To achieve this, modern companies recognize the importance of metadata in managing data assets (23). This has led to the development of various frameworks that utilize metadata to automate data exploitation, partially assisting users in making decisions (24). In parallel, there are systems that focus on automating specific tasks within the data lifecycle, such as schema discovery, data cleaning, or data integration, which we refer to as "task-specific data governance automation" (25). Additionally, there are domain-specific data governance methods, which provide solutions for specific areas such as politics or cyber-physical systems (26).

Although these systems are domain-specific and cannot be easily adapted to other areas, they still offer frameworks for data governance that are largely manual (27). Therefore, while they enable data governance in these fields, they do not fully automate it (28). In this section, we review related work in the first two areas.

For instance, a system that automatically extracts structural and semantic metadata from the contents of a data lake. This metadata is used to define a unified query interface across data sources (23). Another alternative is Goods, the solution provided by Google to manage its data lake, which crawls, indexes, and integrates heterogeneous datasets (24). One of its distinctive features is relationship mapping, which encodes automatically extracted relationships between datasets, such as containment, origin, or content similarity. The search engine then uses this metadata to facilitate dataset exploration (25). Finally, metadata frameworks provide specific solutions for data lake scenarios in the Internet of Things (IoT). The authors propose an architecture based on a middleware that leverages a metadata repository to model aspects such as resources, infrastructure, datasets, security models, or cost (26). The use of this metadata enables defining logical factors on underlying datasets, such as aggregation, cleaning, or profile creation (27).

Task-specific data governance automation includes systems like Data Tamer, which focuses on data organization. It relies on a shell-based architecture to extract data from sources to locations, representing sets of key-value pairs (28). Additionally, by intensively using machine learning techniques, it provides modules for schema integration, entity normalization, and record linkage. It is an evolution of the Data Tamer system, adding to the previously mentioned functions and also maintaining a relationship graph that represents all relationships between tables or keys. This graph is used to compute queries that discover join paths using data cleaning triggers (23). Another alternative is an architecture that aims to support data processing tasks such as extraction, cleaning, and dataset aggregation (24). VADA is a knowledge representation system based on the logical expression of Datalog±, which provides services for schema matching, schema alignment, data integration, and data quality, among other things (25).

These systems demonstrate how automating data governance and management using metadata, task-specific frameworks, and domain-oriented approaches contributes to improving the efficiency of data handling processes.

Data and Information Management in Robotics

Data and information management in robotics involves the efficient collection, organization, and processing of data to enhance the performance and decision-making capabilities of robotic systems. Effective management of data ensures robots can function autonomously, adapt to their environment, and achieve desired outcomes in various applications.

- **Data Sources and Types**

Robots can collect data from various sources, such as sensors, cameras, microphones, GPS systems, and communication networks. The data can

be structured or unstructured, numerical or textual, continuous or discrete, and so on. Depending on the type and source of the data, different methods and tools are needed to store, process, analyze, and visualize the data. For instance, a database might be used to store structured data, a cloud service for processing unstructured data, a machine learning algorithm for analyzing numerical data, and a dashboard for visualizing textual data (29).

- **Data Quality and Security**

  One of the challenges of managing the data and information generated by robots is ensuring their quality and security. Data quality refers to the accuracy, completeness, consistency, and timeliness of the data, while data security refers to protecting the data from unauthorized access, modification, or deletion. To ensure data quality and security, certain best practices must be implemented, such as data validation, cleaning, encryption, backups, and the use of authentication and authorization mechanisms. (30)

- **Data Integration and Interoperability**

  Another challenge in managing the data and information generated by robots is integrating and interoperating them with other data sources and systems. Data integration is the process of combining data from different sources and formats into a unified view. Data interoperability is the ability of different systems and devices to exchange and utilize data. To achieve data integration and interoperability, standards and protocols such as JSON, XML, MQTT, and ROS need to be used.

- **Data Analysis and Decision-Making**

  One of the goals of managing the data and information generated by robots is to use them for analysis and decision-making. Data analysis is the process of extracting insights and patterns from data, while decision-making is the process of selecting the best action or solution based on data analysis. To perform data analysis and decision-making, technologies and tools such as statistics, machine learning, artificial intelligence, and optimization are required. (29)

- **Data Visualization and Communication**

  Another goal of managing the data and information generated by robots is to visualize and communicate them to different audiences and stakeholders. Data visualization is the process of presenting data in graphical or interactive forms, while data communication is the process of conveying and sharing data with others. To achieve data visualization and communication, principles and tools such as charts, graphs, maps, dashboards, and reports need to be used. (29)

- **Data Ethics and Governance**

  The final challenge of managing the data and information generated by robots is ensuring their ethics and governance. Data ethics are the set of values and principles that guide the collection, use, and sharing of data. Data governance refers to the set of policies and procedures that regulate the data lifecycle and activities. To ensure data ethics and governance, guidelines and frameworks such as the IEEE's ethical considerations in robotics and automation, the European Union's General Data Protection Regulation (GDPR), and fair data principles should be followed (30).

Study Methodology

Study Methodology is the approach used in the study of a research topic. It is the framework used in the research. The chapter looks at the Study Methodology that was used for the study. The source and data type are also described in the chapter, the sampling techniques, methods used to come up with the study sample size and target population. The chapter looks at the collection and analysis of data.

The Study Methodology further provides the guidelines for gathering and processing the research information used in the current research. The validity and reliability of the questionnaire were also tested, and the validity of the questionnaire was also tested for hypothesis testing by identifying the extent of the natural distribution of data, so the researcher examined the following elements in the study:

3/2- Study Design:

Depending on the nature of the subject of the study and the information that must be obtained to reveal the effect of Use of Intelligent Robots and Automation Technologies (I.R)(as an independent variable) on Improve Data Management and Organization Processes(D.TM) (as dependent variables), and through the questions that the study seek to answer, this study relied on the descriptive analytical approach, which is "a way to describe and measure the phenomenon studied by collecting, classifying, and analyzing the problem.

A descriptive Study Design was used for the current study. The descriptive approach also means that type of research that is carried out by interrogating the study community members or a sample of them, with the aim of describing the phenomenon studied in terms of its nature and degree of existence. According to (Sekaran & Bougie) (31), descriptive Study Design is a non-experimental in that it deals with the relationships between non manipulated variables in a natural rather than laboratory setting. The conditions and events have already happened and researcher can select the variables that are most relevant for analyzing the existing relationships.

In Descriptive design, hypothesis is also formulated and tested and generalizations of findings are arrived a through inductive-deductive reasoning.

Descriptive design also employs methods of randomization so that error may be estimated when inferring population characteristics from observations of samples and the variables and procedures are described.

The researcher who used this research sought to investigate discrepancies and come up with recommendations that would improve overall performance and bridge the research gap in this area.

3/3- Study Procedures:

Two types of data were used to achieve this approach from the following sources:

3/3/1- Secondary Data:

It is the data obtained to build the theoretical framework of the study, where it was relied on to identify the theoretical background of the study, on the various references of books and articles and previous studies of Arab and foreign academic theses of the relevant master and doctorate and published research, which dealt with the topics of Use of Intelligent Robots and Automation Technologies (I.R) and Improve Data Management and Organization Processes (D.TM).

3/3/2- Preliminary Data:

This data was collected in the field through the survey list in the field study to test the validity of the assumptions on which the study was based. By obtaining this data from employees in Administrative Information Systems.

To attain and meet the research objective, the researcher adopted a deductive and quantitative approaches where information are gathered from respondent through a survey using questionnaires To ensure validity and reliability on research findings are relevant, researcher Need an appropriate questionnaire, sampling technique and data analysis method which also covers the accuracy and the quality of the research.

3/3/3 Questionnaire Development

1. Included identifying and defining the problems and establishment objective of the study and development research plan.
2. Included a summary of the comprehensive literature review and the study literature review.
3. Included a field survey which was conducted with the study of is Measuring the relationship between Use of Intelligent Robots and Automation Technologies(I.R) and Improve Data Management and Organization Processes.
4. Focus on the modification of the questionnaire design, through distributing the questionnaire to pilot study, The purpose of the pilot study was to test and prove that the questionnaire questions are clear to be answered in a way that help to achieve the target of the study. The questionnaire was modified based on the results of the pilot study.
5. In this study, the questionnaire was translated the questionnaire from English to Arabic to fit with language of the target group, and scrutinized the language of the questionnaire by particularistic in language, and distributed 30 samples of questionnaire to find out how employees understand the content and ensure the smoother and found an excellent result, so the adopted the final form to questionnaire.
6. Focus on distributing questionnaire. This questionnaire was used to collect the required data in order to achieve the research objective between May and December 2024.
7. The questionnaire was data analysis and discussion. Statistical Package for the Social Sciences, (SPSS) was used to perform the required analysis. The final phase includes the conclusions and recommendations.

3/4- Population and Sample Design:

3/4/1- Population:

In this study, we used a cross-sectional design and collected data from 312 employees working in Administrative Information Systems. The use of this design is based on previous literature in the field of Use of Intelligent Robots and Automation Technologies (I.R), Improve Data Management and Organization Processes (D.TM).

3/4/2- Sample Design:

A sampling frame is a comprehensive list of all sampling units, from which a sample can be, selected. The study's sampling frame was made up of Employees and managers of Administrative Information Systems.

The size of the sample was determined using the following equation (31)

$$n = \frac{N P(1-P)x^2}{(N-1)d^2 + P(1-P)x^2}$$

Whereas:

N: Sample size required.

N: Size of the study population.

P: The ratio of the community is equal to.

D The percentage of error that can be exceeded and the maximum value is 0.05.

X^2: the value of the chi- square with one degree of freedom = 3.841 at 95% confidence level or 5% significance level.

By applying the above equation to the collected data, the study sample size was (312) of Employees in Administrative Information Systems in Egypt.

3/5- Data Collection Methods:

The main instruments used for data collection were questionnaires. These contained close-ended items, where the respondents were required to tick or circle the most appropriate answers. Consultations with academic professionals

were used to validate the content while building the questionnaires.

The questionnaire was used as the main tool for obtaining the primary data from the study population. The questionnaire was chosen because it is one of the most common methods of data collection and is used to suit and adapt it in terms of the nature of the study. Based on the review of previous studies and scientific research specialized in the subject. The survey list includes the following themes:

- **First** (independent variable): Identifying the extent of Use of Intelligent I

The following is an indication of the dimensions and sources on which the researcher relied, and the number of questions composed for each dimension in the questionnaire on the side of the Use of Intelligent Robots and Automation Technologies (I.R), as in the following table:

Table (1): A Statement of the Dimensions and their Sources that were used on the Side of the Use of Intelligent Robots and Automation Technologies (I.R).

N	Dimension	Source	Statement
1	**Intelligent Robots**		This dimension was measured by 5 questions
2	**Automation Technologies**		This dimension was measured by 5 questions

- **Second**: Recognize the extent of interest in Improve Data Management and Organization Processes (D.TM) in Administrative Information Systems companies. This variable was measured by 15 questions.

The following is an indication of the dimensions and sources on which the researcher relied, and the number of questions composed for each dimension in the questionnaire on the side of the Improve Data Management and Organization Processes (D.TM), as in the following table:

Table (2): A Statement of the Dimensions and their Sources that were used on the Side of the Improve Data Management and Organization Processes (D.TM).

N	Dimension	Source	Statement
1	**Data Management**		This dimension was measured by 5 questions
2	**Data Organization**		This dimension was measured by 5 questions

The aggregate grading method was used according to the Likert scale, in which the (data) is divided into five groups containing a graded scale, giving a weighting weight for each answer (Strongly agree- agree - neutral - disagree - Strongly disagree).

The following is the standard of the degree of response in terms of availability and importance:

Table (3): Standard degree of response.

N	Range	Response	Mean
1	**Strongly agree**	**Very high**	4.0 - 5
2	**Agree**	**High**	3.0 - less than 4.0
3	**Neutral**	**Medium**	2.0 - less than 3.0
4	**Disagree**	**Low**	1.0 - less than 2.0
5	**Strongly disagree**	**very low**	1 - Less than 1.0

After completing the preparation of the questionnaire and building its expressions, and presenting it to His Excellency the supervisor of the thesis, the questionnaire was presented in its initial form to a group of arbitrators with specialization and Years of Experience from the members of the faculty, in order to ascertain the degree of suitability of the phrase, its clarity, and its belonging to the dimension / axis to which it belongs , Safety of linguistic phrasing, as well as consideration of scale and suitability. And based on the opinions of the arbitrators about the suitability of the questionnaire for the aims of the study, and according to their directives and proposals, the wording of some phrases was modified.

3/6- Data Analysis Methods:

The primary data collected using the questionnaire were processed by some statistical methods that are suitable for the study hypotheses, in order to summarize and describe the different correlation and effect between the study variables. The statistical software ready for data analysis known as SPSS was used.

To ensure the questionnaire were complete and consistent before processing their responses, they were edited. Quantitative data collected was analyzed by the use of descriptive statistics and presented through percentages, means, standard deviations and frequencies. To determine the relationship between the study dependent and independent variable further regression analysis was conducted.

The responses from the questionnaires were tallied, the percentages of the responses variations were computed and the data was described and interpreted in line with the assumptions and objectives of the study. Content analysis was also be used to test data that was qualitative in nature. Regression and correlation analysis were further conducted to determine the relationship between the study variables. The relationship between the variables was stated using a mathematical function.

Some statistical methods were used to suit the nature of the hypotheses in terms of studying the relationship, influence and correlation between dependent and independent variables, including the following:

- The Cronbach Alpha method is used to calculate the validity and reliability of the scale used in the study.
- Descriptive statistics were used to describe the opinions of the study sample and to determine the importance of the statements in the questionnaire.
- Pearson correlation coefficient the correlation coefficient was used to study the relationship strength and correlation direction between study variables.
- F-test: The value of this test indicates the quality of the relationship model, and the validity of the accreditation without errors.
- T-test (if the effect is statistically significant at 0.01) indicates that there is a significant effect of the independent variable on the dependent variable, and that this effect is significant.

3/7- Pilot Test:

The use of a pilot test by the researcher allowed for the questionnaire to be validated and pre-tested. the pilot group range from 25 to 100 subjects depending on the method to be tested but it does not need to be statistically selected. This pilot study involved 30 respondents. Since during the pilot study, statistical conditions are not adhered to, the respondents of the pilot study were conveniently chosen. The main aim of this was so as to make any necessary changes in the questionnaire such that the main study's respondents would not have any problem when sought to answer the questionnaire questions.

3/7/1- Validity:

The validity of an instrument can be defined as a determination of the extent to which the instrument actually reflects the abstract construct being examined. "Validity refers to the degree to which an instrument measures what it is supposed to be measuring". High validity is the absence of systematic errors in the measuring instrument. When an instrument is valid; it truly reflects the concept it is supposed to measure. Achieving good validity required the care in the research design and sample selection. The amended questionnaire was by the supervisor and experts to evaluate the procedure of questions and the method of analyzing the results. The experts agreed that the questionnaire was valid and suitable enough to measure the purpose that the questionnaire designed for (32).

Table (4): Summary of validity of the research

%	NO	
100	**312**	**Valid**
0	**0**	**Cases Excluded [a]**
100.0	**312**	**Total**

List wise deletion based on all variables in the procedure.

To insure the validity of the questionnaire, two statistical tests should be applied. The first test is Criterion-related validity test (Pearson test) which measures the correlation coefficient between each item in the field and the whole field. The second test is structure validity test (Pearson test) that used to test the validity of the questionnaire structure by testing the validity of each field and the validity of the whole questionnaire. It measures the correlation coefficient between one filed and all the fields of the questionnaire that have the same level of similar scale (33).

3/7/2- Reliability:

The consistency of a measure is what is defined as reliability. This is measured using the test-retest measure. When many similar items are included in a test, or a diverse sample of individuals are measured or using testing procedures that are uniform then reliability is increased. The Cronbach alpha score of the instrument used to collect primary data was calculated. Cronbach alpha measurers ranges between 0-1. When the Cronbach alpha Scores are between 0-0.6 it shows that the instrument reliability is low. When e scorers are 0.7 and higher than reliability and internal consistency is high.

To make sure that the degree of reliability and validity of the questionnaire used in the study of the Measuring the relationship between Use of Intelligent Robots and Automation Technologies (I.R) and Improve Data Management and Organization Processes, the researcher used the method factor (alpha Cronbach) to measure the reliability and validity tool used in the study is as follows. The validity of the internal consistency was calculated, and it gives an image of the extent of consistency between the expressions within the same axis, by calculating the correlation coefficient between the degree of each phrase and the overall degree of the axis to which it belongs. The following shows the results of the validity of the internal consistency.

Use of Intelligent Robots and Automation Technologies (I.R)

The Use of Intelligent Robots and Automation Technologies (I.R) variable and its dimensions are the independent variable, and it has been measured through 2 dimensions, and the following table shows the result of this test as follows:

Table (5): Results of Validity and Reliability to Variable of Use of Intelligent Robots and Automation Technologies (I.R).

Dimensions	Statement	Internal consistency	No.	alpha Cronbach
Intelligent Robots	Enhancing security in libraries using robots to reduce labor costs.	**0.737**	**5**	**0.857**
	Providing innovative services in libraries through the use of robots.	**0.772**		
	Improving user experience in accessing information through robots.	**0.839**		
	Increasing data management efficiency in libraries with robotic technologies.	**0.831**		
	Using robots to improve the quality of services provided to users.	**0.809**		
Automation Technologies	Automation helps planning officers in libraries provide the necessary data for human resource planning.	**0.738**	**5**	**0.794**
	The necessary data for workforce planning in libraries is collected automatically using management information systems.	**0.788**		
	Automation helps save time when planning human resources in libraries using management information systems.	**0.711**		
	Automation helps accurately predict and determine the quantitative human resource needs in libraries.	**0.771**		
	Automation helps accurately predict and determine the qualitative human resource needs in libraries.	**0.709**		
Total			**10**	**0.887**

** Statistical significance at the level (0.01).

* Statistical significance at the level (0.05).

From the previous table, the following is evident:

-Validity of all items on the level of the dimensions of the Use of Intelligent Robots and Automation Technologies(I.R), where the different dimensions and the extent to which they represent the Use of Intelligent Robots and Automation Technologies(I.R), and this is largely dimensions.

-The values of the Alpha Cronbach parameter confirmed the reli Automation Technologies (I.R).

Improve Data Management and Organization Processes (D.TM)

The variable of Improve Data Management and Organization Processes (D.TM) is the dependent variable, and it was measured through 10 questions. The following table shows the result of this test as follows:

Table (6): Results of Validity and Reliability to Variable of Improve Data Management and Organization Processes (D.TM).

Dimensions	Statement	Internal consistency	No.	alpha Cronbach
Data Management	Automation technologies are used to improve data management and organize information in libraries.	**0.744**	**5**	**0.762**
	Necessary data is collected automatically to enhance the efficiency of management information systems in libraries.	**0.733**		
	Robots assist in organizing data more accurately and effectively in libraries.	**0.749**		
	Advanced methods are used to analyze data and make informed decisions to improve library operations.	**0.753**		
	Proposed solutions for improving data management in libraries are evaluated using automation and robotics technologies.	**0.614**		
Data Organization	Automation technologies are used to improve data organization in the library.	**0.707**	**5**	**0.812**
	Management information systems in the library provide quick and accurate access to data.	**0.829**		
	Robots assist in facilitating data organization and storage in the library.	**0.813**		
	Data is reviewed and organized regularly to ensure its accuracy in the library.	**0.730**		
	Modern technologies in the library help improve the efficiency of data management and organization.	**0.701**		
Total			**10**	**0.895**

** Statistical significance at the level (0.01).

* Statistical significance at the level (0.05).

From the previous table, the following is evident:

-

Validity of all items on the level of the Statements of the Improve Data Management and Organization Processes, where the in Statements and the extent to which they represent the Improve Data Management and Organization Processes, and this is largely reflected in the degree of credibility of these dimensions.

-The values of the Alpha Cronbach parameter confirmed the reliability of the dimensions significantly, where the values of th Organization Processes.

Therefore, it can be said that the standard has the reliability and internal validity of its conditions, which is a good treatment to achieve the goals of the study and can be relied upon in publishing the outputs to society as a whole, as most of them are greater than 60%, which confirms that the tool used to express the study of the Measuring the relationship between Use of Intelligent Robots and Automation Technologies(I.R) and Improve Data Management and Organization Processes.

3.8 Normality Distribution Test

(Kolmogorov-Smirnov Test-(K-S): The K-S test is an empirical distribution function (EDF) in which the theoretical cumulative distribution function of the test distribution is contrasted with the EDF of the data. A limitation of the K-S test is its low sensitivity to extreme values; the Lilliefors correction renders this test less conservative It has been reported that the K-S test has low power and it should not be seriously considered for testing normality Moreover, it is not recommended when parameters are estimated from the data, regardless of sample size the null hypothesis is that "sample distribution is normal." If the test is significant, the distribution is non-normal. For small sample sizes, normality tests have little power to reject the null hypothesis and therefore small samples most often pass normality tests (34) as

shown in Table No. (7) that all dimensions are distributed naturally.

Table (7): Normality Distribution Test

DIMENSION	NO. OF ITEMS	p-value
Use of Intelligent Robots and Automation Technologies (I.R)	**10**	**0.106**
Intelligent Robots	5	0.184
Automation Technologies	5	0.163
Improve Data Management and Organization Processes (D.TM)	**10**	**0.135**
Data Management	5	0.206
Data Organization	5	0.124
Total	**20**	**0.071**

The Field Study

The purpose of this chapter is to present the practical framework of the study to achieve its objective by analyzing the data obtained from the field study. This is done by using some descriptive and deductive statistical methods that the researcher found suitable.

The researcher described the demographic variables of the study sample of employees in Administrative Information Systems.

Descriptive statistics of the study variables were performed.

The field study also targeted testing the validity of the main hypotheses of the study and its sub-hypotheses, and these tests are the main goal of the study through which the researcher seeks to know the extent of the substance and the strength and direction of this effect as well as knowing the ratio of the impact of each dimension of the independent variable (Use of Intelligent Robots and Automation Technologies (I.R)) on the dependent variable (Improve Data Management and Organization Processes (D.TM)) and the interrelationship between them.

The results of the field study were as follows:

Some descriptive statistics were made for some data and information related to the study sample from Administrative Information Systems employees that were collected through the questionnaire. It can be made clear that the correct sample included in the study is (n = 312) while they are working in the mentioned companies.

The following table shows descriptive statistics of frequency and proportion of demographic variables for the study sample according to (type - qualification -Years of Experience- Career Level) as follows:

4/2- Statistics of the Study Sample:

Table (8) Descriptive statistics of demographic variables for the study sample (n = 312)

Demographic variables		%	No.
Type	**Male**	51.9	**162**
	Female	48.1	**150**
Qualification	**Bachelor's**	50.0	**156**
	Master's	34.6	**108**
	Ph.D	15.4	**48**
Years of Experience	**less than 10 years.**	25.0	**78**
	From 10 years to less than 20 years.	39.4	**123**
	From 20 years and over.	35.6	**111**
Career Level	**Director general.**	17.3	**54**
	Director of the Department.	25.0	**78**
	Head of the Department.	30.8	**96**
	Administrative / technical officer.	26.9	**84**

From the previous table No. (8), we find the following:

- **Type**: More than half of the respondents (51.9%) were male and the rest (48.1%) were female.
- **Qualification:** It is evident from the previous table that the largest percentage of the study sample according to the academic qualification is that 50.0% of the total study sample with a Bachelor's, followed in order by 34.6% of the total sample have Master's**,** Finally, the academic qualification for Ph.D 15%.
- **Years of Experience:** It is evident from the previous table that the largest percentage of the study sample according to years of Years of Experience, is that approximately 75.0% of the total study sample have years of Duration (From 10 years and over), and that 25.0% of the total sample have years of Years of Experience of less than 10 years.
- **Career Level:** This study divided the Career Level into 4 levels: Director general, Director of the Department, Head of the Department and Administrative most of the respondents were the Head of the Department (30.8%)

4/3- Descriptive Statistics to Measure the Variables.

The researcher measured the availability of the study variables for Use of Intelligent Robots and Automation Technologies (I.R) and for Improve Data Management and Organization Processes(D.TM) from the point of view of the sample as follows:

4/3/1- Descriptive Statistics for Use of Intelligent Robots and Automation Technologies(I.R).

Use of Intelligent Robots and Automation Technologies (I.R) in its dimensions is the independent variable, and it has four basic dimensions and includes ١٠ questions.

Availability of independent variable (I.R), point of view of the study sample was determined. The results were as follows:

- Descriptive Statistics for Intelligent Robots.

The availability of interest in Intelligent Robots was identified as one of the Use of Intelligent Robots and Automation Technologies (I.R), from the viewpoint of the study sample. The results were as follows:

Table (9): Descriptive Statistics to Intelligent Robots in Use of Intelligent Robots and Automation Technologies (I.R).

N	Statement	Mean	agreement rate	Std deviation	Arrang.
1-	Enhancing security in libraries using robots to reduce labor costs.	**3.41**	**68.27%**	**1.14**	3
2-	Providing innovative services in libraries through the use of robots.	**3.45**	**69.04%**	**1.13**	2
3-	Improving user experience in accessing information through robots.	**3.51**	**70.19%**	**1.23**	1
4-	Increasing data management efficiency in libraries with robotic technologies.	**3.27**	**65.38%**	**1.23**	5
5-	Using robots to improve the quality of services provided to users.	**3.31**	**66.15%**	**1.29**	4
	Total	**3.39**	**67.81%**	**0.96**	

From the previous table No. (9), we find that the total average dimension of (Intelligent Robots) is (3.39) and with an agreement rate of (67.81%), and this indicates that the Intelligent Robots in the Use of Intelligent Robots and Automation Technologies(I.R) was a agree degree in Administrative Information Systems, and that opinions tend towards agreement on the expressions of this dimension, where It turned out that the most available Statements in measuring after (Intelligent Robots) came first in a response indicating agreement, Statement: (3) with Mean of (3.51), and that the least available statement came in last place with a response indicating agree Statement: (4) With Mean of (3.27).

- Descriptive Statistics for Automation Technologies.

The availability of interest in Automation Technologies was identified as one of the Use of Intelligent Robots and Automation Technologies (I.R), from the viewpoint of the study sample. The results were as follows:

Table (10): Descriptive Statistics to Automation Technologies in I.R.

N	Statement	Mean	agreement rate	Std deviation	Arrang.
1-	Automation helps planning officers in libraries provide the necessary data for human resource planning.	**3.27**	**65.38%**	**1.28**	5
2-	The necessary data for workforce planning in libraries is collected automatically using	**3.42**	**68.46%**	**1.22**	4

N	Statement	Mean	agreement rate	Std deviation	Arrang.
	management information systems.				
3-	Automation helps save time when planning human resources in libraries using management information systems.	**3.47**	**69.42%**	**1.04**	2
4-	Automation helps accurately predict and determine the quantitative human resource needs in libraries.	**3.64**	**72.88%**	**1.02**	1
5-	Automation helps accurately predict and determine the qualitative human resource needs in libraries.	**3.47**	**69.42%**	**1.19**	3
	Total	**3.46**	**69.12%**	**0.86**	

From the previous table No. (10), we find that the total average dimension of (Automation Technologies) is (3.46) and with an agreement rate of (69.12%), and this indicates that the Automation Technologies in the I.R was a high degree in Administrative Information Systems, and that opinions tend towards agree on the expressions of this dimension, where It turned out that the most available Statements in measuring after (Automation Technologies) came first in a response indicating agreement, Statement: (4) with Mean of (3.47), and that the least available statement came in last place with a response indicating agree Statement: (2) With Mean of (3.27).

- Overall statistics for I.R.

The extent of interest in the I.R has been determined in Administrative Information Systems, so that these dimensions from the viewpoint of the study sample are arranged. The results were as follows:

Table (11): Descriptive Statistics for the I.R Variable.

N	Dimensions	Mean	Percentage %	td.
1-	**Intelligent Robots.**	**3.39**	**67.81%**	**.96**
2-	**Automation Technologies.**	**3.46**	**69.12%**	**.86**
	Total (I.R)	**3.39**	**67.83%**	**.72**

From the previous table No. (11), we find that the most available dimensions of I.R are respectively: The first (Automation Technologies) the Mean is (3.46) and a rate of (69.12%), The second (Intelligent Robots) the Mean is (3.39) the rate is (67.81%), Therefore, there is a high availability of I.R dimensions, and opinions tend to agree, with the overall average of the dimensions being (3.39), with an agreement rate (67.83%).

4/3/2- Descriptive Statistics for Improve Data Management and Organization Processes.

Improve Data Management and Organization Processes (D.TM) in its dimensions is the independent variable, and it has four basic dimensions and includes 10 questions.

Availability of independent variable (D.TM), point of view of the study sample was determined. The results were as follows:

- Descriptive Statistics for Data Management.

The availability of interest in Data Management was identified as one of the Improve Data Management and Organization Processes (D.TM), from the viewpoint of the study sample. The results were as follows:

Table (12): Descriptive Statistics to Data Management in Improve Data Management and Organization Processes (D.TM).

N	Statement	Mean	agreement rate	Std deviation	Arrang.
1-	Automation technologies are used to improve data management and organize information in libraries.	**3.72**	**74.42%**	**1.06**	1
2-	Necessary data is collected automatically to enhance the efficiency of management information systems in libraries.	**3.70**	**74.04%**	**1.09**	2
3-	Robots assist in organizing data more accurately and effectively in libraries.	**3.62**	**72.31%**	**1.08**	3
4-	Advanced methods are used to analyze data and make informed decisions to improve library operations.	**3.48**	**69.62%**	**1.19**	4

N	Statement	Mean	agreement rate	Std deviation	Arrang.
5-	Proposed solutions for improving data management in libraries are evaluated using automation and robotics technologies.	**3.36**	**67.12%**	**1.22**	5
	Total	**3.58**	**71.50%**	**0.81**	

From the previous table No. (12), we find that the total average dimension of (Data Management) is (3.58) and with an agreement rate of (71.50%), and this indicates that the Data Management in the Improve Data Management and Organization Processes(D.TM) was a neutral degree in Administrative Information Systems, and that opinions tend towards neutral on the expressions of this dimension, where It turned out that the most available Statements in measuring after (Data Management) came first in a response indicating agreement, Statement: (1) with Mean of (3.72), and that the least available statement came in last place with a response indicating agreement Statement: (5) With Mean of (3.36).

- Descriptive Statistics for Data Organization.

The availability of interest in Data Organization was identified as one of the Improve Data Management and Organization Processes (D.TM), from the viewpoint of the study sample. The results were as follows:

Table (13): Descriptive Statistics to Data Organization in D.TM.

N	Statement	Mean	agreement rate	Std deviation	Arrang.
1-	Automation technologies are used to improve data organization in the library.	**3.46**	**69.23%**	**1.20**	2
2-	Management information systems in the library provide quick and accurate access to data.	**3.27**	**65.38%**	**1.20**	5
3-	Robots assist in facilitating data organization and storage in the library.	**3.51**	**70.19%**	**1.08**	1
4-	Data is reviewed and organized regularly to ensure its accuracy in the library.	**3.36**	**67.12%**	**1.14**	4
5-	Modern technologies in the library help improve the efficiency of data management and organization.	**3.36**	**67.12%**	**1.12**	3
	Total	**3.39**	**67.81%**	**0.87**	

From the previous table No. (13), we find that the total average dimension of (Data Organization) is (3.39) and with an agreement rate of (67.81%), and this indicates that the Data Organization in the D.TM was a high degree in Administrative Information Systems, and that opinions tend towards agree on the expressions of this dimension, where It turned out that the most available Statements in measuring after (Data Organization) came first in a response indicating agreement, Statement: (3) with Mean of (3.51), and that the least available statement came in last place with a response indicating agreement Statement: (2) With Mean of (3.27).

- Overall statistics for D.TM.

The extent of interest in the D.TM has been determined in Administrative Information Systems, so that these dimensions from the viewpoint of the study sample are arranged. The results were as follows:

Table (14): Descriptive Statistics for the D.TM Variable.

N	Dimensions	Mean	Percentage %	Std.	
1-	**Data Management.**	**3.58**	**71.50%**	**0.81**	1
2-	**Data Organization.**	**3.39**	**67.81%**	**0.87**	٢
	Total (D.TM)	**3.47**	**69.40%**	**0.72**	

From the previous table No. (14), we find that the most available dimensions of D.TM are respectively: The first (Data Management) the Mean is (3.58) and a rate of (71.50%), the second (Data Organization) the Mean is (3.39) the rate is (67.81%).

Therefore, there is a high availability of D.TM dimensions, and opinions tend to agree, with the overall average of the dimensions being (3.47), with an agreement rate (69.40%).

4/4- Test the Hypotheses of the Study:

The objective of the study is to examine the validity of the main hypotheses of the study and its sub-hypotheses. These tests are the main objective of the study, through which the researcher seeks to

know the essence, strength and direction of this effect.

The main hypothesis: "There is a Statistically Significant impact of Use of Intelligent Robots and Automation Technologies (Intelligent Robots - Automation Technologies) on Improve Data Management and Organization Processes in Administrative Information Systems".

The first hypothesis of the study states that: *"**There is a statistically significant impact of Use of Intelligent Robots and Automation Technologies on Data Management in Administrative Information Systems.**"*

This hypothesis was divided into three sub-hypotheses, multiple linear regression was used to find out the effect of the independent variable (Use of Intelligent Robots and Automation Technologies (I.R)) on the dependent variable (***Data Management***), and then use the relationship to predict the value of one of the two variables in terms of the other variable. The regression analysis was used by (F&T) testing as follows:

Table (15): Results of a regression analysis of impact of Use of Intelligent Robots and Automation Technologies on *Data Management*.

N	Dimensions	(R^2)	(F)	Coef (β)	(T)	p-value
1-	**Intelligent Robots.**	0.247	101.90	0.419	10.095	0.000
2-	**Automation Technologies.**	0.210	82.60	0.434	9.089	0.000
	Total	**0.333**	**155.11**	**0.654**	**12.45**	**0.000**

Statistical significance at level (0.01).

From the previous table No. (15), we find that at the level of significance (0.01) and degrees of freedom (310), the value of the (F) test indicates the quality of the relationship model and the validity of the dependence without errors, where the value of (F) was equal to (155.11), which is statistically significant at a significant level (0.01).

The value of the determination coefficient (R^2), which equals (0.333), indicates that the (Use of Intelligent Robots and Automation Technologies(I.R)) variable explains the change in (Data Management) by approximately (33.3%), and the percentage of random errors represented in the accuracy of the units of measurement remains for the variables, where it (24.7%) explains Of the variation in the dimension (Intelligent Robots), and (21.0%) of the variance is explained in the dimension (Automation Technologies), which indicates the role and impact of the dimensions of a variable (Use of Intelligent Robots and Automation Technologies(I.R)) in the interpretation of the Data Management.

The following figure summarizes the Correlation and impact between (Use of Intelligent Robots and Automation Technologies (I.R)) and Data Management, as follows:

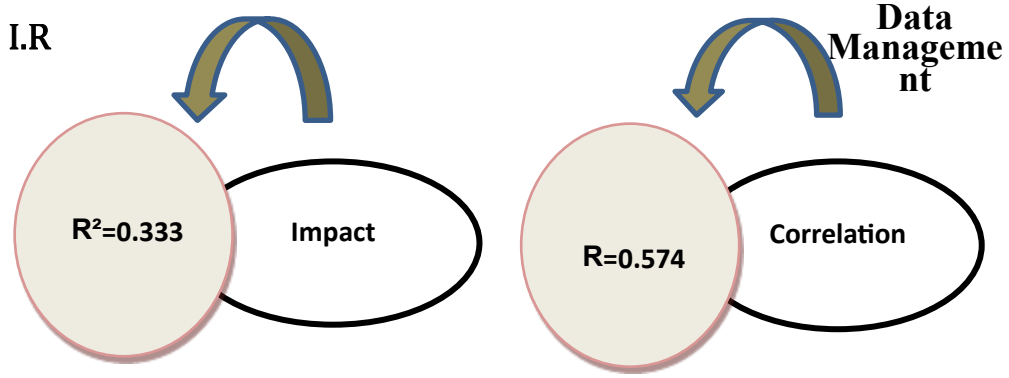

Figure (3): Correlation and Impact between (Use of Intelligent Robots and Automation Technologies (I.R)) and Data Management.

1. There is a statistically significant effect of Intelligent Robots on Data Management.

Table (15) shows that there is a positive direct effect of Intelligent Robots on Data Management, since (β=0.419, t=10.09, sig. 0.01, p >0.05) Therefore, the null hypothesis is rejected and the alternative hypothesis is accepted, which indicates that the Intelligent Robots has an effect on Data Management at (α≤0.01).

2. There is a statistically significant impact of Automation Technologies on Data Management

Table (15) shows that there is a positive direct effect of Automation Technologies on Data Management, since (β =0.434, t=9.089, p <0.01) Therefore, the null hypothesis is rejected and the alternative hypothesis is accepted, which indicates that the Automation Technologies has an effect on Data Management at (α≤0.01).

The second hypothesis of the study states that: ***"There is a statistically significant impact of Use of Intelligent Robots and Automation Technologies on Data Organization in Administrative Information Systems."***

This hypothesis was divided into three sub-hypotheses, multiple linear regression was used to find out the effect of the independent variable (Use of Intelligent Robots and Automation Technologies (I.R)) on the dependent variable (***Data Organization***), and then use the relationship to predict the value of one of the two variables in terms of the other variable. The regression analysis was used by (F&T) testing as follows:

Table (16): Results of a regression analysis of impact of Use of Intelligent Robots and Automation Technologies on *Data Organization*.

N	Dimensions	(R^2)	(F)	Coef (β)	(T)	p-value
1-	**Intelligent Robots.**	0.246	10.939	0.447	10.047	0.000
2-	**Automation Technologies.**	0.245	100.523	0.502	10.026	0.000
	Total	**0.372**	**183.502**	**0.740**	**13.546**	**0.000**

Statistical significance at level (0.01).

From the previous table No. (16), we find that at the level of significance (0.01) and degrees of freedom (310), the value of the (F) test indicates the quality of the relationship model and the validity of the dependence without errors, where the value of (F) was equal to (183.502), which is statistically significant At a significant level (0.01).

The value of the determination coefficient (R^2), which equals (0.372), indicates that the (Use of Intelligent Robots and Automation Technologies(I.R)) variable explains the change in (**Data Organization**) by approximately (372.4%), and the percentage of random errors represented in the accuracy of the units of measurement remains for the variables, where it (24.6%) explains Of the variation in the dimension (Intelligent Robots), and (24.5%) of the variance is explained in the dimension (Automation Technologies), and (28.2%) of the variance is explained in the dimension (Organized Thinking), which indicates the role and impact of the dimensions of a variable (Use of Intelligent Robots and Automation Technologies(I.R)) in the interpretation of the **Data Organization**.

The following figure summarizes the Correlation and impact between (Use of Intelligent Robots and Automation Technologies (I.R)) and **Data Organization**, as follows:

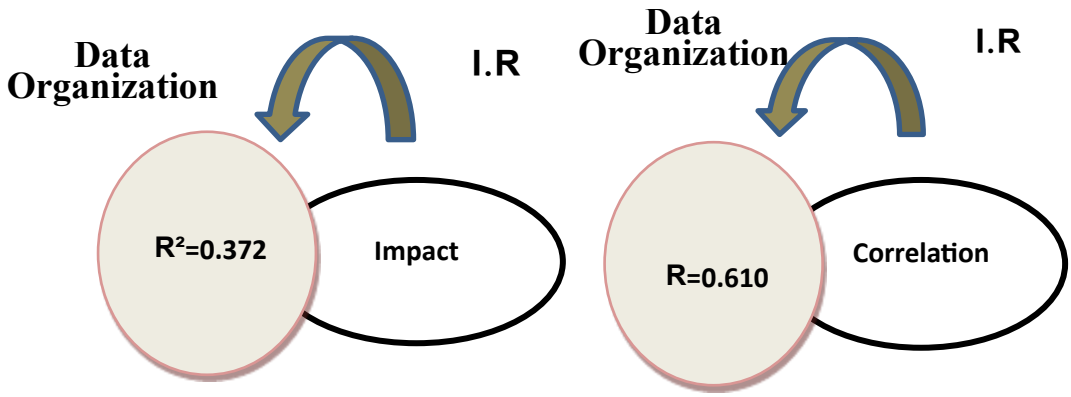

Figure (4): Correlation and Impact between (Use of Intelligent Robots and Automation Technologies (I.R)) and Data Organization.

Sub-Hypothesis:

1. There is a statistically significant effect of Intelligent Robots on Data Organization.

Table (16) shows that there is a positive direct effect of Intelligent Robots on Data Organization, since (β=0.447, t=10.047, sig. 0.01, p

>0.05) Therefore, the null hypothesis is rejected and the alternative hypothesis is accepted, which indicates that the Intelligent Robots has an effect on Data Organization at ($\alpha \leq 0.01$).

2. There is a statistically significant impact of Automation Technologies on Data Organization

Table (16) shows that there is a positive direct effect of Automation Technologies on Data Organization, since ($\beta = 0.502$, $t = 10.026$, $p < 0.01$) Therefore, the null hypothesis is rejected and the alternative hypothesis is accepted, which indicates that the Automation Technologies has an effect on Data Organization at ($\alpha \leq 0.01$).

Results:

The study revealed several key findings that contribute to addressing the research problem and validating its hypotheses. These findings are summarized as follows:

- **Use of Intelligent Robots and Automation Technologies (I.R):**

The study found that the overall availability of Intelligent Robots and Automation Technologies (I.R) in Administrative Information Systems was high, with a mean of 3.39 and an agreement rate of 67.83%. Automation Technologies had the highest impact, with a mean of 3.46 and an agreement rate of 69.12%, indicating a significant role in improving planning efficiency and resource allocation. Intelligent Robots followed closely, with a mean of 3.39 and an agreement rate of 67.81%, emphasizing their role in enhancing security, user experience, and service quality in data-related processes.

- **Impact on Data Management (D.TM):**

The study revealed that Data Management was the most strongly impacted dimension, with a mean of 3.58 and an agreement rate of 71.50%, indicating a high level of agreement among participants. Automation Technologies significantly improved data collection and processing accuracy, achieving the highest β-value ($\beta = 0.434$, $t = 9.089$, $p < 0.01$) in regression analysis. Intelligent Robots also contributed positively to data management, with $\beta = 0.419$, $t = 10.095$, $p < 0.01$, indicating their importance in increasing efficiency and reducing errors.

- **Impact on Data Organization:**

The study found that Data Organization had a mean of 3.39 and an agreement rate of 67.81%, reflecting participants' agreement on its importance. Automation Technologies again showed a strong impact, with $\beta = 0.502$, $t = 10.026$, $p < 0.01$, highlighting their effectiveness in improving data accessibility and organization. Intelligent Robots demonstrated a significant effect on data organization, with $\beta = 0.447$, $t = 10.047$, $p < 0.01$, underlining their role in facilitating accurate data storage and retrieval.

- **Overall Hypothesis Validation:**

The main hypothesis, "There is a statistically significant impact of the use of Intelligent Robots and Automation Technologies on improving data management and organization processes," was supported. The regression analysis confirmed that Intelligent Robots and Automation Technologies explain approximately 33.3% of the variance in Data Management and 37.2% of the variance in Data Organization, indicating their substantial contribution to enhancing administrative processes.

Discussion of Results:

The findings of this study present valuable insights into the impact of Intelligent Robots and Automation Technologies (I.R) on improving data management and organizational processes within Administrative Information Systems. These results not only validate the hypotheses but also emphasize the transformative potential of these technologies in modern administrative operations.

The study revealed that **Automation Technologies** significantly enhance administrative efficiency, particularly in data collection and processing. With a mean of **3.46** and an agreement rate of **69.12%**, Automation Technologies emerged as the most impactful dimension of I.R. Regression analysis confirmed that **Automation Technologies** had a direct, positive effect on **Data Management** (**$\beta = 0.434$, $t = 9.089$, $p < 0.01$**) and **Data Organization** (**$\beta = 0.502$, $t = 10.026$, $p < 0.01$**).

This finding underscores the importance of leveraging automation tools to streamline repetitive tasks, reduce errors, and optimize resource utilization. The ability of automation technologies to predict and fulfill both qualitative and quantitative resource needs in real-time further highlights their critical role in enhancing administrative decision-making processes.

Intelligent Robots were found to positively impact both **Data Management** and **Data Organization**, with means of **3.39** (67.81% agreement) and regression values of **$\beta = 0.419$, $t = 10.095$, $p < 0.01$** (for Data Management) and **$\beta = 0.447$, $t = 10.047$, $p < 0.01$** (for Data Organization). These findings indicate that robots not only enhance security and service quality but also contribute to organizing and storing data with greater accuracy and efficiency.

The study also highlighted that Intelligent Robots improve user experiences by providing innovative solutions and facilitating quick access to information. Their role in reducing human error and supporting data-driven decision-making aligns with

the broader goal of achieving smarter, more reliable administrative systems.

The overall findings suggest that combining **Intelligent Robots** and **Automation Technologies** creates a synergistic effect that significantly enhances **Data Management** processes. With a combined determination coefficient ($\mathbf{R^2}$) of **33.3%**, the study demonstrated that these technologies explain a substantial proportion of the variance in administrative data management practices. This reflects the ability of I.R to enhance real-time data collection, organization, and analysis, ensuring higher accuracy and reliability.

The study's participants highlighted the importance of automation technologies in supporting advanced methods for analyzing data and making informed decisions. This finding suggests that organizations should prioritize automation to handle large volumes of data efficiently, reduce processing times, and enhance overall productivity.

The findings also highlight the positive impact of I.R on **Data Organization**, with a determination coefficient ($\mathbf{R^2}$) of **37.2%**. The ability of automation technologies to provide quick and accurate access to data was rated highly by respondents, emphasizing their role in improving data accessibility and usability.

Furthermore, the findings indicate that robots contribute significantly to regular data reviews and organization, ensuring data accuracy and relevance. This suggests that leveraging modern technologies can create well-structured data systems that support long-term administrative success.

The validation of both main and sub-hypotheses underscores the pivotal role of I.R in improving administrative processes. The study demonstrated that these technologies:

- Provide actionable insights through real-time data processing.
- Enhance the organization of large datasets, facilitating quicker and more informed decision-making.
- Foster innovation by integrating cutting-edge solutions for data management and organization.

These results align with existing literature on the effectiveness of automation and robotics in reducing operational inefficiencies and advancing organizational capabilities.

The findings of this study reflect broader trends in digital transformation and the adoption of smart technologies in administrative systems. By automating mundane tasks and integrating intelligent robots, organizations can not only improve efficiency but also redirect human resources to focus on more strategic objectives.

This alignment with global trends further validates the necessity of investing in I.R to stay competitive and adapt to the rapidly evolving technological landscape. Moreover, these findings open new avenues for research, particularly in exploring the application of advanced robotics and AI in other administrative and organizational contexts.

The results emphasize the critical role of Intelligent Robots and Automation Technologies in transforming administrative information systems. By improving data management and organization processes, these technologies address key operational challenges and pave the way for more efficient, reliable, and innovative administrative practices. Organizations should prioritize the adoption and integration of these tools to achieve sustainable improvements and maintain a competitive edge.

Recommendations:

Based on the results, the following recommendations are proposed to further improve the use of Intelligent Robots and Automation Technologies in Administrative Information Systems:

- **Enhance Investment in Automation Technologies:** Since Automation Technologies had the most substantial impact, organizations should prioritize investments in automated data collection and processing systems. This includes adopting advanced tools to improve data accuracy, speed, and efficiency.
- **Expand the Use of Intelligent Robots:** Intelligent Robots should be further integrated into administrative processes to enhance security, user experience, and service quality. Special attention should be given to training staff on the effective use of robotic technologies.
- **Strengthen Data Management Systems:** Leverage automation technologies and intelligent robots to improve data analysis and decision-making processes. Regular evaluations should be conducted to ensure the proposed solutions for improving data management remain effective and up-to-date.
- **Improve Data Organization Practices:** Automation technologies and robots should be utilized to regularly review and update organizational data to ensure accuracy and accessibility. This involves adopting systems that enable faster and more reliable data retrieval.
- **Implement Continuous Training Programs:** Regular training and workshops should be conducted to enhance employees' proficiency in operating automation technologies and intelligent robots, ensuring their optimal use in administrative tasks.
- **Promote Research and Development (R&D):** Encourage collaboration between research institutions and organizations to explore innovative

ways of integrating intelligent robots and automation technologies into data management systems.

- **Standardize Technology Adoption:** Establish industry-wide standards and protocols for integrating intelligent robots and automation technologies in Administrative Information Systems to ensure consistency and interoperability across organizations.
- **Monitor and Evaluate System Performance:** Regularly assess the performance of automation technologies and intelligent robots to identify areas for improvement and ensure they meet organizational needs effectively.

Questionnaire

Intelligent Robots & Automation Technologies

N	Statement	Strongly agree	agree	Neutral	Disagree	Strongly disagree
		1	2	3	4	5
	Intelligent Robots					
1	Enhancing security in libraries using robots to reduce labor costs.					
2	Providing innovative services in libraries through the use of robots.					
3	Improving user experience in accessing information through robots.					
4	Increasing data management efficiency in libraries with robotic technologies.					
5	Using robots to improve the quality of services provided to users.					
	Automation Technologies					
6	Automation helps planning officers in libraries provide the necessary data for human resource planning.					
7	The necessary data for workforce planning in libraries is collected automatically using management information systems.					
8	Automation helps save time when planning human resources in libraries using management information systems.					
9	Automation helps accurately predict and determine the quantitative human resource needs in libraries.					
20	Automation helps accurately predict and determine the qualitative human resource needs in libraries.					

Data Management & Data Organization

N	Statement	Strongly agree	agree	Neutral	Disagree	Strongly disagree
		1	2	3	4	5
	Data Management					

N	Statement	Strongly agree	agree	Neutral	Disagree	Strongly disagree
1	Automation technologies are used to improve data management and organize information in libraries.					
2	Necessary data is collected automatically to enhance the efficiency of management information systems in libraries.					
3	Robots assist in organizing data more accurately and effectively in libraries.					
4	Advanced methods are used to analyze data and make informed decisions to improve library operations.					
5	Proposed solutions for improving data management in libraries are evaluated using automation and robotics technologies.					
Data Organization						
6	Automation technologies are used to improve data organization in the library.					
7	Management information systems in the library provide quick and accurate access to data.					
8	Robots assist in facilitating data organization and storage in the library.					
9	Data is reviewed and organized regularly to ensure its accuracy in the library.					
20	Modern technologies in the library help improve the efficiency of data management and organization.					

References

[1] Muniswamaiah, M., Agerwala, T., & Tappert, C. (2019). Data virtualization for analytics and business intelligence in big data. *CS & IT Conference Proceedings, 9*(9). CS & IT Conference Proceedings.

[2] Antwiadjei, L. (2021). Evolution of business organizations: An analysis of robotic process automation. *Eduzone: International Peer Reviewed/Refereed Multidisciplinary Journal, 10*(2), 101-105.

[3] Aldoseri, A., Al-Khalifa, K., & Hamouda, A. M. S. (2023). A Roadmap for Integrating Automation with Process Optimization for AI-powered Digital Transformation. *Preprints*, 2023.

[4] Anton, E., Oesterreich, T. D., Aptyka, M., & Teuteberg, F. (2023). Beyond Digital Data and Information Technology: Conceptualizing Data-Driven Culture. *Pacific Asia Journal of the Association for Information Systems*, 15(3), 1-36.

[5] Paul, N., Sullivan, Z., Marinier, B., & Moshkina, L. (2023). *Intelligent Data Management Pipeline to Facilitate Human Robot Interaction in Large-Scale Real-Time Environments*. In 2023 IEEE International Conference. IEEE.

[6] Allam, K. (2023). Data-driven dynamics: Unraveling the potential of smart robotics in the age of big data. *EPH - International Journal of Applied Science*, 9(2).

[7] Andronie, M., Lăzăroiu, G., Karabolevski, O. L., Ştefănescu, R., Hurloiu, I., Dijmărescu, A., & Dijmărescu, I. (2023). Remote Big Data Management Tools, Sensing and Computing Technologies, and Visual Perception and Environment Mapping Algorithms in the Internet of Robotic Things. *Electronics, 12*(1), 22.

[8] Li, J., Qin, R., & Wang, F.-Y. (2023). The Future of Management: DAO to Smart Organizations and Intelligent Operations. *IEEE Transactions on Systems, Man, and Cybernetics: Systems*, 53(6).

[9] Balta, H., Bedkowski, J., Govindaraj, S., Majek, K., Musialik, P., Serrano, D., Alexis, K., Siegwart, R., & De Cubber, G. (2017). Integrated Data Management for a Fleet of Search-and-rescue Robots. *Journal of Field Robotics, 34*(3), 539–582. Wiley Periodicals, Inc.

[10] harma, V., Khang, A., Hiwarkar, P., & Jadhav, B. (2023). Robotic process automation applications in data management. In *AI-Centric Modeling and Analytics* (1st ed., pp. 22). CRC Press.

[11] izar, M. (2022, October). *Digitalization and data automation: The path for a more efficient well integrity data management and cost-effective responses*. Paper presented at ADIPEC, Abu Dhabi, UAE.

[12] orukaiev, Z., Ostapchenko, K., Chemerys, O., & Evdokimov, V. (2022). Information technology platform for automation of decision-making processes by the organizational management system. In *Power Systems Research and Operation* (pp. 257–279). Egyptian Knowledge Bank.

[13] adal, S., Jovanovic, P., Bilalli, B., & Romero, O. (2022). Operationalizing and automating Data Governance. *Journal of Big Data, 9*(1), 117.

[14] aeed, J. H. (2021). Artificial Intelligence in Information Science: Approaches and Effects. *Arab Journal of Informatics and Information Security*, Issue 2, pp. 71–89.

[15] ridevi, P. C., & Shanmugam, A. P. (2017). Artificial Intelligence and its Applications in Libraries.

[16] incze, J. (2017), "Virtual reference librarians (Chatbots)", *Library Hi Tech News*, Vol. 34 No. 4, pp. 5-8.

[17] amble, A. (2020). Artificial intelligence and mobile apps for mental healthcare: a social informatics perspective. *Aslib Journal of Information Management*, 72(4), 509-523.

[18] ilmegani, C. (2021). How to Build a Chatbot: Components & Architecture. Ai Multiple.

[19] iogou, C., Georgiadis, M. C., Voutetakis, S., & Papadopoulou, S. (2017). Optimum energy management of PEM fuel cell systems based on model predictive control. In E3S Web of Conferences (Vol. 16, p. 10003). EDP Sciences.

[20] hen, F., & Adam, E. E. Jr. (2011). The impact of flexible manufacturing systems on productivity and quality. *IEEE Transactions on Engineering Management, 38*(1), 33-45.

[21] S wider, J., Wszołek, G., & Carvalho, W. (2005). Programmable controller designed for electro-pneumatic systems. *Journal of Materials Processing Technology, 164*, 1459-1465.

[22] N urora Process. (2023). The three different types of automation in manufacturing. *Aurora Process*. Retrieved December 28, 2024.

[23] uix, C., Hai, R., & Vatov, I. (2016). GEMMS: A generic and extensible metadata management system

for data lakes. In: España, S., Ivanovic, M., Savic, M. (eds.) *Proceedings of the CAiSE'16 Forum, at the 28th International Conference on Advanced Information Systems Engineering (CAiSE 2016)*, Ljubljana, Slovenia, June 13-17, 2016. CEUR Workshop Proceedings, vol. 1612, pp. 129–136. CEUR-WS.org, 2016.

[24] alker, C., & Alrehamy, H. H. (2015). Personal data lake with data gravity pulls. *Fifth IEEE International Conference on Big Data and Cloud Computing, BDCloud 2015*, Dalian, China, August 26-28, 2015, pp. 160–167. IEEE Computer Society, 2015.

[25] ai, R., Geisler, S., & Quix, C. (2016). Constance: An intelligent data lake system. In: Özcan, F., Koutrika, G., Madden, S. (eds.) *Proceedings of the* 2016 *International Conference on Management of Data, SIGMOD Conference 2016*, San Francisco, CA, USA, June 26 - July 01, 2016, pp. 2097–2100. ACM, New York.

[26] isvizi, A., Lytras, M. D., & Aljohani, N. R. (2021). Big data research for politics: human-centric big data research for policy making, politics, governance and democracy. *Journal of Ambient Intelligence and Humanized Computing, 12*(4), 4303–4.

[27] tonebraker, M., Bruckner, D., Ilyas, I. F., Beskales, G., Cherniack, M., Zdonik, S. B., Pagan, A., Xu, S. (2013). Data curation at scale: The data tamer system.

[28] ezig, E. K., Cao, L., Stonebraker, M., Simonini, G., Tao, W., Madden, S., Ouzzani, M., Tang, N., Elmagarmid, A. K. (2019). Data civilizer 20: A holistic framework for data preparation and analytics. *Proceedings of the VLDB Endowment, 12*(12), 1954–1957.

[29] inkedIn. (2024). *How do you manage the data and information generated by your robots?* RetWeved December 27, 2024.

[30] ernardo, B. M. V., São Mamede, H., Barroso, J. M. P., & dos Santos, V. M. P. D. (2024). Data governance & quality manage ment—Innovation and breakthroughs across different fields. *Journal of Innovation & Knowledge, 9*(4), 100598.

[31] ekaran, U., & Bougie, R. (2016). *Research methods for business: A skill building approach*. John wiley & sons.

[32] olbin, I., Rao, A. S., Hadjarian, A., & Krittman, D. (2020). Responsible AI: A primer for theVlegal community. *2020 IEEE International Conference on Advanced Search*. IEEE.

[33] selin, E. R. (1999). The quality of accounting research and internal, external, and construct validity. *Asian Review of Accounting*, *7*(1), 43-64.

[34] hasemi, A., & Zahediasl, S. (2012). Normality tests for statistical analysis: a guide for non-statisticians. *International journal of endocrinology and metabolism*, *10*(2), 486.