

Theories, Frameworks, and Models of Using Artificial Intelligence in Organizations

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Abstract

Artificial intelligence (AI) is the replication of human intelligence by computer systems and machines using tools like machine learning, deep learning, expert systems, and natural language processing. AI can be applied in administrative settings to automate repetitive processes, analyze and forecast data, foster social communication skills among staff, reduce costs, and boost overall operational effectiveness. In order to understand how AI is being used for administrative duties in various organizations, this paper gives a critical dialogue on the topic and proposed a framework for using artificial intelligence in organizations. Additionally, it offers a list of specifications, attributes, and requirements that organizations planning to use AI should consider.

Keywords:

AI; Machine Learning; Administrative Tasks.

1. Introduction

Administrative work is at the core of the proper and effective fulfillment of work-related operations and management. Duties/tasks (i.e., central processes that aid in the swift flow of operations in offices and at the workplace, such as filing, answering and managing phone calls, scheduling appointments, receiving visitors, managing key office leaders' itineraries; office supply-handling) are often carried out by administrative professionals (e.g., assistants; secretaries; other office managers). The development of administrative work has been influenced by the need for more efficient operations in offices and organizations; indeed, distinguished managers often restructure their organizations to reduce any inefficient activity and to build effective organizational and operational processes. Thus, the development of technologies that can increase this effectiveness has digitalized a wealth of administrative tasks, which has led to many countries being predicted an improvement in the digitalization of their administrative work by a very high percentage by 2030 (Fejes & Futo, 2021; Saudi Vision, 2030).

Technological development and innovation have led to the emergence of smart technology, which provides endless benefits for organizational, administrative, and institutional work. Note that the word SMART is an acronym for Self-Monitoring, Analysis, and Reporting Technology. This tech notably uses artificial intelligence (AI) to equip inanimate objects and aspects with cognitive awareness—hence its name. According to Fejes & Futo (2021), smart technology can be used to define strategies, make administrative decisions, obtain and present information, analyze and predict data, and even perform routine institutional and administrative tasks: for instance, in institutions that provide healthcare services, Phillips (2021) notes that smart technology is being used to provide telehealth services, which improves how administrators to store and retrieve patient data ensures that there is a coherent placement of healthcare professionals in different areas—particularly in extremely demanding situations.

The rapid development of AI has thus automated numerous administrative tasks to a point where experts believe that smart applications and tools will ultimately replace 40% of work in the next fifteen years, the majority of this percentage comprising repetitive work and white-collar duties in fields like law, marketing, healthcare, accounting, and hospitality, just to mention a few (Loebbecke et al., 2020). Note that a large number of administrative professionals welcome the use of artificial intelligence in their place of work: according to research by Scheetz et al. (2021), at least 71% of respondents agreed that the adoption of AI in their workplaces would greatly enhance the field of practice, whilst 60%

believed that AI would have a positive effect on their work within a period of fewer than five years from its implementation.

Liu & Lin (2020) explain that the word 'AI' was first coined by John McCarthy et al. in 1955, after which nothing much was said about it until a century later. As of 2021, AI is no longer a mere idea, but rather an emerging and disruptive technology powered by aspects such as machine learning to develop SMART systems that can transform the world significantly. From an economical point of view, AI has been predicted to have the capability to create an economy of about \$13 trillion (Liu & Lin, 2020), which indicates the idea that AI is not only beneficial from a work perspective but also an economic perspective. Thus, this study focuses on the use of AI in administrative and organizational work to understand what frameworks, applications, and tools are employed in different administrative settings.

This report is broken down into five different sections, as follows: Section 2 describes the concept of artificial intelligence in organizations; Section 3 then provides a critical review of the most important Theories, Frameworks, and Models of Using Artificial Intelligence in Organizations. Section 4 showcases the important elements for using artificial intelligence in organizations and the proposed framework for using artificial intelligence in organizations. Lastly, Section 5 presents a conclusion.

2. The Concept of Artificial Intelligence in Organizations

The development of AI in organizations has been strongly influenced by the production of intelligent hardware, the growth of algorithms, and the emergence of big-data science (Chen, Li & Chen, 2021). AI such as deep learning, machine learning, and natural language processing aid in the planning, management, and operation of different factors and systems within institutions. In this vein, according to Bullock, Yang & Wang (2020), machine learning is a

feature of AI that is often used to perform duties that could only be undertaken by human beings, such as the filing of information, which can now be completed by smart electronic record systems that eliminate all the drawbacks of the traditional forms of filing.

Further, features of AI like machine learning are capable of providing a decision support system in different routine tasks in administrative offices: Bullock, Yang & Wang (2020) note that a wealth of the work concerning AI in public institutions is focused on big data or the use of smart governance. These authors go on to explain that AI is more of an agent within the context of an organization that completes tasks with stochastic methods with the help of inbuilt logic-based rules.

Note that there is both weak and strong AI: weak AI (top-down AI) involves the employment of programs that are created to mimic the characteristics of logical thinking in humans (Wu & Shan, 2021), whilst strong AI (bottom-up AI) believes machines can be made intelligent to a point where they possess real ideological awareness, ability, reasoning capabilities, and even emotion, as shown in Figure 1 below.

According to Weili (2020), three different schools of thought developed around the concept of AI: semiotics believe that AI arises from mathematical logic; connectionists believe it comes from bionics; behaviorists believe it was derived from action and perception. Regardless, in order to fully implement AI in organizations, both technical and capital capacity must be met so as to ensure that the institution is ready to support the requirements posed by AI applications and tools (Solow-Niederman, 2019). For instance, Talib et al. (2021) indicate that the deep learning algorithms of AI need enough storage to ensure they can support big databases, as well as powerful processors so they can be effectively

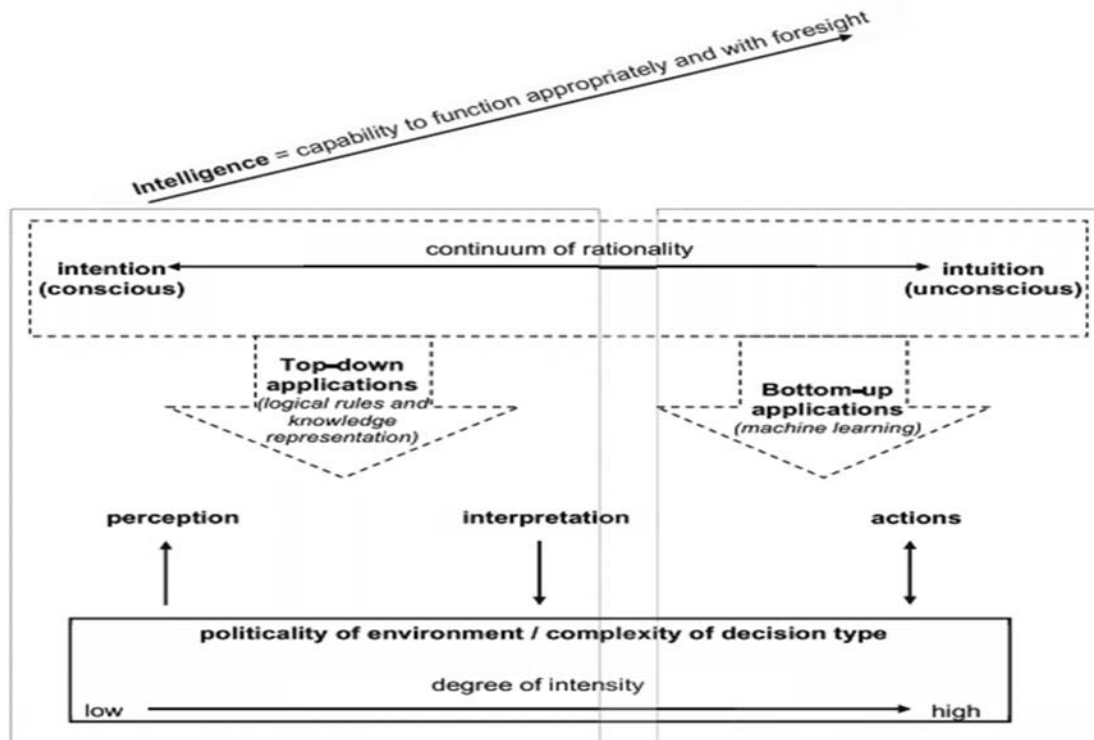


Figure 1: Framework for AI categories Concerning the Continuum of Rational Behaviour (Trunk, Birkel & Hartmann, 2020)

autonomous and smart. This implies that the implementation of AI systems would need capital, but the returns would be worthwhile and beneficial towards collective cost reduction and increased efficiency.

3. Theories, Frameworks, and Models of Using Artificial Intelligence in Organizations

According to Swan (2021), more than 74% of respondents in a research conducted to understand employee's receptions to AI agreed that the technology would have a positive impact on them and the workplace, since such technology could be used to complete routine administrative tasks (e.g., the scheduling of appointments; the automated recording of messages). Indeed, Gudkov (2020) found that different Robo-adviser models support the machine-learning algorithms that contain analytic, predictive, and even investment capabilities. This framework supports the use of AI for the completion of routine

administrative activities, and further supports the involvement of big data, whereby intelligent systems can search online and on different sites to draw pertinent information, as requested by an administrator. The advantage of handing over some administrative tasks to AI is the assurance of accuracy and privacy when the needed control systems are in place.

Bullocks, Yang & Wang (2020), as AI developers, are currently inventing different tools and applications that can be used to support appropriate decision-making in organizations: for instance, for administrative officers who complete payment tasks, AI can be incorporated to ensure accuracy and to jeep checks and balances. The authors further note that anomaly-detection models can be effective in identifying unusual credit cards or improper claims, for instance, in a hospital setting. As an example of this in practice, the Health Care Fraud and Abuse Control Program (HCFAC) employs artificial discretion to curb the inaccurate collection of payments and to detect fraudulent claims. One

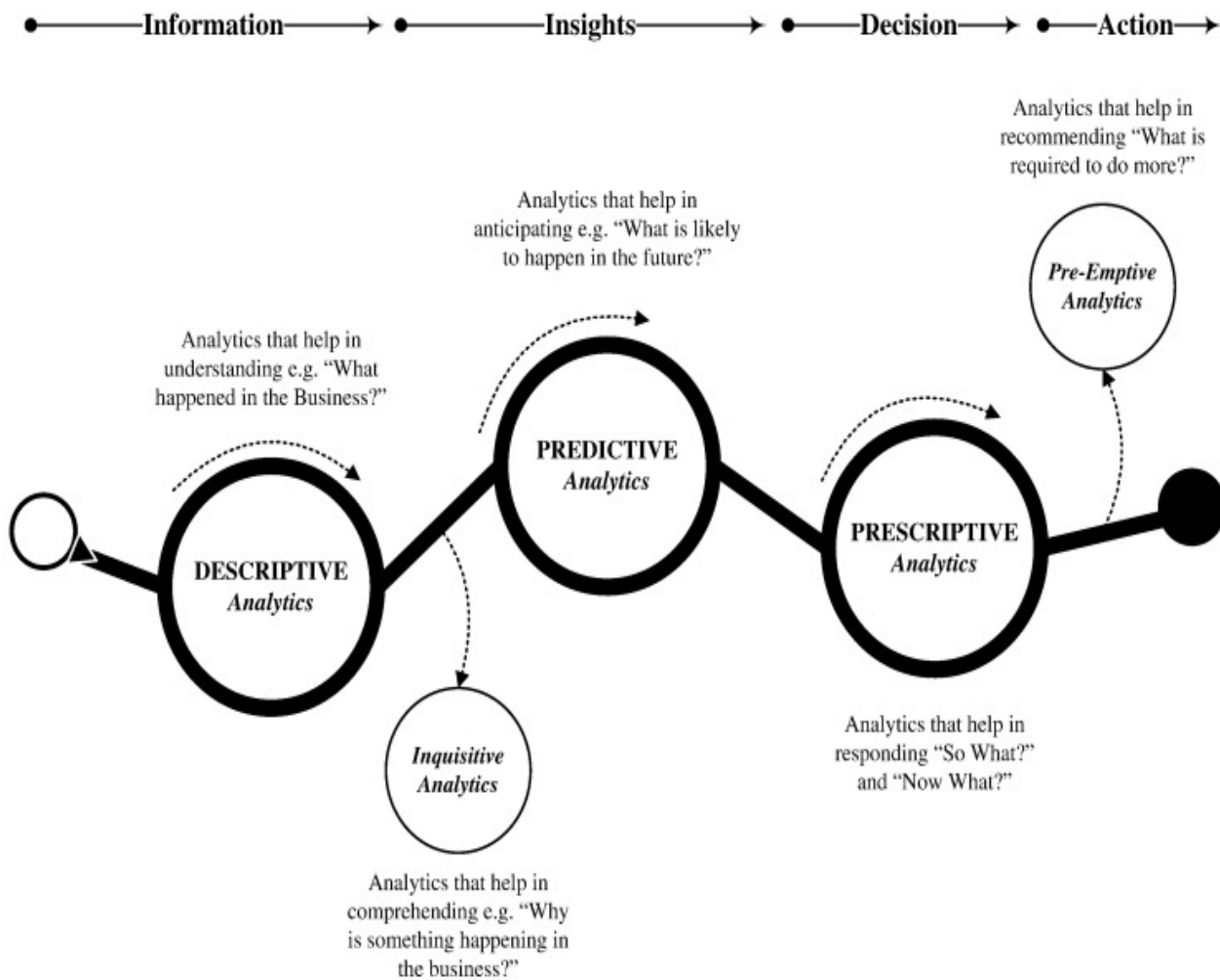


Figure 2: The Process of Data Analysis to the Decision Point

clear advantage of anomaly-detection models adapted by HVFAC is that the organization was able to save \$2.6 billion in 2018 and gain about four dollars for every dollar used on the program (Bullocks, Yang, & Wang, 2020), which indicates that significant benefits could be seen with the employment of such a system.

According to Morgenstern et al. (2021), analytical and predictive models that use AI have proven themselves capable of surfing through big data to draw specific information/statistics from a large database, as shown in Figure 2 below. Software powered by AI can aid in the efficient analysis of data, as well as in highlighting valuable insights, such as in the case of the use of

AI text-analysis models that employ techniques of natural language processing to comprehend human language; this way, they can perform text-mining and even analysis on different platforms such as social media, internal office databases, and specific documents. Other models that have been used to change the face of administrative work are sentiment analysis models, which also employ natural language processing to group data (text) by opinion. Through visualisation, analysis, and prediction, this would help an administrator to understand customer feedback significantly, since here, they would have a more comprehensive picture.

Bullocks, Yang & Wang (2020) present the framework of street-to-system-level bureaucracy, noting that Information Communication Technology (ICT) is rapidly changing; that is, the nature of work in many organizations that use ICT has been evolving from human-to-human to human-to-computer, creating a screen-level type of bureaucracy. Thus, the street-level bureaucracy has shifted to a screen-level one supported by smart systems which co-work with employees. In fact, Bullocks, Yang & Wang (2020) debate the idea that ICT that uses smart technology is soon going to be the only reliable form of communication in organizations, with screen-level bureaucracy governing administrative tasks (e.g., phone placement; message-taking; activity-scheduling; staff evaluations).

Simulation models in AI can equip designers and engineers with unique and efficient ways to produce prototypes and other products: for instance, one can design products much quickly, more accurately, and within stated specifications. Notably, the employment of frameworks that use computer-aided design and drafting has not been popular in administrative work due to the presence of competent human designers—and yet administrative professionals can still perform design tasks easily with AI systems for design simulation. Note that design simulation further employs other techniques (e.g., topology optimisation; generative design capacity). Indeed, AI is now being employed in order to achieve design optimisation, which results in less costly, more appealing, and stronger designs.

In a study by Wu & Shan (2021), AI is found to be a strong supporter of social governance because it has penetrated most spheres of socioeconomic life: not only are people enjoying the benefits of AI in schools, churches, and gaming arcades, but also in everyday life. Based on the theory of social governance, AI can fulfil the needs of society either by enabling other aspects or by fully automating processes in order to ensure the access and availability of different services and products, as specified by the user.

In order to evaluate typed documents, Cox (2021) notes automatic writing evaluation (AWE) tools can be used to appraise and draw feedback on the content of different documents and manuscripts based on a provided baseline, as shown in Figure 3 below. An example of such popular applications is LearnAndWrite and also Grammarly, which can be used to complete administrative tasks, including proofreading reports and surveys. Additionally, technologies such as conversational agents have been invented, in turn providing an interface that is interactive on a human level. For instance, virtual assistants use AI to provide a wide range of administrative tasks, such as the management of email accounts, generation of designs, and even-record keeping.

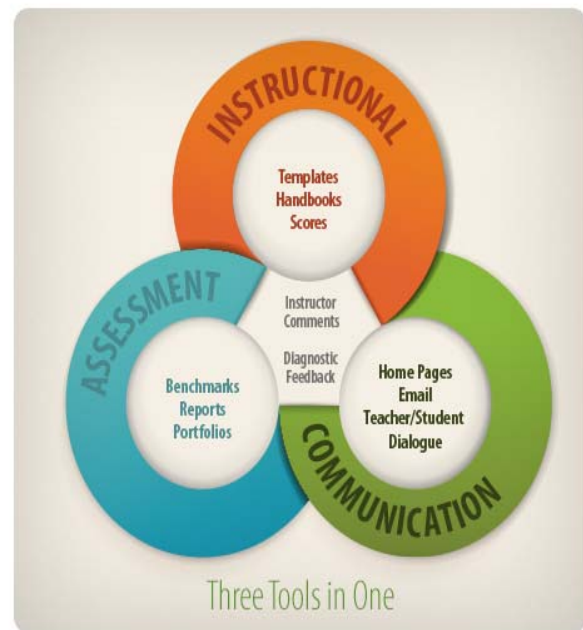


Figure 3: Tools Present in an Automatic Testing and Writing Model

In hospital administration, Phillips (2021) notes that the use of different applications of telehealth has aided the optimisation of participation and follow-ups with patients even in remote areas. Notably, biomedical informatics has additionally been used to enhance healthcare services and to

streamline the administrative operations in medical institutions.

3.1 The Integration of Artificial Intelligence into Routine Tasks

Routine administrative tasks include scheduling, planning, analysis, typing, and the evaluation of reports. According to Borner et al. (2020), the automation of routine tasks in organizations is often grounded on different aspects (e.g., the type of duties performed; access; security): for instance, smart ICT systems can automatically schedule appointments for different guests, taking the management of diaries and itineraries from physical to online. Further, using features such as machine learning, a daily attendance report can be generated every morning based on the digital registration of employees as they arrive at work. Furthermore, AI can be used to generate and send reports directly to the human resources office. Indeed, as can be seen here, business automation using AI can eliminate the extra costs needed to employ individuals to complete that task, human errors, and the extra time taken by humans to ensure the work done is perfect. It can also boost employee productivity by eliminating repetitive tasks that can get boring, thus draining motivation.

3.2 Human Resources Interaction with Smart Applications

AI has a direct impact on how human resource (HR) offices operate: not only does it change how files are stored and retrieved, but also how employees and other staff are contacted and even recruited. For instance, online application systems help HR officers to sort through their first pool of applicants and filter out those who don't have a certain aptitude level; further, HR officers can maintain their evaluations by using automated performance appraisal tools that can visualise the entire contribution a given employee will provide in comparison to others. One advantage of smart online application systems is that they are fast,

efficient, and able to reach a wider pool of applicants—and in this vein, Momtaz (2021) explores an emotion-based AI approach that derives data from cognitive technology to present an efficient interpretation of different facial actions. Note that AI applications that are used to manage information and statistics surf through a large amount of data for analysis and appraisal, meaning different staff may believe that their privacy is not paramount to the organization. For instance, excessive surveillance in offices can alienate employees and break the trust between subordinates and management—and, similarly, the Dutch risk-profiling system named SyRI was discontinued by the Dutch government because of its compromising the data privacy of users (van den Homberg et al., 2021).

3.3 Recognising the Applications of Cognitive Computing and Machine Learning

As noted earlier, cognitive computing enables AI by providing mechanisms that permit inanimate objects to have a sort of awareness. In his study, Cox (2021) describes a voice recognition application that provides answers to different administrative questions: with the use of cognitive computing and machine learning, this application can return accurate answers to guests seeking to book an appointment, relay a message, or get familiar with the institution's frequently asked questions. Agerfalk (2020) notes that machine learning allows systems to perform cognitive computing tasks through the use of inbuilt algorithms and external data. Figure 4 below shows the different uses of machine learning (e.g., diagnostics; reinforcement).

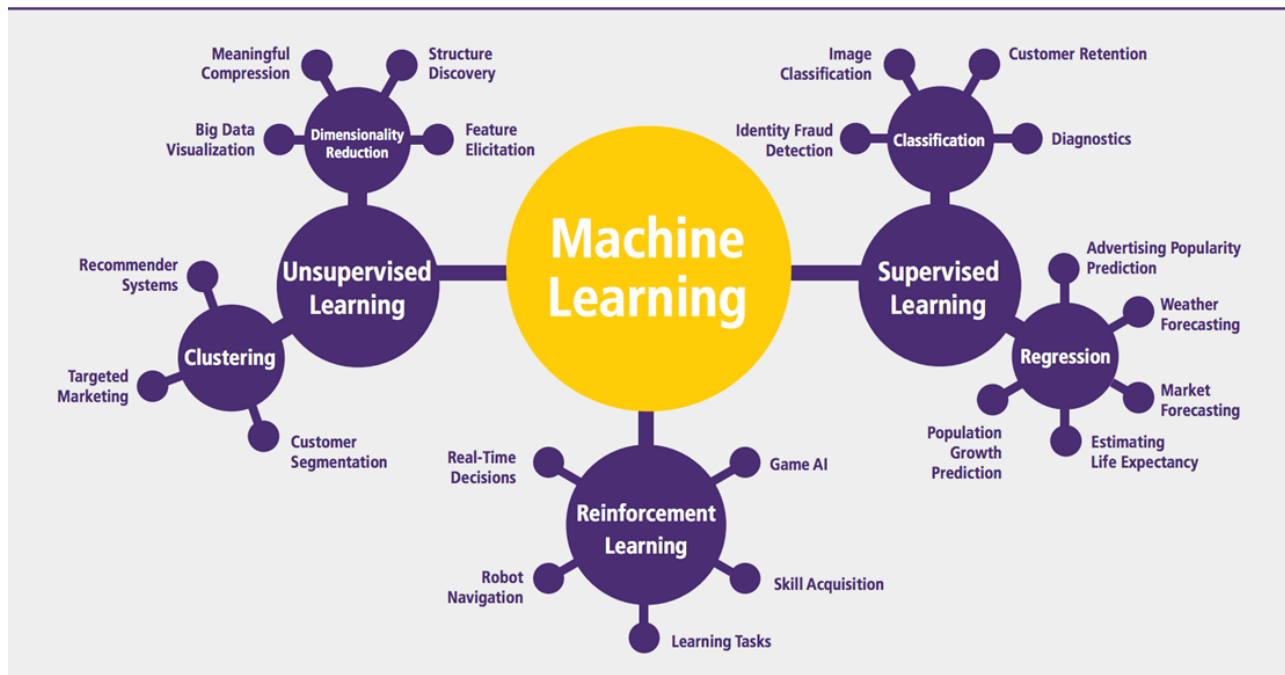


Figure 4: Machine Learning and How it can be Leveraged in Organizations

Other applications include self-service technologies that ‘learn’ different administrative duties (e.g., placing and recording orders/medication) (Singh et al., 2019). This has contributed to the emergence of vendor-independent shops and sites. Indeed, this means that different administrative properties have been assumed by self-service AI technologies.

3.4 Identifying Data Analysis Techniques and Their Role in Employee Performance

Data analysis techniques that are often used to appraise employee performance include graphic rating scales, the use of objectives and targets, self-evaluation, and the employment of 360-degree feedback chains. According to Cox (2021), AI learns from data, and thus always depends on it to make correct analyses and predictions—meaning that these data tools have a central role in the measuring of employee performance because of their inbuilt analytic and predictive models and algorithms. Cox (2021) further affirms that performativity is a result of

datafication—that is, data analysis tools prompt organizations to a behaviour-change that points performance towards given merit.

3.5 The Quality of Decision-Making Based On the Outputs of Smart Applications

The results of AI technologies and tools are often considered to be accurate enough for the basis of decision-making: for instance, in an AI application developed for self-check-in, the resultant report that is sent to the HR office for evaluation of staff work arrival times can be assumed to be accurate and free of interference or anomaly. However, Liu, Lin & Chen (2019) explain that the reliance of AI on big data creates a potential bias associated with the source of data, inaccurate inferences, and/or even the ‘black-box’ problem of algorithms. For instance, the recently developed COMPAS risk assessment tool (designed for court proceedings) can return both biased and unbiased results, depending on the quality of the input. Li et al. (2021) further found that AI-enabled applications can perform strongly when the data input is free of potential bias—and

yet despite this, they advise that it is imperative to consider any potential bias.

4. 4. The Important Elements for Using Artificial Intelligence in Organizations

As of 2021, AI is being driven by the advancements of big data, machine-learning, and natural language processing—and in order to ensure that the applications and tools of AI are effective within different organizations, it is imperative to consider their attributes and demands so as to ensure they can effectively support machine-learning, big data, and natural language processing. According to Bates et al. (2020), it is more than important to employ critical thinking so that users can have the capacity to comprehend and assess different results from AI tools. With this in mind, the requirements and attributes of AI tools and applications in organizations include:

- **Adaptability.** An AI application/tool must be able to adapt to its immediate environment through machine-learning techniques, thereby getting better after every performance (Chowdhury, 2022).
- **The Ability of Data Ingestion.** Because AI technologies work with large volumes of data and information, a system must possess data ingestion so as to ensure that it can process voluminous data and still maintain a high speed (Budhwar, 2022).
- **Reactivity.** This attribute means that systems will be able to change based on external conditions—that is, they will be able to monitor data and even ‘summon’ or bring to play rules and other behavior that can be used in cognitive computing/decision-making and analysis (Stahl, 2022), (Gudkov, 2020).
- **Concurrency.** With the use of techniques derived from databases and the development of operating systems, AI systems must be able to deal with multiple queries and processes at a time (Scheetz , 2021), (Sandeep, 2022).
- **Hybrid Information Technology Platforms.** AI systems require platforms that can support the interconnectedness of different tools, since there is no single architecture that can solely support it; rather, AI systems need hybrid platforms that can offer ingestion, concurrency, reactivity, analytics, and support for machine-learning frameworks and algorithms (van Noordt, 2022), (Bates, 2020).
- **Internet Connectivity.** An effective hybrid platform can run efficiently on the cloud, because here, it can adjust when necessary, unlike traditional data centres.
- **Security Governance Technologies.** Since AI targets a large pool of data, it is more than imperative to ensure that cybersecurity measures are tightened in order to protect the privacy and confidentiality of information (Lucero, 2019).
- **Focus on the Capacity of Organizations when Developing AI.** Lucero (2019) advises that rhetoric by itself is not enough during the development of AI technologies; rather, it is imperative to ensure that an organization can implement AI systems and support a smooth transition (Momtaz, 2021), (Loebbecke, 2020).
- **Expertise.** The operators of different AI must be well-equipped with the necessary skills to install, operate, and even troubleshoot different issues within the acquired technology. Either new, skilled employees in that field can be recruited or

the services can be outsourced (Solow-Niederman, 2019), (Fejes, 2021).

Note that different applications and tools possess various computing demands that must also be fulfilled so as to ensure that they are to run efficiently within the infrastructure of a given organization. In light of the above discussion, this research study provides a recommended framework for using artificial intelligence in organizations that consists of a three-tier architecture of devices, communication, and governance in order to summarize the contents of the article. A sample of such a framework is shown in Figure 5.

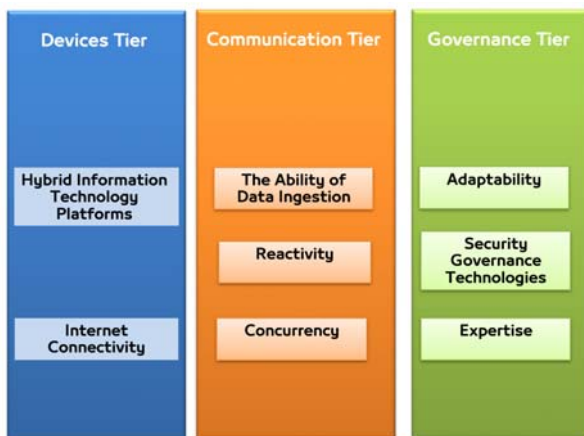


Figure 5: A Proposed Framework of Using Artificial Intelligence in Organizations

5. Conclusion

AI is an emerging and disruptive technology using concepts such as machine learning, deep learning, and even natural language processing to create smart tools and applications that automate work processes and tasks. In administration, AI can be used to automate routine tasks and speed up processes, and due to the shift from traditional bureaucracy to a screen-level type of bureaucracy, AI processes have changed businesses to include person-computer activities, in addition to the conventional man-man tasks. Notably, AI can be used for HR interactions to perform tasks such as

data analysis and prediction—meaning even employee performance appraisals can now be automated. Applications of AI can speed up processes, minimize costs, eliminate human error, and even increase operational efficiency. Note, however, that there is a potential bias in AI data related to the source of the information.

The requirements and attributes of the proposed framework for using AI in organizations consist of three tiers which includes expertise, security governance technologies, adaptability, reactivity, hybrid systems, data ingestion, concurrency, and the presence of Internet connectivity. The future plan will be focused on evaluating this framework using expert evaluations from administration and technical perspectives.

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Data Availability

All data generated during this study are included in this published article.

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