

THE ROLE OF ALGORITHMS, AUTOMATION AND ARTIFICIAL INTELLIGENCE IN HUMAN RESOURCES MANAGEMENT

INTRODUCTION

The Fourth Industrial Revolution (4IR) is intimidating for most of us. Our understanding of and competence in fast-developing technology is often challenged, both at work and in our home environments. Previous SABPP Fact Sheets have explored HR's place in the 4IR and South Africa's constraints in facing the 4IR.



In this factsheet, computational concepts associated with the 4IR are unpacked, exploring how these concepts impact employment, work, and the HR function. We will look at what algorithms, automation, and artificial intelligence (AI) are and how they could play a role in the HR function. We will then explore the opportunities and challenges associated with the use of these for employment, work, and the HR function.

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USE OF TECHNOLOGY IN HRM

The first and most common purpose for which technology is used in the HR function is to make a HR process easier or simpler. Most organisations employ IT within the HR function, even if they only use word processing, spreadsheet tools and the internet. A large number of HR departments – especially in larger and medium-sized organisations – operate on some type of HR technology platform. Most global organisations invest in a combination of enterprise resource planning (ERP), HR service centres, employee portals, web applications, interactive voice response (IVR) and voice recognition systems (Mishra & Akman, 2010). Organisations use HR portal tools for company communication, access to employee-related policies, information regarding work and life, training, HR record keeping and recruitment. Automated processes within HR eliminate the need for HR professionals to perform manual, repetitive and administrative tasks. Automation is discussed in detail further on in this Fact Sheet *here*.

The second purpose for which technology is used in the HR function is to report on organisational and HR activities. HR metrics and its interactive visualisation in the form of HR dashboards are all artifacts of this form of technology utilisation in the HR function. While in the past, HR reporting involved static reports and survey results, thanks to AI, we now have highly interactive HR dashboards which enable us to examine operational issues, or to look at people issues at a strategic level. AI is deliberated further on in this Fact Sheet **here**.

The third purpose for which technology is used in the HR function is within strategic evidence-based decision making. Controlling an organisation, or even a simple process in the current context of the VUCA world, is complex. There is a lot of uncertainty and unpredictability in the environment, due to which decision makers are becoming adamant on substantiating their decisions with evidence. This is even truer in the HR function, because employees and employment are highly unpredictable, especially in the current environment. In other words, the objective of quantifying activities within the HR field ultimately comes from the fact that organisations are trying to be more certain and predictable (Kolkman, 2020).

Thus, technology can be used in the HR function for the following purposes:

- 1. To reduce administrative load (present);
- To obtain and report information quickly and effectively, to ultimately support business (past); and
- 3. To strategically contribute to business through predictions (future).



REDUCE ADMINISTRATIVE LOAD

- PRESENT -



OBTAIN AND REPORT INFORMATION QUICKLY AND EFFECTIVELY, TO ULTIMATELY SUPPORT BUSINESS

- PAST -



TO BUSINESS THROUGH PREDICTIONS

- FUTURE -

3

TECHNOLOGY DECODED

Many professionals who are not in the IT field tend to get overwhelmed by technology and may not take the time to understand what it is and, very importantly, what it is not. Understanding some basic terms within the field of technology will enable one to understand the role of technology as a tool within the HR management space, and to also utilise it more effectively. In this next section, we will explore algorithms, flowcharts, automation, artificial intelligence, machine learning, analytics and dashboards.



ALGORITHMS

An algorithm is a sequence of simple and well-defined instructions that are usually executable by a computer. The overall purpose of algorithms is to solve problems or to execute a task. An important characteristic of an algorithm is its reliability. An algorithm always produces the same output information when the same input information is entered into the algorithm. Every time that you engage with IT, in the form of a calculator, computer or even a car, you are engaging with algorithms.

The simplest example of an algorithm is a recipe. A recipe provides you step by step instructions on how to convert your ingredients (inputs) into a palatable meal (output). If you follow the recipe exactly as it has been provided, the output will always be the same from the same inputs. Similarly, algorithms enable the step by step processing of data (input) to convert it into information (output) which can be used for various purposes.

Algorithms can be represented by *flowcharts*, which are simply diagrammatic representations of the step-by-step approach. Flowcharts show each step in a box, and the flow of the steps by connecting the boxes with arrows. The boxes have different shapes to denote different purposes of each step. Thus, elongated circles show the start or end of a process, rectangles show action or instruction, parallelograms show input or output, and diamonds show where a decision must be made. Diamonds will have more than one arrow emerging from it, depending on the decision that must be made.

Another important characteristic of a good algorithm is that each step of the algorithm is definite and unambiguous. The more ambiguous an algorithm is, the more variability there is in the output of the algorithm. Thus, if each step and the output of each step are clear, then chances that the algorithm is effective in giving the expected output are high.

Algorithms are closely associated with processes. If a process has specific steps and stages, an algorithm can be developed for the process. Here is an example of an algorithm that outputs the larger number of two numbers that are inputted:

STEP 2 Input the two numbers (let's name them N1 and N2) STEP 3 If N1 is greater than N2, go to Step 6 STEP 4 Display 'N2 is the larger number' STEP 5 Go to Step 7 STEP 6 Display 'N1 is the larger number' STEP 7 Stop	STEP 1	Start	The equivalent flowchart is given below:
STEP 3 If N1 is greater than N2, go to Step 6 STEP 4 Display 'N2 is the larger number' STEP 5 Go to Step 7 STEP 6 Display 'N1 is the larger number' STEP 7 Stop DISPLAY "N1 IS THE GREATER"	STEP 2	Input the two numbers (let's name them N1 and N2)	START
STEP 4 Display 'N2 is the larger number' STEP 5 Go to Step 7 STEP 6 Display 'N1 is the larger number' STEP 7 Stop Display 'N2 is the larger number'	STEP 3	If N1 is greater than N2, go to Step 6	INPUT N1, N2
STEP 5 Go to Step 7 STEP 6 Display 'N1 is the larger number' STEP 7 Stop	STEP 4	Display 'N2 is the larger number'	\downarrow
STEP 6 Display 'N1 is the larger number' STEP 7 Stop DISPLAY "N2 IS THE GREATER"	STEP 5	Go to Step 7	$\begin{array}{c} \text{IS} \\ \text{N1>N2} \\ \text{?} \\ \text{Yes} \end{array} \text{DISPLAY "N1 IS THE GREATER"} \end{array}$
STEP 7 Stop DISPLAY "N2 IS THE GREATER"	STEP 6	Display 'N1 is the larger number'	↓ No
	STEP 7	Stop	DISPLAY "N2 IS THE GREATER"

AN ALGORITHM IS LIKE A Recipe

Muhammad Waseem

While the above example is a simple algorithm, more complex algorithms can be developed for more complex processes. The more complex an algorithm is, the more complex the equivalent flowchart would also be.

Algorithms can be developed for HR processes and procedures if each step is definite and unambiguous. As workforce digitisation creates large volumes of data, algorithms are in fact crucial to value-adding data interpretation (Cheng & Hackett, 2019). Please find below the example of a flowchart for a recruitment process.



Recruitment Process Flowchart

Source: https://www.conceptdraw.com/How-To-Guide/types-flowchart

As you can imagine, a recruitment process is trickier than identifying if one number is greater than another. But each step is specific and unambiguous and that makes it a straightforward process. Thus, HR processes can be described using algorithms. For the same reason, repetitive, simple tasks and, in some instances, complex tasks can be handled by a computer if the process can be described in the form of an algorithm. Thus, algorithms become the basis of automation in HR.

Algorithms are the basis of all sophisticated application of technology, not only automation. Dashboards and AI are also based on algorithmic models. Thus, if a software application does not function the way it should, the algorithm must be reviewed to determine what the issue is. There are two reasons why an algorithm may malfunction. The first is that there is an error in the process flow itself, and the second is that there may be a step that is ambiguous or unclear. It is such errors that can cause sophisticated technology to malfunction. The negative effects of using technology blindly without considering such errors are *discussed further below*.

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AUTOMATION

Automation is the technique through which a process or system operates without human intervention. While traditionally, automation refers to those tasks once performed by human beings, more recently, automation also refers to tasks that would be impossible for human beings to achieve in the absence of technology.

Automation enhances the efficiency of the HR function by freeing HR professionals and employees from tedious and repetitive manual tasks. Automation works by following set rules or processes to complete tasks. Payroll and records management are two aspects of HR management that have been highly automated.

As mentioned previously, the basis of automation is algorithms. With the help of algorithms, computing systems can process large amounts of information accurately and consistently and removes human error and bias.

Automation enables many repetitive, low-value back-office functions to be done faster and more efficiently, enabling more reliable HR transactions and service delivery (McGovern, Pandey, Gill, Aldrich, Myers, Desai, Gera & Balasubramanian, 2018). In general, HR professionals spend a lot of time on standard onboarding processes, sorting through common questions and requests, and basic payroll and benefits management. If these activities are automated, it would leave the HR professional with more time and information, which they can use to be more creative and strategic.

Automation and AI may have a lot of common features, but they are actually very different concepts. While automation software follows pre-set rules, which may lead to the generation of various forms of information, AI is designed to simulate human thinking. AI is designed to constantly seek patterns, learn from experience and self-select appropriate responses. Simply put, while automation collates data, AI systems learn from data. In the next section, AI is explored further.

Source: www.globaltechcouncil.org

ARTIFICIAL INTELLIGENCE

AUTOMATION

WHAT'S THE DIFFERENCE?

DEFINITION

It deals with technologies or processes that competently mimic how humans react to new information, make decisions, speak, hear, as well as understand language. Automation is driven by a programme or software with simple programming. It has a single purpose: to let machines perform repetitive, monotonous tasks.

BENEFITS

It increases revenue and productivity.

It increases productivity, reduces variation, reduces cost and increases reliability.

EXAMPLE

An example of AI is self-driving cars using human-like vehicle handling.

An example of automation is email automation used by the marketing team.

ARTIFICIAL INTELLIGENCE

Artificial intelligence (AI) is a sub-field within computer science based on the hypothesis that machines can think, mimic, learn from experience, adjust to new inputs, and solve problems the same way that humans can (Duan, Edwards & Dwivedi, 2019). Al builds upon different disciplines which include formal logic, probability theory, decision theory, management science, linguistics and even philosophy, and is a sophisticated form of automation. As a field, AI is continuously evolving. Siri and Google Assistant are examples of AI in our day-to-day lives.

Al is based on highly sophisticated and complex algorithmic models which process, learn and manipulate data and thus 'learn' from data. Al offers reliability, speed, cost effectiveness, solutions to complex problems, and the ability to make decisions. For example, if you call into a bank, you will be taken through a series of Interactive Voice Response (IVR) questions to which you will input a number or some other data to get the answer to your question. Only if your answer cannot be provided by the system, does the IVR system direct your call to an actual human being. Many websites now have chat options, which are also handled by 'chatbots'. If customers are handled using these forms of artificial intelligence, employees can also be assisted using artificial intelligence. Furthermore, Al can integrate a large number of computers and databases to solve highly complex problems.

The algorithmic models that are at the basis of AI are useful because such models may yield results that may not otherwise have been considered For example, Deloitte found that a lack of grammatical errors on a dataset of resumes predicted the performance of salespeople more than their academic grades (Bersin, 2013).

Al can be categorised into three areas:

- understanding and learning from external data,
- attempting to imitate human cognitive functions such as vision and speech, and
- tackling the complexities of human thinking and feeling (Kaplan & Haenlein, 2019).



UNDERSTANDING AND LEARNING FROM EXTERNAL DATA ATTEMPTING TO IMITATE HUMAN COGNITIVE FUNCTIONS SUCH AS VISION AND SPEECH, AND



TACKLING THE COMPLEXITIES OF HUMAN THINKING AND FEELING

Understanding and learning from external data is referred to as **machine learning**, while the capability of machines to imitate thinking and feeling refer to **affective computing**, **fuzzy logic**, **self-learning** and **decision support**. **AI robotics** incorporate all the above categories of understanding and learning, imitating human cognitive functions and thinking and feeling.

ANALYTICS AND DASHBOARDS

Analytics relates to collecting and analysing data to gain insights to predict future behaviour. Thus HR analytics enable organisations to establish patterns about their employees and employment practices (Noack, 2019). Predictive analytics is utilised specifically by organisations to develop insights regarding people matters, for example, the work done by Afriforte (*https://afrifortecloud.com/sabpp*) which collects large amounts of employee health and safety data and can, using clever algorithms, predict burnout and accidents caused to stress. Similarly, FNB can, using large data sets, predict employee turnover, as presented to the HR Standard Summit of 2014.

Furthermore, analytics is being used to determine costs and returns on investment on various interventions. HR analytics is a broad and substantial field of study, which requires a factsheet on its own.

In the context of this factsheet, HR analytics is discussed for two reasons. Firstly, automation is utilised to collect data and to develop HR analytics. Furthermore, AI and machine learning are utilised to create interactive visualisations which are commonly referred to as dashboards. These dashboards are useful in enabling decision-making within organisations. Through dashboards, HR functions have quick and advanced access to people data, enabling improved decision-making. Thus, automation and AI play an important role in enabling HR analytics and dashboards.



AUTOMATION AND AI IN THE HR VALUE CHAIN

As mentioned previously, technology is most effectively used in HR to reduce administration. Automation, in the most primal sense, has taken away much of the repetitive tasks in the HR function. A by-product of such automation in HR is the data obtained, which introduced HR professionals to mainstream data analysis and evidence-based decision making. Data obtained from within the HR function and outside of the HR function in the organisation and data obtained externally may all be used to enable decision making in the organisation. Utilising AI in this space is enabling improved decision making and exposure to scenarios and possibilities that may not have been considered previously.

Automation and AI offer considerable opportunities to improve HR functions. Merging AI with HR administrative functions can benefit and improved the overall employee experience (McGovern et al., 2018). Humans and AI are together producing large amounts of data, and the use of AI is creating the opportunity to develop better insights into human behaviour and ability to perform.

An important contribution that AI can make to the HR function is to create personalised employee experience (McGovern et al., 2018). Beginning with the recruitment process, AI can enable organisations to find the right information about potential applicants with lower costs in less time and securely. While recruiting teams struggle to source and attract qualified candidates, AI can be utilised in the sourcing phase to streamline the recruitment process, identify passive candidates who meet job requirements, narrow down key sources that have produced successful hires and placements in the past, and increase success (Cheng & Hackett, 2019).

Automation can enable effective onboarding, answering employees' questions and helping them get up to speed quickly. Al can help update personal information on behalf of employees securely. Managers can access their teams' information and perform HR transactions from remote locations. Chatbots can authenticate employees and provide them with only authorised information (McGovern et al., 2018). Team managers can plan digital learning opportunities based on skill-gap assessments powered by Al. Furthermore, the employee experience can be validated on a regular basis by consolidating and comprehensively analysing people's statements, mood and intentions on social media and other public-data sources.



HR STANDARDS, AUTOMATION AND AI: AN INSIDE-OUT APPROACH

The National HR Standards initiative of the SABPP aims to reduce inconsistencies in HR practice and to provide a common and standardised framework for sound HR practice. In its fundamental purpose, therefore, the HR Management System Standards model can be used as a framework to drive automation and AI in an organisation's HR processes, because automation and AI thrive in consistent and standardised environments. Driving automation and AI in HR could be done through an 'inside-out approach', which is divergent to the 'outside-in' HR approach suggested by Ulrich (2012). While the outside-in approach suggested by Ulrich is relevant to strategic outlook and development, a simultaneous inside-out approach may be necessary to channel the use of automation and AI in the HR management.

The underlying rationale behind the 'inside-out approach' to employing automation and AI in HR is that, in order to make an impact in the technological context, the HR function needs to start from within. In other words, making an impact externally within the organisation may be possible once we have effective systems internally. The inside-out approach suggests that one could start from the bottom of the HR Management System Standards model. The HR Measurement Standard and the associated system could be the first to be automated, whereby the continuous process of gathering, analysing, interpreting, evaluating and presenting data is improved using various technological tools. The HR Technology Standard refers to the effective utilisation of technological applications and platforms, thus availing accessible and accurate intelligence for organisational decision making. The HR Technology Standard provides the basic framework to automate various HR processes and to utilise AI in HR activities.



While the HR Measurement and HR Technology Standards can be used to employ automation and AI in activities internal to the HR function, the HR Service Delivery Standard gives the HR professional the opportunity to utilise technology to improve on delivery of services and to support the effective management of the human element in an organisation. Furthermore, record-keeping, administration and implementation of HR policies, practices and procedures give the HR professional the opportunities to introduce technology.

Once HR measurement and HR service delivery elements are automated, one can effectively explore integrating automation and AI in the employee value chain. The HR Architecture Standards are a great starting point to explore and identify automatable elements outside of the HR function. Also, since these Standards are associated with implementation, the impact of such automation or AI application can be experienced in effect, not just by HR professionals but also by other stakeholders.

Business Strategy and HR Business Alignment elements can be technologised once HR Architecture elements are technologised. Such a process flow enables the use of information from the HR Architecture elements for effective reporting, decision making and strategic thinking.

Additionally, as one goes through the process of technologising various processes, HR professionals may come across opportunities to collaborate with others to ensure effective automation and AI application. Therefore, HR professionals must consider the impact of various automation and AI implementations on employees and line managers and the work that they must do. Especially because quite a few HR responsibilities are handled by line managers and employees through self-service applications, it is important that they are informed of and trained on such applications through a systematic change management process. HR professionals could also use the opportunity to collaborate internally with data and business analysts to better equip themselves with data and analysis techniques. Furthermore, collaborating with the marketing function and with the corporate governance function ensures that any implementation is done effectively and smoothly. Finally, HR professionals also can collaborate externally with and through professional bodies and with organisations that have good practices and create communities of excellence in this important aspect of HR.

DIFFICULTIES OF ADOPTING TECHNOLOGY IN HR

Most literature and research point to the advantages and benefits of utilising technology in HR. However, as is with any tool that one can use, adopting technology in HR comes with its own set of barriers and shortcomings. In this section, these difficulties are explored.

BARRIERS TO USING TECHNOLOGY IN HR

Financial barriers are often blamed for the lack of implementation of automation and AI in HR tasks, but there are several other barriers that cannot be ignored. Quite often, HR professionals, and other employees as well, do not have the right competencies to implement and manage automation and AI. Therefore, the ongoing maintenance of AI in the presence of financial and competence barriers can be quite overwhelming. Also, limited integration capabilities and limited proven application of various systems can get in the way of the implementation of various AI systems available in the market.

SHORTCOMINGS OF USING TECHNOLOGY IN HR

Besides the barriers that are described in the previous section, using technology and specifically AI in HR comes with its own set of challenges. These shortcomings must be acknowledged and addressed, as there are tendencies to blindly believe the accuracy and validity of anything that technology produces, due to the perceived objectivity of algorithmic models. Some of the shortcomings are described below.



1. BIAS

Technology is only as good as the creator, and in some instances, the user. Bias and existing worldviews, especially of the AI creators, can creep into the system and the information obtained through it due to overreliance on historical data in machine learning models (Nishant, Kennedy & Corbett, 2020). Amazon famously had to scrap the recruiting engine that they painstakingly developed because it showed bias against women and minority profiles (*Read more about it here*).

A similar concern relates to the issue associated with poor or inaccurate input data. If the wrong data is inputted into any algorithm, simple or complex, the output is not going to be useful. It is therefore important that assumptions that the implemented AI solution will always provide the correct response are carefully checked. The algorithm and its logic must be regularly revisited to ensure that the best and most accurate results are obtained.

2. HEURISTIC NATURE OF HR ALGORITHMS

Simply put, a heuristic is "an approach to problem solving or self-discovery that employs a practical method that is not guaranteed to be optimal, perfect, or rational, but is nevertheless sufficient for reaching an immediate, short-term goal. Where finding an optimal solution is impossible or impractical, heuristic methods can be used to speed up the process of finding a satisfactory solution" (Wikipedia). Organisational behaviour is a complex topic with many, often conflicting theories. An algorithm is designed based on the assumptions contained in a theory, therefore there is the possibility that a chosen algorithm is imperfect and will therefore produce an invalid result. So, while HR algorithms mostly offer solutions that are sufficient and practical, they are not necessarily optimal or perfect. Therefore, one cannot rely completely on the results or the outputs obtained from such algorithms, especially to make decisions. Thus, while the HR management field will increasingly utilise sophisticated IT applications, the efficacy of such decision-making tools in addressing typical HR problems need to be further investigated (Lawler & Elliot, 1996).





Algorithm, as mentioned in the factsheet, refers to a sequence of simple and well-defined instructions that are usually executable by a computer. Heuristic refers to a technique that helps you look for an answer. Algorithms are expected to be sound, precise, simple and complete. In other words, if you want to go from A to B, an algorithm will tell you the shortest and most efficient way to get there. A heuristic is more exploratory and therefore, its results are subject to chance. A heuristic doesn't tell you how to directly go from A to B, but it tells you how to look for A and B, and in between, it may even make you realise that B may not be where you want to go after all!

Much of what we do in HR has a heuristic nature. Human beings are complex. No HR professional can undoubtedly say that if we do step 1, 2 and 3, the employee will behave in a specific manner. So, converting some people processes into algorithms can be difficult, considering the heuristic nature of HR processes. This dilemma of algorithm and heuristic will therefore be an integral part of technologising people processes.



3. LOSS OF DATA PRIVACY AND EMPLOYEE CONFIDENTIALITY

A major concern regarding processing large amounts of data relates to employee data protection. Employees should always be aware that data on them is being collected and proper consent should be obtained, as required by the Protection of Personal Information Act, to be implemented later in 2020.



4. SMALL DATA SETS

The number of employees in an organisation, and the number of times a particular HR activity is done in an organisation may be relatively small, at least by the standards needed for data science (Tambe, Cappelli & Yakubovich, 2019). This makes the application of sophisticated data science techniques problematic.

CONCLUSION

The efforts and costs associated with utilisation of automation and AI can be justified as it reduces the amount of time HR professionals spend on administrative and repetitive tasks, performs routine HR transactions, provides answers to frequently asked questions, measures return on investments, offers personalised employee experiences, and reduces bias in HR decision-making. AI-based applications have the potential to raise employee productivity and help HR professionals become knowledgeable performance consultants. In order to remain competitive in today's global economy, organisations must seize the opportunities that 4IR technology has to offer and look at incorporating algorithms, automation and AI so that the HR function can performs its duties effectively and diligently.

From this month onwards, we are giving you the opportunity to earn 1 CPD point for reading the factsheet and answering 3 simple questions by following the *link*. We hope that you enjoy the read!

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PREVIOUS EDITIONS OF THE FACT SHEET

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