



Conceptualizing the Impact of AI and Automation on Leadership, Human Capital and Organizational Performance

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ABSTRACT

Humanity is at the brink of the Fourth Industrial Revolution which is poised to change businesses, industries and societies. While there is plethora of technologies on offer, Artificial Intelligence (AI) is touted as the most disruptive technology of them all as AI will have deeper and broader impact on businesses, workforce and on industries at large. Transformational leaders envision the possibilities of performance improvements via AI technology and developing the strategies to digital transformation. However, this paper aims to conceptualize the novel impact of the digital transformation in terms of AI and automation on organizational performance by scrutinizing the impact of AI on two key elements, to transform the leadership and human capital, that are used by all organizations in their performance measurement approaches and models. Our investigation was conducted by way of an extensive literature review and found significant implication on factors selected. The investigation also revealed that AI and automation will also have significant implications on the configuration of the future organization. Considering these implications, we postulate that organizational performance metrics of today need to evolve significantly to measure performance of future organization.

Keywords: Artificial Intelligence (AI), Automation, Human Capital, Leadership, Organizational Performance.

INTRODUCTION

Throughout history, the adoption of technology, from fire to steel, has transformed humanity and have helped build nations and empires (Diamond, 1997; Harari, 2014; Vince, 2019). Evidence shows that countries that have embraced technologies and industrialized have gained power and prosperity since the First Industrial Revolution and have lifted millions of people out of poverty (Crafts, 1989; Diamond, 1997; Engerman & O'Brien, 2004; Kniivilä, 2007; Macon-Cooney, 2019). Today these countries are ranked at the top in most aspects of economic, political, social and technological development and are generally identified as the modern world (Diamond,

1997; Macon-Cooney, 2019) showing that technology adoption is key for growth and economic prosperity. Since the First Industrial Revolution, as an integral aspect of a country's economy, business organizations have also adopted technologies to enhance their productivity and performance.

Today, humanity is facing a technological revolutions that will fundamentally alter our lives, work and the way we relate to each other in a scale and scope that have never been seen before (Schwab, 2016). Amongst the emerging technologies of today, Artificial Intelligence (AI) has been identified as the biggest

disrupting force and the business organizations that are slow to embrace AI may risk extinction (Raj & Seamans, 2019).

While the benefits of AI to human society and business organizations are vast, past experiences show that adoption of new technologies by business organization has not always proven a linear positive relation resulting high performance and productivity (Brynjolfsson et al., 2017) also known as the productivity paradox (Brynjolfsson et al., 2017). In most cases where technology adaptation and transformation has not delivered the expected results, there has been unrealistic expectations on technology capabilities (Borup et al., 2006). Hence it is critical for organization to understand the true potential and impact of AI and other frontier technologies and to be prepared to transform themselves to reap the expected benefits (Raj & Seamans, 2019; Saldanha, 2019).

Performance is an ultimate measure of success for organizations, since its only through performance organization can achieve sustainable growth (Gavrea et al., 2011). Since measuring organizational performance involves multiple variables, there are no universally accepted organizational performance management metrics. As technology impact on organizational performance are highly influence by the sociological expectations rather than the technical expectations (Borup et al., 2006), future organizational performance measurement metrics should take into account the impact of AI and other frontier technologies on leadership and human capital. leadership could be defined simply as the art of influencing people so that they will strive willingly towards the achievement of group goals.

Leadership plays a critical role between the organization and the individual employees and it influences the intensity of collaboration between the employees and the organization. (Timothy et al., 2011). As the key decision makers, leaders determine the acquisition,

development, and deployment of organizational resources and the conversion of these resources into products and services, and the delivery of value to organizational stakeholders. Hence, they are also the sources of sustained competitive advantage of the organization (Madanchian et al., 2016). Technology has significant impact on leadership and has been the catalyst for many of the existing leadership theories since the First Industrial Revolution (Björkman & Johansson, 2017; Brynjolfsson & McAfee, 2016). With the adoption of technology today's workplaces are becoming more collaborative and team-based, where cognitive and social skills are valued, and the approach to understanding leadership in the workplace is moving away from the classical leadership ontology, with clearly defined leaders, followers and shared goals towards collectivistic leadership approaches that looks at leadership as a process of shared responsibilities and contribution. Shared leadership is one such approach, in which team members share responsibility for a set of roles and tasks, where leadership cannot be separated from the social context (Björkman & Johansson, 2017).

We are witnessing the transition from a production economy to a knowledge economy, and there has been a paradigm shift in the way 'assets' are viewed within organizations. From a strategic management perspective, physical resources confer little advantage to organizations because they can be bought and sold on the open market with ease (McCracken et al., 2017). In a knowledge economy, it is the competence (intangible abilities and skills) of the workforce or Human Capital and the knowledge inherent within the organization's structures, routines, systems and processes which can contribute towards the knowledge capital of the organization. Human Capital not only plays a vital role in developing and creating new ideas and knowledge, it also facilitates social capital and the sharing of knowledge and ideas through internal relationships and complements a firm's structural and innovation capital by creating

new and unique knowledge (McCracken et al., 2017).

The digital transformation process that the world is undergoing at present is transformative compared to any previous technology disruptions. AI and Automation will enable us to infer and understand the world from a whole new perspective which will have significant impact on our present undressing of what is leadership and the role of human capital. This concept paper aims to analyze the impact AI and Automation on two key factors of organizational performance, leadership and human capital, and elaborates how this could influence future organizational performance measurement metrics. This paper aims to inquire, (1) what is the impact of AI on transforming leadership and human capital? And (2) How would this influence the organizational performance measurement metrics? Theoretical argument to this inquiry was developed based on extensive review and analysis of existing literature.

LITERATURE REVIEW

Continuum of Industrial Revolutions

The cognitive revolution and the emergence of fictive language 70,000 was the first revolution of homo sapiens (humans) followed by the agriculture revolution 12,000 years ago where humans began to domesticate plant and animals. (Diamond, 1997; Harari, 2014; Vince, 2019). The agriculture revolution paved the way for permanent settlement of humans and gave rise to the first kingdoms, scripts and money amongst other things (Diamond, 1997; Harari, 2014; Vince, 2019). During this period human societies were powered by human and animal muscle limiting the ability of growth.

The First Industrial Revolution which began in 1784's saw the rise of mechanization using water and steam and began replacing muscle power with steam power. The Second which began in 1870's used electric power to create mass production, invention of the internal combustion engine and saw the rise of cities and our modern education system. The Third which began in 1969 used electronics and

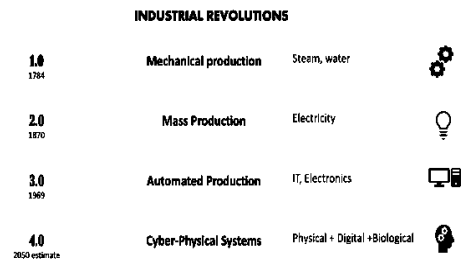


Figure 1: Industrial Revolutions. From Foreign Affairs. Retrieved from <https://www.foreignaffairs.com/articles/2015-12-12/fourth-industrial-revolution>. Copyright 2015 by Klaus Schwab.

information technology to automate production and gave rise digitization. Today a Fourth Industrial Revolution is being unraveled which is built on the Third. It is characterized by a fusion of technologies that is blurring the lines between the physical, digital, and biological spheres (Schwab, 2016; Xu et al., 2018). According to Schwab (2016),

"We are at the beginning of a revolution that is fundamentally changing the way we live, work, and relate to one another. In its scale, scope and complexity, what I consider to be the fourth industrial revolution is unlike anything humankind has experienced before".

Cyber-Physical Systems

The fourth industrial revolution goes far beyond manufacturing, automation and digitization of information. Today's technologies are advancing to a state where we are now capable of deconstructing and reproducing even biological matters. Today we are able to blur the boundaries between physical, digital and the biological worlds and create a new world of cyber physical systems (Schwab, 2016).

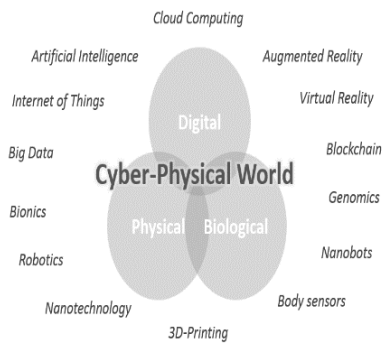


Figure 2 : Cyber Physical World. From Silicon Valley Innovation Center. Retrieved from <https://svicenter.com/the-fourth-industrial-revolution-is-here-is-your-business-ready/>. Copyright 2017 by Silicon Valley Innovation Center.

The reason for such a dramatic change which has not been seen during the past industrial revolutions is the velocity, scope and system impact of the current revolution (Schwab, 2016; Xu et al., 2018). A huge wave of emerging technologies such as Artificial Intelligence, Robotics, Virtual Reality, Nanotechnology, 3D Printing to name a few, are integrating with one another combining to deliver higher value than they could on their own (Xu et al., 2018; Zhulenev A, 2018). The breadth and depth of these changes are poised to transform the entire system of production, management and governance. However, concerns have also been raised that humans may eventually lose their economic and military usefulness and the economic and political systems may not value them in the future (Harari, 2016).

Emergence of Artificial Intelligence

Among all the emerging technologies Artificial Intelligence (AI) is by far the most important and disruptive (Rana et al., 2017; Zhulenev, 2017) as well as transformative (Hong et al., 2017). The field of AI as a science existed since 1956 but the last few years have witnessed significant breakthroughs. AI powered image-recognition software can now

match human vision capabilities and Natural Language Processing (NLP) is now on par with human-level language comprehension (Raj & Seamans, 2019; Hong et al., 2017; Zhulenev, 2017). Traditionally humans were considered to have two types of abilities physical and cognitive and in the past machines were created to support or replace humans physical abilities while humans still retained an immense edge of cognitive abilities (Harari, 2019). However as we develop powerful AI, humans are separating intelligence and conciseness, which we considered as cognition, and parting intelligence to machines which will have major implications to humanity as a whole (Harari, 2019).

AI can be broadly categorized into General Artificial Intelligence and Narrow Artificial intelligences where General AI refers to the ability of the system to think and act on its own and Narrow AI refers to systems that relies on highly sophisticated algorithmic techniques to find patterns in data and make predictions. Narrow AI is also referred to as machine learning as the system learns from existing data (Raj & Seamans, 2019). While General AI does not currently exist, we have already started using some Narrow AI applications to supplement our cognitive and administrative capabilities (Zhulenev, 2017; Raj & Seamans, 2019).

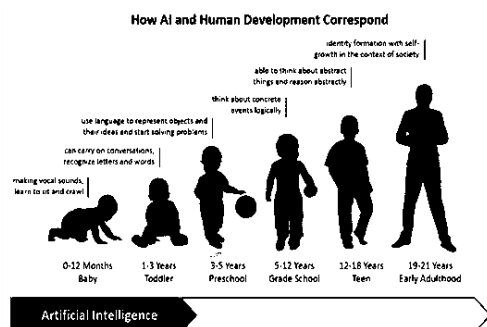


Figure 3 : AI and Human Development Correspondence. From Silicon Valley Innovation Center. Retrieved from <https://svicenter.com/the-fourth-industrial-revolution-is-here-is-your-business-ready/>. Copyright 2017 by Silicon Valley Innovation Center.

Personal assistant tools and chatbots are capable of holding a simple conversation which corresponds to a toddler today and they keep improving day by day (Zhulenev, 2017). Figure #3 below depicts the potential growth path of AI into the future, from Narrow AI to General AI.

Today, machine learning focuses on prediction and estimation of the unknown based on a set of given data and there are a variety of algorithms that are used in machine learning. While some of these algorithms are based on logit models others involve neural networks which are sophisticated algorithms that tries to mimic the human brain on how the brain looks for patterns in data (Raj & Seamans, 2019).

Impact of Artificial Intelligence on Business Organizations

The process of automation started with the First Industrial Revolution as the steam engine and the cotton gin automated some of the previously manual tasks (Frey & Osborne, 2017; Raj & Seamans, 2019). While AI, Robotics and Automation are related concepts they are different to one another. Robotics is technology that is used to automate physical tasks and AI is more about computer-based learning than physical manipulation. However, increasingly these two technologies are being combined to create smarter technologies that can go beyond performing physical tasks and continuously learn from themselves (Frey & Osborne, 2017; Raj & Seamans, 2019).

While in the past automation impacted industries with physical labor such as manufacturing and agriculture, today AI based automation is disrupting knowledge work and services industries such as banking, finance and healthcare. With the combination of AI and robotics, also known as smart automation, the disruption would be felt across multiple industries including manufacturing and transport and it seems that no industry would be spared (Frey & Osborne, 2017; Hawksworth et al., 2018).

Table 1: Key differences between automation and AI

Types of Automation and AI		What they can do	
Robotic automation process		Repetitive; Rule-based work.	
Artificial Intelligence (AI)	Applied AI	Judgement based processing	“Thinking”
	General AI, machine learning		“Learning”; improves over time. Example: natural language processing to understand human communication.
	Synthetic, computer based (“runaway”) AI	Decision-making; learning; doing; independent creation and improvement of AI without a need for human intervention.	

Note. Adopted from “The impact of the technological revolution on labor markets and income distribution” by Hong et al. 2017. Copyright 2017 by United Nations.

The Interplay between Technology and Humans

The theory of Social Construction of Technology (SCOT) holds that human action shape technology (Bijker et al., 1987) and technology is inextricably bound with social conditions (Yousefikhah, 2017). This view is contrast to technology determinism which argues that technology shapes human action (Campbell & Russo, 2003; Jaeger, 2001; Yousefikhah, 2017). Technology determinisms holds that technology exists and waiting to be found by humans and once found it will become the driving force of the society (Campbell & Russo, 2003; Jaeger, 2001). While there are a multiple social constructionist views generally all of them have a few things in common. They deny technological determinism, they recognize the interplay and interdependence between social and technological elements (Jackson et al., 2019). They also deny that technologies are

ever complete and they redirect attention from product to process (Jackson et al., 2019) which is a contradiction to SCOT.

Social constructionist inquiries have made a number of contributions to the understanding of the process by which technology and organizations interact that has resulted in the emphasis of co-construction of organization and technology. Like technology, organization are never complete as they continue to interact and reshape each other (Jackson et al., 2019). Technology enables many tasks to move from action centered to intellectual which has forced workers to develop certain level of abstraction about the task they perform which in turn enables to reconceptualize, restructure and improve their work. The use of technology to inform work as opposed to automation has had profound impact on organizational performance (Jackson et al., 2019).

Today, technology forms the core of the organization as organization become increasingly technology centric. The influence of technology in enabling employees of further abstraction of their task resulting in high productivity and innovation which cannot be ignored. A key feature of the future organization is the adoption and use of exponential technologies such as AI at its core and the influence of these technologies on leadership, human capital, customers and community will be profound. Understanding the technology – human interplay would be a critical aspect in determining performance of future organizations.

Growth of an Organization

Organizational growth is a complex phenomenon as it is not unidimensional since it could be conceptualized and measured in many different ways and it is hard to predict and assess. Further, it can manifest itself in various ways, and consequently it can have differential effects on several different levels (Naldi et al., 2010). The phenomenon of growth is used with two different discourses; growth as an (1) increase in amount (output,

sales, export, etc.) which is an absolute measure and as an (2) internal process of development (increase in size, improvement in quality, etc.) which is a relative measure. While the dominant measure of growth in general is increase in amount and studied quantitatively, the relative measures are generally studied qualitatively (Naldi et al., 2010).

The Unicist theory of business growth establishes the conditions that need to be given and the actions that need to be developed to promote growth in businesses. It further emphasizes on the limits that are given by the available resources and by the archetypes of cultures and institutions (Belohlavek, 2015). According to the Unicist theory, there are two simultaneous actions that need to be developed to make a business grow, (1) conjunctural actions that seize advantage of opportunities and (2) structural actions to develop the structural growth of a business. The process is approached considering (1) the context for growth, (2) the critical mass for growth and (3) the operation for growth (Belohlavek, 2015). Structural actions which are taken to develop the structural growth of a business entail the optimization of technology adoption by leadership and human capital for business growth. Considering the centrality of technology in current and future organizations, understanding the impact of technologies such as AI on leadership and human capital is critical to comprehend the growth of future organizations.

Organizational Performance

Organization performance is based on the idea that an organization is a voluntary collection of productive resources which includes humans, physical and capital resources for the purpose of achieving a shared objective (Carton, 2004). Organization performance can also be described as the relationship between minimal and effective cost, effective cost and realized output and output and achieved outcome (Shafiu et al., 2019). The idea of measuring performance of an organization is to give its stakeholder a view of the organization.

As the model of business and technology evolves, so does the need for information requirement to understand the organization (Kuske & Zander, 2004). Performance of an organization is vital as its only though performance an organization is able to grow and expand making performance a key indicator of organizational progress (Gavrea et al., 2011).

While the concept of organizational performance is common in academic literature, there is no clear definition of what organizational performance is since very few studies have corroborated consistent definitions and measures (Constantinos et al., 2014; Gavrea et al., 2011; Richard et al., 2009), hence there are multiple views could be found based on different authors perspectives. Since organizational performance can be measured using multiple aspects, which results in different interpretation of what is successful performance, each of these measures of organizational performance can also be considered unique. Moreover, every organization operates in its own unique environment making performance measurement inherently situational as well as contextual (Carton, 2004). Performance of an organization is influenced by its external environment which includes its customers, competitors and suppliers and its internal environment which includes its strategy, leadership, employees, quality, performance measurement, innovation, technology and corporate governance (Gavrea et al., 2011).

Measuring Organizational Performance

Performance can be explained as set of financial and non-financial indicators that informs the degree of achievement of objectives and results. Since performance is dynamic it requires judgement and interpretation. Performance could also be explained by a causal model which examines how current action may affect future results. It is also necessary to understand the multiple elements that are involved and their

characteristics and the areas of impact. The ability to quantify results is key for understanding organizational performance (Gavrea et al., 2011). According to Bourne & Neely, (2003), performance measurement means the following when referred to in literature and practice: (1) a set of multi-dimensional performance measures (financial/non-financial and internal/external) that quantify performance achieved and helps in forecasting future performance; (2) performance measurement required a reference framework against which the results of action can be judged. This framework is presently accepted as organization's strategy; (3) performance measure has an impact on the environment it operates. It is an integral part of part of management planning and control system as it influences the behavior of individuals and groups that are being measured; (4) performance measurement also involves assessing the impact on stakeholders whose performance is being measured. Performance might be understood differently by the different stakeholders of an organization making it subjective (Carton, 2004; Gavrea et al., 2011).

Up until the 1990's financial measures played a key role in measuring organizational performance. However, the understanding of the limitation of unidimensional financial measure triggered the move towards an integrated and multidimensional measurement approach after the 1990's. The introduction of multidimensional and interconnected variables for organizational performance measurement also bought in the idea of objective and subjective measures. Accounting measures, financial market measures and mixed accounting and financial market measures and survival measures are considered objective and other measures are considered subjective (Richard et al., 2009; Singh et al., 2016). Both objective and subjective measures are used together as the subjective measures enables the managers to factor in the objectives of the organization when evaluating their performance (Singh et al., 2016).

Today every approach and model for organizational performance measurement involves leadership and human capital as two key subjective variables amongst others, showing the significant impact these variables will have on overall organizational performance.

Table 2 : Comparison of traditional and non-traditional performance measures

Traditional performance measures	Non-traditional performance measures
Based on outdated traditional accounting system	Based on company strategy
Mainly financial measures	Mainly non-financial measures
Intended for middle and high managers	Intended for all employees
Lagging matrices (weekly or monthly)	On-time metrics (hourly or daily)
Difficult, confusing and misleading	Simple, accurate and easy to use
Lead to employee frustration	Lead to employee satisfaction
Neglected at the shop floor	Frequently used at the shop floor
Have a fixed format	Have no fixed format (depends on need)
Do not vary between locations	Vary between locations
Do not change over time	Change over time as the need changes
Intended mainly for monitoring performance	Intended to improve performance
Not applicable for JIT, TQM, CIM, FMS, RPR, OPT, etc.	Applicable
Hinders continuous improvement	Help in achieving continuous improvement

Note. Adopted from "Understanding Performance Measurement Through the Literature" by Khan & Shah, 2011, African journal of business management 5(35), pp 13413. Copyright 2011 by African journal of business management.

Influence of Leadership and Human Capital on Organizational Performance

Leadership and Organizational Performance

Leadership is an element that is often cited in organization performance literature as well as a key subjective variable in all the organizational performance measurement models. Leadership has a direct impact on the organizational profitability, share prices and it has been described as the key element that ensures connectivity between all the success factors of an organization (Gavrea et al., 2011).

When an effective leadership that involves motivation, management, inspiration, remuneration and analytical skills is present in an organization, the organization records increased employee satisfaction which has a positive effect on productivity and profit (Shafiu et al., 2019). A leader must have the ability to promote creativity and innovation and inspire his team to challenge their own value system to improve their performance, thus the style of leadership plays a significant role (Shafiu et al., 2019). Leadership style also has a direct influence in the organizational culture which in turn influences organizational performance (Al Khajeh, 2018).

Human Capital and Organizational Performance

Human capital is another key subjective element that has been reflected in all the organizational performance diagnostic models emphasizing the criticality of this variable. Poor employee engagement has a direct influence on organizational performance. (Gavrea et al., 2011). As human capital is characterized by the highest degree of restraint, attracting and retaining quality employees becomes a critical issue for competitive advantage and organizational performance. Studies have also shown the direct correlation between employee turnover and profitability of an organization (Gavrea et al., 2011).

Some scholars have also attributed organizational performance to employee job satisfaction and employee effective commitment (Shafiu et al., 2019). While employee performance depends on many factors' motivation, job satisfaction, training and development, employee motivation is considered critical as it has been shown to influence the overall organizational performance to a significant degree. It has been proposed that a motivated employee will generally have their goals aligned with the organizational goals thus contributing significantly to the organization performance (Dobre, 2018).

Training and development of employees is another critical aspect in improving organizational performance. Employee development is a process where the employee is trained by the organization to learn, acquire and update knowledge and skills (Kenny, 2019). Employee development tends to be a joint initiative of the employee and the organization to enhance existing skills and knowledge of the employee and enrich competency by training and development (Kenny, 2019).

Conceptualizing the Impact of AI on Leadership, Human Capital and Organizational Performance

Potential Impact of AI and Automation on Organization

The rapid advances in Artificial intelligence (AI), robotics and other forms of smart automation have the potential to deliver great benefits to the world economy by boosting productivity, creating new and improved products and services (Hawksworth et al., 2018; Hong et al., 2017). By 2030 these technologies are expected to contribute up to 14% of global GDP which is equivalent to US\$ 15 trillion at today's value (Hawksworth et al., 2018). However these technologies also have the potential to cause significant disruption to whole industries, job markets, organizations and governance structures (Frey & Osborne,

2017; Harari, 2016; Hawksworth et al., 2018; Kolbjornsrud, 2016).

A study published by Hawksworth et al. (2018) argues that there are large benefits to be reaped by business in all sectors and identify how this process might unfold over the period to the 2030's in three different overlapping waves of automation as shown in Figure 4.

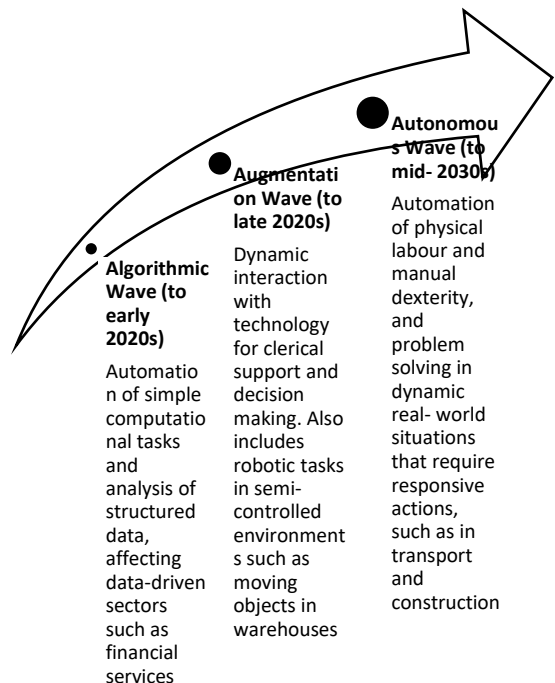


Figure 4 : Waves of Automation. Adopted from “Will robots really steal our jobs? An international analysis of the potential long-term impact of automation” by Hawksworth et al. 2018. Copyright 2018 by Price Water House.

As described by Hawksworth et al. (2018), (1) Algorithm wave, which is already underway, is focused on automation of simple computational tasks and analysis of structured data in areas like finance, information and communications. (2) Augmentation wave, which is also underway but will reach maturity in 2020's, is focused on automation of repeatable tasks such as filling in forms, communicating and exchanging information through dynamic technological support, and

statistical analysis of unstructured data in semi-controlled environments such as aerial drones and robots in warehouses. (3) Autonomous wave, where technologies are under development at present and will reach full maturity by 2030's, is focused on automation of physical labour and manual dexterity, and problem solving in dynamic real-world situations that require responsive actions, such as in manufacturing and transport (e.g., driverless vehicles).

Table 3: Key impacts in the three waves of automation

Phase	Description	Tasks Impacted	Industries Impacted
Algorithm wave	Automation of simple computational tasks and analysis of structured data, affecting data-driven sectors such as financial services.	This includes manually conducting mathematical calculations, or using basic software packages and internet searches. Despite increasingly sophisticated machine learning algorithms being available and increasingly commoditised, it is these more fundamental computational job tasks that will be most impacted first.	Data driven sectors like financial and insurance information and communication, and professional, scientific and technical services.
Augmentation wave	Automation of physical labour and manual dexterity, and problem solving in dynamic real-world situations that require responsive actions, such as in transport and manufacturing.	For example, routine tasks such as filling in forms or exchanging information, which includes the physical transfer of information. It is also likely to see a decreased need for many programming languages as repeatable programmable tasks are increasingly automated, and through machines themselves building and redesigning learning algorithms.	The financial and insurance sector will continue to be high impacted, along with other sectors with higher proportion of clerical support including public administration, manufacturing, and transport and storage.
Autonomy wave	Automation of physical labour and manual dexterity, and problem solving in dynamic real-world situations that require responsive actions, such as in transport and manufacturing.	AI and robotics will further automate routine tasks but also those tasks that involve physical labour or manual dexterity. This will include the simulation of adaptive behaviour by autonomous agents.	Sectors like construction, water, sewage and waste management, and transportation and storage with the advent of fully autonomous vehicles and robots.

Note. Adopted from “Will robots really steal our jobs? An international analysis of the potential long-term impact of automation” by *Hawthornthwaite et al. 2018. Copyright 2018 by Price Water House.*

As shown in Table 3, by 2030 the different waves of automation will have an impact across multiple tasks and across multiple industries.

Whether organizations and their leadership are ready to face the automation waves is another question. A study by Deloitte (2018), found

that while corporate executives have a broader understanding of the automation challenges ahead of them, they acknowledge their lack of readiness to harness the future as they are still focused on traditional business strategies. They also lack confidence with their workforce and face challenges with investments into advanced technology.

Potential Impact of AI and Automation on Leadership

Unlike the previous of automations which largely disrupted blue color and repetitive service jobs, recent advancement in AI and smart automation will also disrupt all levels of management in an organization, from strategic level to the frontline. Leaders and managers will have to reconsider their roles and will be forced to reconsider the basic principles they apply in managing their organizations and employees (Brynjolfsson & McAfee, 2016; Chamorro-Premuzic et al., 2018; Kolbjornsrud et al., 2016; Leurent et al., 2019).

As organizations begin to rely more on technology, the workplace will become more collaborative moving away from division of labor of today's workplace and the collaboration between humans and machines. Cognitive and social skills will be more valued the approach to leadership will move towards a collective leadership style where leadership will be a process of shared responsibilities and contribution. They also emphasize that all leaders and managers will have to place humans at the center and follow a people first strategy and their primary task will be enabling employees (Björkman & Johansson, 2017; Brynjolfsson & McAfee, 2016; Kolbjornsrud et al., 2016; Leurent et al., 2019). Figure 5 is a pictorial representation of the leadership style and supporting behavior of the future leader.



Figure 5 : Leadership in the Fourth Industrial Revolution: Six dimensions of leadership and supporting behaviors. Adopted from “Leading through the Fourth Industrial Revolution Putting People at the Centre” by *Leurent et al. (2019)*. Copyright 2018 by World Economic Forum.

Administrative management tasks (Hard elements of leadership) performed by today's managers such as coordination and control will be replaced by AI and the future managers will thrive on judgment work (Soft elements of leadership), which will require them to develop new skills and mindsets. Future managers will also have to learn to treat intelligence machines as colleagues, learn to collaborate digitally across boundaries and also work like a designer using their creative abilities (Brynjolfsson & McAfee, 2016; Chamorro-Premuzic et al., 2018; Kolbjørnsrud et al., 2016). Judgment work, according to Kolbjørnsrud et al. (2016), which they consider as the human advantage will require, considerable degree of creative and social intelligence, whether related to people development, problem solving or strategizing and innovation as shown in Figure 6.

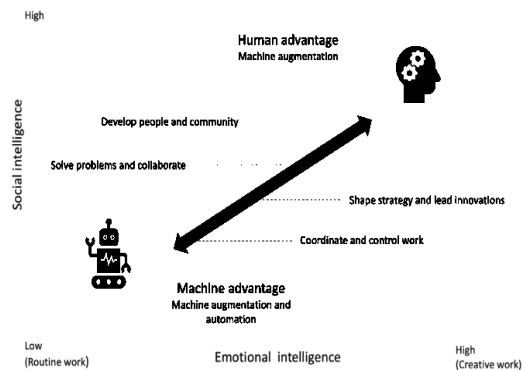


Figure 6 : Judgement Work: The Human Advantage. Adopted from “The promise of artificial intelligence Redefining management in the workforce of the future” by *Kolbjørnsrud et al., 2016*. Copyright 2018 by Accenture.

The use of AI will vastly impact decision making at all levels of management. The ability of AI to collect and interpret vast amount of data from inside and outside the company which would have been challenging to organize and analyze, can be discovered, structured and analyzed for better decision and in many cases AI systems will be able to make decision on their own. AI does not have cognitive predispositions, making it possible to build an answer free from subjective ideas AI avoids being impacted by culture or religion in decision-making processes (Björkman & Johansson, 2017). While it is evident that AI and automation are going to bring fundamental changes to management and leadership, there is both resistance and readiness in the managerial ranks depending on their position and age. While strategic level leader and young managers are ready to embrace AI, middle level and older managers are skeptical about the promise of AI (Kolbjørnsrud et al., 2016). It has also been observed that traditional organization are slow in their adoption of AI compared to their digital counterparts which could trigger a competitive imbalance in the

future (Deloitte, 2018; TATA Consultancy Services, 2016).

Another challenge is the understanding and functioning of AI system. Leaders, managers and generally all humans need to understand how AI works rather than follow the 'Blackbox' approach of today. There has to be good understanding what the AI system are capable of achieving and what type data they use. Organization and leaders should employ proper governance mechanisms and rules on how AI should be used in the respective organization (Björkman & Johansson, 2017). It is also necessary for leaders understand the constant technological changes of the future, learn and keep themselves abreast and behaving like entrepreneurs and innovators in their organizations to cope with the challenges (Björkman & Johansson, 2017).

Potential Impact of AI and Automation on Human Capital

Disruption to labor due to automation is hardly a phenomenon. The process of creative destruction throughout the course of history due to technological inventions from farming to industry, has been the source of wealth as well as disruption (Frey & Osborne, 2017). Fear of technological disruption and its effects on the labor market was felt during the early First Industrial Revolution when Queen Elizabeth I refused to grant patents to William Lee's stocking frame knitting machine in 1589 (Frey & Osborne, 2017). Another example is Luddite movement of early 19th century where a group of English textile artisans protested against the automation of textile production (Autor, 2015).

Academic literature available today suggests that whenever technology causes disruption in the labor market, there will be a loss of 'jobs' but there will always be 'work' as the labor will get reskilled and move to others areas in the value creation process. These literature cite many examples from the artisans moving in to factory labor and electric automation giving rise to relatively skilled blue color

workers and educated white color workers (Autor, 2015; Frey & Osborne, 2017; McKay et al., 2019; Vermeulen et al., 2018). An interesting phenomenon that could be observed in this literature is that, with the rise of computerization and computerized automation a number of repetitive tasks such as telephone operators were made redundant and lost to automation. The labor that was made redundant either skilled up and joined other high paying abstract jobs or moved down and joined low paying manual (physically adept) jobs, hollowing out the middle level routine jobs and polarizing the labor market (Autor, 2015; Frey & Osborne, 2017; McKay et al., 2019; Vermeulen et al., 2018). It has also been suggested the that job polarization has contributed towards the income polarization seen in the labor market today (Autor, 2015; Frey & Osborne, 2017).

To emphasize the important and defend the role of humans in an automated system, Autor (2015), has drawn a parallel between Michael Kremer's O-Ring production model and an automated value delivery process. He argues that as proposed by the O-Ring model of economic development, failure of any step in the chain of production leads to the failure of the entire production process, in an automated process where machines and algorithms makes some steps work more reliable, cheaper or faster, will increase the value of the remaining human link in the production chain. However, it is critical to understand that the AI revolution is not just about machines getting faster and smarter rather it is fueled by breakthroughs in life and social sciences which may challenge the role of humans in an organization in the future (Harari, 2019).

The ensuing automation revolution and societal transformation will create new forces and a new context shaping the world of work. Automation and digitalization will transform how work is done by substituting, augmenting and creating new tasks for workers. As tasks and jobs transform, the skills required by the workforce will also change, making skills of the future a critical need for workers and

employers alike (World Economic Forum, 2019). Organization will require new set of skills from their employees and will have to constantly reskill their employees to keep up with the pace of change. Companies such as Amazon who are at the frontier of automation have already understood the challenges and are investing on reskilling their workforce (Schuetz Molly, n.d.). Our present education systems are not geared to cater to the needs of the future workforce as most of the jobs of the future does not exist at present (Bayraktar & Ataç, 2018). With the rise of the gig economy and globalization organizations will operate over multiple geographies and will have distributed workforces and shift away from the traditional employee-employer relationships (World Economic Forum, 2019). Figure 7 depicts the forces that will influence the workforce of tomorrow.



Figure 7 : Forces shaping the future of work. Adopted from “HR4.0: Shaping People Strategies in the Fourth Industrial Revolution” by World Economic Forum 2019. Copyright 201 by World Economic Forum.

The function of Human Resource Management has evolved from being a Personnel Management function prior to the 1980’s to a function that cumulates a range of strategic and tactical responsibility from talent management to business partnerships and shared operational services as organizations began focusing on the impact of people, motivation and engagement, as a critical differentiating factor in the race for success and sustainability.

Human Resources Management would become core function of the future organization and would play a critical role in identifying the skill requirements by constantly scanning the environment and keep the workforce up to date.

As in the past, one of the key areas of concern today is how automation may disrupt the labor markets and contribute towards income inequality. There is widespread public anxiety that robots and AI will replace human jobs on a scale never seen before resulting in mass unemployment and underemployment causing widespread impoverishment (Harari, 2019; Hong et al., 2017; McKay et al., 2019). In addition today’s business leaders lack confidence in their workforce to face the challenges of automation (Deloitte, 2018). Some scholars have predicted that with the current smart automation waves the jobs at risk in the US market could be as high as around 47% by 2030 while others have argued that this number could be as low as 10% (Hawksworth et al., 2018). It has also been observed that labor is also losing its share of income (Hong et al., 2017; McKay et al., 2019).

Potential Impact of AI, Automation and Organizational Performance

AI, smart automation and other frontier technologies are poised for deeper faster and broader and more disruptive forms of automation (McKay et al., 2019). They have the capability to enhance labour productivity enabling the organization to achieve more form the workforce, enable customization for the organization product or service offer thus creating good and services that are bespoke to individual customer needs, Improve quality of the product or service and expedite process making value delivery faster and reduce waste (Britton Benjamin, n.d.). Today, while AI is been used by some companies at the core of their business in many organizations AI is still at experimentation levels (TATA Consultancy Services, 2016). However, increasingly software driven products and process, an avalanche of data generated by the hyper

connected instruments, products and business processes and enormous data processing power at affordable costs are pushing AI to the centre stage and many organization have identified and understood the benefits and implication of AI (TATA Consultancy Services, 2016).

When industry switch from steam power to electric power, organizational performance did not increase instantly. The reason being that factories simply replaced steam power with electric power and did not change the production process. It took a few decades for the industries to reconfigure the production process to utilise electric power fully to extract better performance (Björkman & Johansson, 2017; Brynjolfsson & McAfee, 2016). The role of technology – human interplay in the changes and adoptions of process could not be understated during this era to reap the benefits of automation which is applicable to the future of automation as well. To extract high performance form AI and smart automation, organizations need to rethink their entire business model, value creation, value capture, value configuration and value delivery.

The three waves of automation which are under way now are poised to make fundamental changes to business organization and industries at large. Organization in their current configuration (shape and form) may not exist in the near future and some of these changes are already visible in organizations such as Amazon, Facebook and google who are considered to be Exponential Organizations (ExO) whose output is disproportionality large (at least 10X) compared to their peers because they employ new organizational techniques that leverages exponential technologies and these organization are considered as the organizations who will dominate the Fourth Industrial Revaluation (Ismail et al., 2014; Saldanha, 2019). A significant feature of these exponential organizations is that they work on the principal that resource are in abundance whereas the traditional organizations are built

on the core principal of resource scarcity (Ismail et al., 2014; Saldanha, 2019).

The concept of organizational performance is based on the core principle of resource scarcity and this can be observed through the various definitions and the use of phrases such as efficiency, effectiveness and productivity. This assumption also means that an organization can only grow linearly. This is reflected in the performance measurement variables, models as well performance measurement systems that are being practised today. However, there is clear evidence that the organization of the Fourth Industrial Revolution, the Exponential Organizations, has a complete opposite view on resources and their growth would not be linear and many digitally native organizations such as Amazon, Google and Facebook are already showing these characteristics.

METHODOLOGY

Proposed Theoretical Framework

This paper focused on two key factors, leadership and human capital that are used in today's organization performance measurement metrics and discussed the disruptive changes they will undergo when AI and automation is adopted by organizations. The content and context of these elements of measure used in today's performance measurement models may not be applicable for the future organizations. Together with the changes to the configuration and construct of the future organization, one should question if the organizational performance measurement metrics of today is suitable to measure performance of the organizations of tomorrow or does it have to go through its next evolutionary wave?

Based on this study, the author proposes the following conceptual model (Figure 8) which also takes into account the human-technology interplay within an organization.

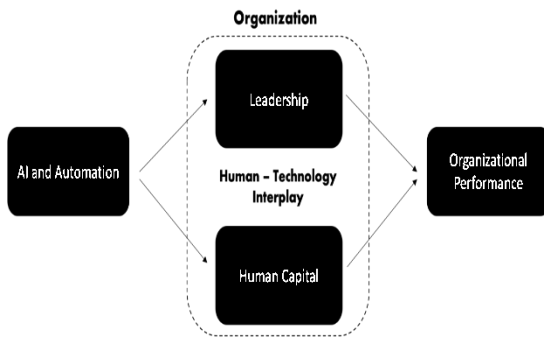


Figure 8 : The impact of AI and automation on organizational performance *based on authors conceptualization.*

FINDINGS AND DISCUSSION

AI is already surpassed human intelligence in the abstract gaming (BBC, 2019) and this trend is poised to continue into other aspects of human intelligence which will fundamentally change the role of humans in the value creation process of an organization.

This paper examines the implications of Artificial Intelligence on organizational performance with the dawn of the Fourth Industrial Revolutions. It focuses on two key subjective factors Leadership and Human Capital which is used in organizational performance measurement, and further probes

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into the impact of these two factors. It is also evident that there would be a significant impact on the construct of the organization. The implication of these changes suggests that the organizational performance metrics that are used today may not be suitable to measure organizational performance of the future organizations as it may have to evolve as well.

This inquiry also revealed that implementing AI, smart automation and other next generation technologies will also bring about new set of challenges to the organizations, involving privacy, data security and ethics as data becomes the core of the future organization. Challenges with regard to leadership, organizational culture and employee reskilling together with broader policy level implications in terms of education, employment and social security were also identified.

CONCLUSION AND FUTURE RESEARCH DIRECTIONS

While this study highlighted the implications on the selected organizational performance measurement variables, further research is required to understand the extend of these implications. Given the broad range and far-reaching consequences of these technologies and the implications they will have at policy and social levels, this is an area ripe for further research and studies.

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