© Universiti Tun Hussein Onn Malaysia Publisher's Office

OJ-TP

https://publisher.uthm.edu.my/ojs/index.php/oj-tp
e-ISSN : 2289-7410

Online Journal for TVET Practitioners

A Review of Leadership Approaches in the Industrial Revolution of 4.0 Era

Siti Liyana Amalina Zulkifle[1], Siti Sarah Omar[1], Normahaza Mahadi[2], Zailin Zainal Arifin[3] and Azizul Yadi Yaakop[4]

[1]Faculty of Technology Management and Business,
Universiti Tun Hussein Onn Malaysia, 86400 Batu Pahat Johor, MALAYSIA

[2]Azman Hashim International Business School,
Universiti Teknologi Malaysia, Jalan Semarak, 54100 Kuala Lumpur, MALAYSIA

[3]Faculty of Deference Studies and Management,
Universiti Pertahanan Nasional Malaysia, Sungai Besi, 57000 Kuala Lumpur, MALAYSIA

[4]School of Maritime Business and Management,
Universiti Malaysia Terengganu, Kuala Terengganu, 21030 Terengganu, MALAYSIA

*Corresponding Author

DOI: https://doi.org/10.30880/jtet.2021.06.02.003
Received 28 April 2021; Accepted 30 July 2021; Available online 30 September 2021

Abstract: This research paper was conducted to review the leadership approaches being utilized by leaders in maneuvering the digital era during Industrial Revolution 4.0. The information was retrieved by reviewing journal articles from various sources in the range of year 2015 until 2020. The study found that there are eight leadership approaches in the Industrial Revolution 4.0 and these are traditional leadership, agile leadership, diversity leadership, ethical responsibility, system leadership, technology leadership, entrepreneurial leadership and adaptive leadership. This paper also emphasized the challenges of leadership faced by the leaders in this IR 4.0 era such as innovation, talent acquisition and development and leading change that have to be encountered by leaders. Finally, the findings of the paper would provide managerial contributions to leaders in facing those challenges of Industrial Revolution 4.0 and at the same time manage to lead effectively during this new digitalization era.

Keywords: Leadership, Industrial Revolution 4.0

1. Introduction

In the Industrial Revolution 4.0, it is essential for a leader to understand various approaches of leadership skills in order to survive in the era where the business field is changing rapidly due to the revolution. In this regard, the leaders play an important role where they need to guide their followers on how to be alert about the new challenges when they are making business related decisions that will affect the organization sustainability and continuity. As the IR 4.0 is growing nowadays, both leader and followers should grab the chance and opportunity so that the company will receive the benefits and succeed in the future. Leadership in the IR 4.0 era is very important as it aids to maximize effectiveness and productivity to accomplish organizational objectives, inspires workers/followers to work in efficient way by planning and managing, solving conflicts and problem efficiently, guide workers/followers upon required changes as well as instill determination and confidence among employees.

*Corresponding author: sarah@uthm.edu.my

As technology grows rapidly, it is very important for a leader to transform leadership practices to succeed in an innovative, digital environment within the period of the IR 4.0. The future leaders have to improve appropriate knowledge and skills in order to be developed into digital leader. In fact, new leadership approached are very essential as it change the cooperative environment of digital workplace. The digital revolution has open new path of working and learning high-performing players as well as create new opportunities on how organization structure themselves and as well as arrangement of work.

Leadership is defined as the capability of an organization management to fix and accomplish challenging aims, make efficient decision making when required, overtake the rivalry and influence followers to achieve at the utmost level they can (Twin, 2020). Northouse (2016) highlighted that leadership was also identified as the interface of person's specific personality characters with those of a cluster and it was prominent that while the attitudes and actions of others may be transformed by the one, the others may also impact a leader.

Leadership approaches can be assumed as leadership theories, talents, traits, styles, characteristics, and personas that make leader and non-leader different (Twin, 2020). In this global era where the world entering its IR 4.0, it is very important for us to identify, establish and practice the leadership approaches to catch up with the rapid transformation. The current leadership approaches have several issues such as communication failures, poor implementation, and problem regarding culture of company, absence of strong vision, as well as absence in responsibility. Therefore, the objectives of this study are twofold: To review and identify leadership approaches and challenges in the IR 4.0 era; and to provide managerial contributions for leaders in facing the challenges of Industrial Revolution 4.0.

2. Review of Industry Revolution 4.0 (IR 4.0)

"Industry Revolution 4.0 represents the fourth revolution that has occurred in manufacturing and it will take what was started in the third industrial revolution with the adoption of computers and automation and enhance it with smart and autonomous systems fueled by data and machine learning." (Marr, 2018, para. 1). There are three stages of industrial revolution prior to Industrial Revolution 4.0. (Figure 1)

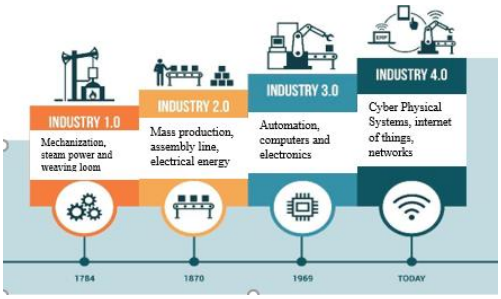

Fig. 1 - The Evolution of Industrial Revolution
(Source: Google Image)

The evolution of IR 4.0 can be presented as a path through the four stages of industrial revolution in the Figure 1 above. The first stage of industrial revolution began with mechanization, steam power and weaving loom in year 1784. It conveyed the change from manual effort to the first manufacturing practices; mostly in fabric industry. An upgraded quality of life was a main factor of the transition. The second industrial revolution was generated by mass production, assembly line and electrical energy in year 1870. The quote from Henry Ford about the Ford T-Model car where he said anyone can have any colour as long as it is black emphasize the starter of mass production but without the opportunity of products' customization. The third industrial revolution is categorized by automation, computers, and electronics in year 1969. In manufacturing, this eases flexible invention, where various products are manmade on flexible production lines using programmable technologies. However, such invention systems still absence in flexibility regarding production capacity. Nowadays, the fourth industrial revolution was generated by the expansion of cyber physical systems, internet of thing (IoT) and networks. The significance of this new equipment for industrial production systems is restructuring of traditional classified automation systems to self-organizing cyber physical production system that offers flexible mass custom invention and flexibility in production capacity (Rojko, 2017).

There are four technologies underpinning Industry Revolution 4.0 that comprise of vertical integration, horizontal integration, through-engineering, and technology integration. Vertical integration offers a tool for a preservation appeal to be submitted and the coordination to be secure in anticipation of an issue. Horizontal integration is all about smart system that offers the equipment to collect information and directly put "Plan B" into result. Through-engineering is when organization today may regulate the process during the whole value chain and allocates the product to the finishing marketplace. Last but not least, technology integration shows a vital and essential role in how companies are able to change their practices to keep pace with the promptly shifting industrial site (Herold, 2016). Schlaepfer & Koch (2015) fully supported these four main characteristics in their study.

Ministry of International Trade and Industry (MITI) also establishes National Policy on Industry 4.0 and highlight eleven technologies associated with Industry Revolution 4.0 which are big data analytic, artificial intelligence, augmented reality, cyber security, additive manufacturing, system integration, Internet of Things (IoT), simulation, advanced materials, autonomous robots, and cloud computing as in Figure 2.

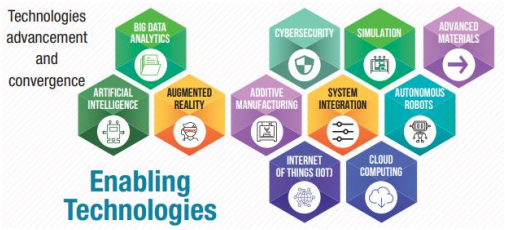

Fig. 2 - Technologies Advancement and Convergence Industry Revolution 4.0 (Source: MITI 2018)

MITI (2018) emphasize that the core of Industry 4.0 is a set of promptly growing and congregating technologies. These are insistent the limitations of what can be mass-produced through additive manufacturing and advanced materials. These technologies are allowing comfortable perceptions through big data analytics. They are difference between objective and integral dimension through rich simulations and augmented reality. They are improving human ability over artificial intelligence and autonomous robots. There is a change in the method data processing is being used such as through cloud computing, system integration and the Internet of Things (IoT). Cyber security also shows an essential part in confirming information systems and manufacturing lines are secure from cybercrime coercions. (MITI, 2018, p. 16).

As technology grows rapidly, it is very important for a leader to transform leadership practices to succeed in an innovative, digital environment within the period of the Industry Revolution 4.0. The future leaders have to improve appropriate knowledge and skills in order to be develop into digital leader. In fact, Leadership 4.0 is very essential as it change the cooperative environment of digital workplace. The digital revolution has open new path of working and learning high-performing players as well as create new opportunities on how organization structure themselves and as well as arrangement of work.

3. Findings on Leadership Approaches in IR 4.0 Era

The Industrial Revolution 4.0 is all about leadership. Leaders need to build their individual digital transformation policy and make sure it is associated with the business and development strategies of their company. Leadership Industrial Revolution 4.0 is also identified as a digital leader can be categorizes as a person who cross-hierarchical, team-oriented, and supportive attitude, with a solid focus on invention (Oberer & Erkollar, 2018). According to Perry & Wiens (2018), the present leadership approach inclines to focus almost totally on maximizing the output of persons. However, in the Industry Revolution 4.0 the leader required to maximizing the performance/output of the individual as well as maximizing the performance of the group.

Looking at this new era, new skills and behavior required in order to be a leader has transformed significantly. There are eight leadership approaches that leader need to possess in this digital age which are traditional leadership, agile leadership, diversity, ethical responsibility, system leadership, technology leadership, entrepreneurial leadership and adaptive leadership.

3.1 Traditional Leadership

Traditional leadership associates with controls, instructions, procedures, and restrictions which quite conflicting with new approach such as freedom of thought, vision skills, outcome value and warm welcome for new thoughts. Based on Herold (2016), the traditional leadership is still required nowadays despite the new styles and method because it elaborates the capability to successfully lead, achieve, and motivate others/supporters.

Nevertheless, Zakaria, Nasir & Akhtar (2019) argued as they pointed out that the traditional approach of leadership and features are becoming outdated as it is not well-matched with interrelated human and technologies. They also highlighted that the leadership style required to be more flexible and emphasizes on education, knowledge improvement such as contextual intelligence, emotional intelligence, system thinking, responsive, great emotion, knowledge controlling ability and others. Despite this argument, Tait (2020) emphasize that traditional leadership main focus is to upgrade the business situation of the organization in the market place. The person who has a traditional leadership approach will influence and inspire their followers to finish the task by supervision, direction and inspiration. Hence, traditional leadership is very important as not everyone can do their job independently without guidance.

3.2 Agile Leadership

Agile leadership adopts five aspects of agility such as innovating, performing, reflecting, risking, and defending which show a significant part in the leader's achievement. Successful leaders must identify and adjust to the unpredictable needs of the changing employees because the millennial employees incline to anticipate more supportive and outgoing structures as well as flexible working schedule (Herold, 2016). Zakaria, et al., (2019) study supported agile leadership as one of essential approaches for Leadership in IR 4.0. In this era, if an organization requires to be smooth and anticipating of advanced technologies, the leader is the decision maker who need to realize the importance of various business networks.

Smet, Lurie & George (2018) emphasized that agile leadership is very important as it create a tailored excursion for the top lineup, build an immersive knowledge experience for all senior leaders across the organization, engage and apply the knowledge to current and new agile-transformation experimentations and initiatives as well as improve a company of enterprise-agility coaches reinforced by a leadership revolution team.

3.3 Diversity

Diversity also one of the leadership approaches that leaders need to possess in this digital age. Herold (2016), emphasized creating a diverse environment is crucial to positive leadership. Diversity means welcoming and implementation a wide array of ideas, perceptions, and circumstances. Successful leaders deliberately mingle themselves with those who disagree and can provide new and varied visions. This approach to diversity improves a leader's knowledge and thoughtful of the concerns at stake.

Staffen & Schoenwald (2016) stated that leader who encourages diversity will support staffs of diverse disciplines in finding themselves in the matrix structure and offer solid direction in an agile situation to effectively deal with rapid transformation. Leaders will reflect networks and partnerships as well as co-operations with external organization, traders and fast operating start-ups within and outside the organization as key success factor for Industry 4.0. Rahman (2019) highlighted that workplace diversity is essential for organization as it offered several benefits such as indicate the level of commitment to fair employment procedures, efficiency of job performance, aid creative teamwork, improve cultural proficiency and increase productivity.

3.4 Ethical Responsibility

Herold (2016) highlighted that ethical responsibility is important key aspect in defining a leader's success and many organization emphasis on the soft skills and experience that employees can bring to the company. An unambiguous examination of ethics is not often seen as essential aspect of the employing process. Nevertheless, it highlighted that consideration of leadership ethics can build or halt the job of C-suite leaders. Ethical responsibility encourages great level of honesty that encourages a sense of responsibility and inspires other people to agree and track the vision. For instance, following company rules and regulations, taking responsibility, efficiency and effective communication.

White (2018) stated that in order to be internationally competitive and build keen and viable businesses during IR4.0, ethical leadership must be at the central of business. In this Industrial Revolution 4.0, those who select ethical practices and true engagement will be successful in the future.

3.5 System Leadership

System leadership has been highlighted in the World Economic Forum in 2019. It means the leader need to manage in a state where power is diffused strengthens the need for a joint vision and cooperative action through a highly interconnected world. Hierarchical and command/control techniques of leading may have been efficient previously, but companies nowadays are shifting faster through networks of hidden influencers which means people appreciate informal authority because they have the belief and admiration of their fellow employees.

In fact, research report from Wynne, Amato & Weerd (2017) belief that the leader and follower can be cleverer, innovative, and knowledgeable especially when it derives to addressing the types of novel, intricate, and various issues that companies face currently by practicing systematic leadership.

3.6 Technology Leadership

Technology leadership means the leaders required to reconsideration their roles as the exceptional effect of emerging technologies. In some cases, a leader who absence in digital skills is actually suspending the business transformation as business today is a digital business (World Economic Forum, 2019).

This can be supported by research from Oberer & Erkollar (2018) where they developed leadership matrix for Leadership 4.0 and technology leadership is one of the important element to be a digital leader. Technology leadership is very vital as a leader required to decide in what way new technology can be used to provide better value. It has a solid effort on innovation and a low employee focus.

3.7 Entrepreneurial Leadership

Entrepreneurial leadership which required leaders to have entrepreneur mindset. The leader need to convey new philosophy and different actions to how they lead, accomplish and go about their work and nurturing diversity of thought, offer freedom and independence to experiment, and tapping into people's strengths and goals to do important work (World Economic Forum, 2019). Staffen & Schoenwald (2016) pointed out that as an entrepreneur the leader will make resolutions that by far surpass the worries of his/her own department. Leader unites with other departments and progresses overall pioneering and integrative clarifications for products and services and drives trials and errors of thoughts.

3.8 Adaptive Leadership

Adaptive leadership which depends on research based on analyze, plan and implement. The test for a leader today is to learn quicker than the world around them changes to maintain with the high speed of change. To gain achievement, leaders required to change their old actions, faith and practices and keep those that best serve them and their employees" (World Economic Forum, 2019).

Mensah & Zimmerman (2015) stated that the adaptive leadership will help leader in improving capabilities and performances to more efficiently manage the tests of less predictability, improved uncertainty, and difficulty surrounding company transformation. According to Northouse (2015), adaptive leadership is distinctive in how it leads attention to the use of leadership to help employees deal with contradictory values that arise in changing work situations and social circumstances. Change and learning are integral in organizational life, and adaptive leadership emphasize precisely on helping employees to face change and observe the development of new morals that may accompany change. No other leadership approach's central resolution is to help employees face their personal values and amend these as needed in order for change and adaptation to happen.

Table 1 - Summary of the Eight Leadership Approaches for IR 4.0 Era

Leadership Approaches	Characteristics	Importance for IR 4.0 Era
Traditional Leadership	Controls, instructions, procedures, and restrictions	- Effectively lead, manage, and inspire others/followers. - Main focus is to upgrade the business situation of the organization in the marketplace
Agile Leadership	Innovating, performing, reflecting, risking, and defending	- Create a tailored excursion for the top lineup, build an immersive knowledge experience for all senior leaders across the organization, engage and apply the knowledge to current and new agile transformation experimentations and initiatives - Improve a company of enterprise-agility coaches reinforced by a leadership revolution team
Diversity	Welcoming and implementation a wide array of ideas, perception, and circumstance in the workplace	- Support staffs of diverse disciplines in finding themselves in the matrix structure - Offer solid direction in an agile situation to effectively deal with rapid transformation
Ethical Responsibility	Following company rules and regulations, taking responsibility, efficiency and effective communication	- Encourages great level of honesty that encourages a sense of responsibility - Inspires other people to agree and track the vision
System Leadership	Lead in a situation where power is diffused strengthens the need for a joint vision and cooperative action through a highly interconnected world	- Leader and followers can be cleverer, innovative, and knowledgeable especially when addressing various issues in the companies
Technology Leadership	- Associate with new technology to provide better value in the company	- Improve innovation and low employee focus
Entrepreneurial Leadership	- Nurturing diversity of thought, offer freedom and independence to experiment, and tapping into people's strengths and goals to do important work	- Develops pioneering and integrative clarifications for products and services and drives trials and errors of thoughts.

Adaptive Leadership	- Learning faster than the world around them and keep up with the high speed of changes	- Improving capabilities and performances to efficiently manage the tests of less predictability, improved uncertainty, and difficulty surrounding company transformation

4. Leadership Challenges in Industrial Revolution 4.0

Based on research by Raza (2016), there are several leadership challenges in Industry 4.0 affects people around the world as countries are facing the realities of the new digital world. Firstly, it is an innovation. Innovation can be considered as everyone's matter. Everyone will be required to produce innovative products, upgrade services, recognize progressive revenue streams, and convey their inventive aptitudes to work efficiently. Kopp, Howaldt & Schultze (2016) pointed out that the innovation in Industrial Revolution 4.0 is all about working, knowledge, developing abilities and innovative competences in a recent working world where people interest emphases in particular on administration and work-related features of innovativeness.

Secondly is talent acquisition and development. Talent acquisition and development will be the best competitive edge as leader requisite to depend on their talent to be competitive. The significance of creativeness and innovation will boost the output gap within their opponents (Raza, 2016). As the talents challenges becomes stronger within millennial employees, despite hire new workers the leaders will ensure that the company train their current workers. The leaders are more enthusiastic that autonomous technology will enhance rather than substitute humans (Harvard Business Review, 2019).

Thirdly is leading change will become everyday work. Change will be a continuous state of procedure, as leaders build pathways, share know-how, and train workers. Leaders need to foresee the upcoming and be equipped with the challenges. They need to be guides, prophets and pathfinders go there, determine what it is like, and return to impart others (Raza, 2016). As a leader, they need to practice the suitable leadership approach in order to guide and motivate the employees depends on the situation and be able to adapt with the challenges and technology associated within Industrial Revolution 4.0.

5. Conclusion

In order to embrace the challenges and rapid transformation of Industrial Revolution 4.0, the leaders need to step out of their comfort zones to challenge their current paradigms and lead with a strong sense of self-awareness with new leadership approaches such as traditional leadership, agile leadership, diversity, ethical responsibility, system leadership, technology leadership, entrepreneurial leadership and adaptive leadership. The leadership in Industrial Revolution 4.0 era is not about managed the space between people while building a high-performance culture solely but they are also responsible in developing and support the organization's backbone. The leaders need to fully ready and gear up as the Industrial Revolution 4.0 has a power to transform various things from physical to digital world and the old methods of approaches are not sufficient while facing the challenges, opportunities, and requirements of Industry 4.0. This is because IR 4.0 is all about cyber physical systems, internet, and networks. Therefore, leaders need to be equipped with relevant knowledge and skills to ensure they manage to overcome any obstacles in the future.

The Industrial Revolution 4.0 brings significantly challenges to organization that need to adjust their ways of working with regards to technology, structure, and strategies. In a bright side, it can create to new opportunities and processes in order to become a market player in the industry. On top of that, the next generations of leaders are required to develop relevant knowledge, skills, and leadership approach in order to fully prepared to be a digital leader in Industry 4.0. Industrial Revolution 4.0 not only affects leaders but workers and organization itself. That is why, it is very crucial for leaders and ambitious leaders to stay up-to-date of the changing landscape and continue a rational and flexible method to guide businesses in the future. Further study is recommended to identify the approaches with proven empirical data either quantitatively through survey or in-depth qualitative study through interviews with leaders or managers, as it would overcome the limitations of this reviewed study.

Acknowledgements

This paper would not have been possible without the exceptional support of my lecturer, Dr Siti Sarah Omar. Her enthusiasm, knowledge and exacting attention to detail have been an inspiration and kept my work on track from my first encounter with this paper to the final draft of the paper. I am also grateful for the insightful comments offered by Dr Siti Sarah. The generosity and expertise of one and all have improved this study in innumerable ways and saved me from many errors. I'm also grateful to Nomahaza Mahadi, Zailin Zainal Ariffin and Azizul Yadi Yaakop who moderated this paper and in that line improved the manuscript significantly. Finally, it is with true pleasure that I acknowledge the contributions of my parents who always support and encourage me to successfully finish this paper till the end.

References

Herold, G. (2016). Leadership in the Forth Industrial Revolution. Global Practice Leader Industrial. 1-14

How leaders are navigating the fourth industrial revolution. (2019). Harvard Business Review. Retrieved on May 24, 2020 from, https://hbr.org/sponsored/2019/03/how-leaders-are-navigating-the-fourth-industrial-revolution#:~:text=Challenges%20include%20being%20too%20focused,in%20place%20to%20do%20so.

Kopp, R., Howaldt, J. & Schultze, J. (2016). Why Industry 4.0 needs Workplace Innovation: A critical look at the German debate on advanced manufacturing. *European Journal of Workplace Innovation*, 2(1), pp. 7-24

Marr, B. (2018). What is Industry 4.0? Here's a Super Easy Explanation for Everyone. Retrieved May 18, 2020 from, https://www.forbes.com/sites/bernardmarr/2018/09/02/what-is-industry-4-0-heres-a-super-easy-explanation-for-anyone/#7a09b6269788

Mensah, N. A. & Zimmerman, J. (2017). Changing through turbulent times: Why Adaptive Leadership matters. *The Journal of Student Leadership*, 1(2), pp. 1-13

Merriam Webster Dictionary. (2020). Leadership. Retrieved on May 14, 2020 from, https://www.merriam-webster.com/dictionary/leadership

Ministry of International Trade & Industry. (2018). Industry 4WRD: National Policy on Industry 4.0. Perpustakaan Negara Malaysia: Ministry of International Trade & Industry. pp. 1-76

Northouse, P. G. (2016). *Leadership Theories and Practice*. Seventh Edition. Western Michigan University: SAGE Publication Inc

Oberer, B. & Erkollar, A. (2018). Leadership 4.0: Digital Leaders in the Age of Industry 4.0. *International Journal of Organizational Leadership*, 1-9

Perry, D. E. & Wiens, R. (2018). Leadership for an Industry 4.0 World. Financial Managers Society. 1-2

Rahman, U. H. F. (2019). Diversity Management and the Role of Leader. *Open Economics 2019*, 2, pp. 30-39. DOI: 10.1515/openec-2019-0003

Raza, B. (2016). Leadership 4.0: Module Management Competencies 1 (MC1), Frankfurt University of Applied Sciences: Master's Thesis

Rojko, A. (2017). Industry 4.0 Concept: Background and Overview. *International Journal of Interactive Mobile Technologies*, 11(5), pp. 79-80. doi.org/10.3991/ijim.v11i5.7072 A

Schlaepfer, R. C. & Koch, M. (2015). Industry 4.0: Challenges and Solutions for the digital transformation and use of exponential technologies. Deloitte. 1-32

Smet, A. D., Lurie, M. & George, A.S. (2018). Leading Agile Transformation: The New Capabilities Leaders need to build 21st Century Organization. McKinsey & Company. 1-27

Staffen, S. & Schoenwald, S. (2016). Leading in the context of the Industrial Revolution. Capgemini Consulting, 1-19

Tait, B. (2020). Traditional Leadership Vs Servant Leadership. Retrieved on Aug 22, 2020 from, https://www.forbes.com/sites/forbescoachescouncil/2020/03/11/traditional-leadership-vs-servant-leadership/#11f61c95451e

Twin, A. (2020). Leadership. Retrieved on May 14, 2020 from, https://www.investopedia.com/terms/l/leadership.asp

White, L. (2018). Ethical Leadership in Industry 4.0. *African Independent*, 11(8), pp. 54

World Economic Forum. (2019). Leading through the Forth Industrial Revolution: Putting People at the Centre, 1-24

Wynne, F. H., Amato, R. & Weerd, F. U. D. (2017). Leadership 4.0: A review of the thinking. Oxford Leadership, 1-30

Zakaria, N., Nasir, A & Akhtar, A. (2019). Are the Leaders Ready to Embrace Industry 4.0? (Special Issue). *Journal of Adv Research in Dynamical & Control Systems*, 11(5), pp. 543-549