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Determinant Factors for Fourth Industrial Revolution (4IR) Leadership Attributes: An Empirical Study from Malaysia*

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Abstract

Most leadership styles are generally designed to enhance the cognitive and behavioral skills of leaders with the implicit assumption that this would ultimately translate into high performance. As we are moving towards Industry 4.0, organizations must employ leadership styles that will help the organization succeed. Thus, the objective of this paper is to confirm the determinant factors for Fourth Industrial Revolution (4IR) leadership attributes in Malaysian manufacturing companies. Stratified sampling was used to select the sample. Data was collected using the online survey method, where the response rate was 43 percent. The respondents consisted of respondents aged from 31–40 years old, with 69 respondents. In terms of race, the highest number of respondents are the Malays. Questionnaires were distributed to middle and top-level managers from manufacturing companies which were listed in the Federation of Malaysian Manufacturers (FMM). Confirmatory Factor Analysis (CFA) was used to confirm the reliability and validity of the construct. Based on the analysis, 66 items could be used to measure the 4IR leadership attributes. The validation of 4IR leadership can also provide predictive implications on improving leaders' performance, given the different attributes confirmed by the findings.

Keywords: Fourth Industrial Revolution, Leadership, Manufacturing, CFA, PLS-SEM

JEL Classification Code: M10, M12, M14

1. Introduction

The Fourth Industrial Revolution (4IR) blends the physical, digital, and biological realms, blurring the boundaries between people and technology. The effects of these shifts on how people operate and how companies create value will be experienced in all sectors, economies, and cultures. It will also reshape the future of work. 4IR not only brings along disruptive changes in production and information processing but also revolutionizes employees' daily work on all hierarchical levels. Due to 4IR, the market process has recently undergone a re-design and transformation. Businesses and governments will need to adjust to these developments while assisting workforce transition.

The 4IR is a new stage of technical development that necessitates organizational change. 4IR is characterized by growing digitization, value chains, distribution models, business models, and product and service interconnection. Industry 4.0 holds the promise of a new era of globalization. With the 4IR reshaping how the world lives and works, global leaders face the pressures of preparing their businesses and their workforces for this new era. Many senior executives are less prepared to move towards Industry 4.0, even though the organization has successfully implemented Industry 4.0 technologies.

As widely acknowledged, digitization affects all organizations, including small and medium-sized enterprises (SMEs) in a variety of sectors or industries, including

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the manufacturing industry. As digital impacts the entire organization, it requires effective leadership at all levels to drive the digital strategy forward. This could be done by placing potential leaders in positions that stretch them beyond their current competencies and skills to lead the employees and support them in building new digital capabilities.

The key drivers of production for Industry 4.0 are technology, human capital, global trade and networks, and institutional framework. As human capital is one of the key drivers, manufacturing companies need to enhance and create an accelerated shift in productivity. This can be established with a structured institutional framework and Industrial 4.0 leadership styles. Leaders in Industrial Revolution 4.0 (4IR) need to have a diverse network of internal and external stakeholders, providing different perspectives, new information, and new approaches for solving problems. Thus, this study aims to confirm the determinant factors for the Fourth Industrial Revolution leadership attributes.

2. Literature Review

2.1. Fourth Industrial Revolution (4IR)

The First Industrial Revolution began with the invention of the steam engine in 1760. The steam engine facilitated the transition from farming and feudalism to the modern manufacturing process. This transition involved the use of coal as the primary energy source, with trains serving as the primary mode of transportation. Textiles and steel were the most important industries in terms of workers, production value, and capital invested. The Second Industrial Revolution began with the invention of the internal combustion engine in 1900. This ushered in an era of rapid industrialization that relied on oil and electricity to power mass production. The Third Industrial Revolution began in 1960, and it was distinguished by the use of electronics and computer technology to simplify manufacturing. Previously, making things used to entail screwing or welding numerous parts together. The Fourth Industrial Revolution now includes computer-generated product design and three-dimensional (3D) printing, producing solid objects by layering materials (Prisecaru, 2016).

The 4IR concept was coined by Klaus Schwab, founder and executive chairman of the World Economic Forum, who described a world in which individuals switch between digital worlds and offline reality through the use of connected technology to empower and manage their lives (Miller, 2016; Xu et al., 2018). There are three reasons why today's transformations are not merely a continuation of the Third Industrial Revolution, but the arrival of a Fourth and distinct one: velocity, scope, and system impact. The speed of the existing innovations does not reflect any past patterns related to the previous Industrial Revolution. Compared to previous industrial revolutions, the Fourth Revolution is progressing at an exponential rather than a linear rate, disrupting almost every industry in every country. The breadth and depth of these changes herald the transformation of the entire production, management, and governance systems (Schwab, 2015).

The Fourth Revolution is growing at an accelerated rate rather than a constant rate, disrupting almost all industries in all countries (Schwab, 2015). According to Schwab, the 4IR is more than just "technology-driven change"; it also has a significant impact on critical industries and segments such as education, health, and commercial. At the same time, the revolution may probably result in increased inequality, especially in terms of labor market dislocation (Brynjolfsson et al., 2014; Schiuma, 2017).

Others have claimed that the mission for aptitude would expand the occupation sector, which will become increasingly separated. As a result, less-skilled and low-paying occupations may be affected by digitization, whereas higher-paying occupations that need more skills are less likely to be replaced. As a result of this increasing dichotomization, communal pressures may rise. (Kodama & Shibata, 2017). In addition to the risk of massive occupation movement under the ongoing 4IR, there are a variety of problems, such as cybersecurity, riding out, risk valuation, and others (Wolf, 2015) that needed to be addressed.

2.2. Leadership Styles

The concept and definition of leadership and style may differ from one person or situation to the other. The word "leadership" has been used in various aspects of human endeavors, such as politics, businesses, academics, and social works (Odunlami et al., 2017). The concept of leadership has been defined in different ways by researchers and has been analyzed using various theories and approaches. Leadership and the different associated styles have an immense impact on how employees perform and grow to create positive organizational outcomes. According to Almaskari et al. (2021), leadership will also have the ability to expose worker strengths. Additionally, some leadership practices, for example, may focus on proposing a strong vision for the organization, while others may concentrate on building transactional relationships with subordinates (Yang & Lew, 2020). Below are three leadership styles practiced in numerous companies.

a) *Transformational Leadership Style*
   Transformational leadership is a contemporary, hands-on approach that helps one to lead people and brings a change in organizations. It is known as leadership that creates positive change in the followers where they take care of each other's interests and act in the group's interests. Transformational leadership theory attempts to explain how certain leaders can achieve extraordinary

levels of follower motivation, admiration, commitment, respect, trust, and performance. Transformational leadership consists of idealized influence, inspiration, intellectual stimulation, and individualized consideration and has been widely recommended as the best style for dealing with transition.

b) *Transactional Leadership Style*
Transactional leaders chose to motivate followers by inspiring a vision of what was to be accomplished in an approach that is task-oriented and facilitated by the ability to solve problems, plan, and organize, and ultimately obtain results. Transactional leaders use rewards and punishments to gain compliance from their followers; they accept goals, structure, and the culture of existing organizations. They are willing to work within the existing systems and negotiate to attain the goals of the organization. They also tend to think inside the box when solving problems (Kabeyi, 2018).

c) *Blue Ocean Leadership Style*
The blue ocean leadership style was created by world-renowned professors Chan Kim and Renée Mauborgne (Kim & Mauborgne, 2014). Blue ocean leadership is a leadership style where the primary focus is to achieve an organizational increase in leadership strength quickly and at low cost, which translates into high performance for the business (Kim & Mauborgne, 2017). Blue Ocean Leadership provides a systematic way to unlock the ocean of unrealized talent and energy in your organization fast and at a low cost. It also focuses on the leaders' actions and activities rather than their behaviors and traits. Based on the blue ocean leadership perspective, every leader has his/her customer. Hence, the underlying concept is that leadership can be regarded as a service that people in an organization "buy or don't buy". One of the benefits of the blue ocean leadership style is its scalability, where the process can be launched or implemented at any level of management. Blue ocean leadership style is also applicable to organizations of all sizes, big, medium, and small (Kim & Mauborgne, 2017; Wan et al., 2018).

2.3. 4IR Leadership

Leadership scholars have certainly noticed a significant increase in the challenges that leaders face in the new world of 4IR (Gratton, 2010, 2011). 4IR leadership plays a vital role in the long-term survival of the company. Therefore, one of the main issues to be addressed in the successful implementation of the 4IR is leadership style. The main concept of 4IR leadership focuses on the leader's ability to formulate a digital transformation strategy (Bawany, 2019). 4IR leadership is also called a "digital leader" who has possessed sufficient digital knowledge and literacy, vision, understanding of customers, agility, risk-taking, and collaboration skills. The development of 4IR leadership involves changing the way leaders think about connecting people with digital technology to achieve organizational benefits.

All in all, forward-thinking companies realize that they need effective leadership skills within an organization to survive in today's changing, uncertain, complex, and ambiguous environment. While some traditional leadership skills, such as creating and communicating a clear vision, motivating, and empowering others, are still crucial to lead successfully in the digital age, there are also new qualification requirements for leaders in a rapidly changing industrial environment (Bawany, 2019). To help leaders master the pros and cons of 4IR, several action points can be proposed. In addition, executives are expected to have new 4IR leadership competencies that encompass lifelong learning or continuous learning, especially in digital technology, management and communication skills, collaboration and conflict management skills, empathic skills, and agility.

Concerning 4IR, the biggest issue confronting the corporate world is the company's ability to adapt to digital transformation. It is common knowledge that most global businesses are ready to embrace the digital revolution to reduce costs and increase efficiency (Kumar et al., 2019). However, the rapid, transparent, and sensitive new market environment created by continuous digital transformation creates not only opportunities for modern companies but also some organizational challenges (Bawany, 2019). One of the most significant obstacles is that the company lacks the necessary skills. The essential skills of today's employees have undergone remarkable changes as a result of the rapid development of 4IR technology, and advanced new skills are necessary to enable employees to succeed in the workplace of the future. The determinant factors suggested for 4IR leadership attributes are: 1) visionary, 2) contingent reward, 3) courage, 4) idealized influences, 5) inspiration, 6) intellectual stimulation, 7) passion, 8) strategic thinking/planner, 9) focus, 10) collaboration, 11) innovation, 12) willingness to change, 13) communication, 14) emotional intelligence, 15) spiritual intelligence, 16) responsibilities and accountability, 17) technology, 18) entrepreneurial, 19) adaptive, 20) shaping societies, 21) problem-solving and 22) critical thinking. Table 1 lists the definitions of the following attributes.

3. Research Methodology

This research was designed as an exploratory study using a quantitative approach. Stratified sampling was used to select respondents who were sampled from different groups. An online survey with a five-point Likert scale was used to

Table 1: Definition of 4IR Leadership Attributes

Attribute	Definition	Author/s
1. Visionary	The ability to communicate an inspiring vision and help others see how they can contribute to the vision.	Olaka et al. (2017)
2. Contingent reward	The feedbacks, financial, material, or psychological incentives are given in exchange for those that meet their identified goals for a job well done.	Raymer (2014)
3. Courage	The character trait that enables a person to do without fear what they believe is 'right'.	Brown and May (2012)
4. Idealized influences	The ability to build trust within the team by featuring characteristics that inspire pride and respect among followers.	Olaka et al. (2017)
5. Inspiration	The ability to motivate their subordinates by projecting desirable vision which is aligned with organizational goals and individuals' goals, being optimistic, confident, and stressing on ambitious goals.	Sanner-Stiehr and Kueny (2017)
6. Intellectual stimulation	The ability to support his/her followers for being creative and innovative.	Smothers et al. 2016)
7. Passion	The strong inclination toward an activity that people like, that they find important, and in which they invest time and energy.	Ho and Pollack (2014)
8. Strategic thinking/ planner	The ability to come up with effective plans in line with an organization's objectives within a particular economic situation.	Ho and Pollack (2014)
9. Focus	The ability to move the organization from focusing on the current situation to the adoption of the new vision, and includes the communication of the vision to others, the formulation of a strong guiding coalition, and the focus on new priority areas and niches.	Abuzaid (2016)
10. Collaborate	The mutually beneficial relationship with clearly defined roles among multiple parties for the attainment of a common organizational goal.	VanVactor (2012)
11. Innovation	The ability to both think and influence others to create "new and better" ideas to move towards positive results.	Rowley et al. (2011)
12. Willingness to change	The employee's readiness to commit to change.	Nur Lyana et al. (2015)
13. Communication	The exchange of information or passing of information, ideas, or thoughts from one person to the other or from one end to the other in the organization.	Hackman and Johnson (2013)
14. Emotional intelligence	The knowledge on understanding others' behaviors and self-emotions and the ability to utilize them positively to achieve organizational goals to establish relationship management	Vaezi and Fallah (2011).
15. Spiritual intelligence	The ability to behave with wisdom and compassion, while maintaining inner and outer peace, regardless of the situation.	Vaezi and Fallah (2011)
16. Responsibility and accountability	The ability to respond to disruptive changes and ensuring a human-centered approach to the current challenges.	Helena and Ellyn (2019)
17. Technology	The ethical practice of improving performance by creating, using, and managing appropriate technological processes and resources.	Helena and Ellyn (2019)
18. Entrepreneurial	The involvement of leaders in organizing and motivating a group of people to achieve a common objective through innovation, risk optimization, taking advantage of opportunities, and managing the dynamic organizational environment	Helena and Ellyn (2019)
19. Adaptive	The ability to influence changes that build and enable the capacity of individuals and organizations to thrive.	Helena and Ellyn (2019)
20. Shaping societies	The need to proactively address rising concerns about inequality, social tensions, political fragmentation, and the protection of the environment.	Helena and Ellyn (2019)
21. Problem solving	The ability to create the best solutions to problems while working.	Helena and Ellyn (2019)
22. Critical thinking	The ability to analyze and creatively adapt to new situations.	Changwong et al. (2018)

collect primary data for this study. A Likert scale is a type of psychometric response scale in which responders specify their level of agreement to a statement typically in five points: (1) Strongly disagree; (2) Disagree; (3) Neither agree nor disagree; (4) Agree; (5) Strongly agree. Questionnaires were distributed randomly among middle to top-level managers in manufacturing companies in Selangor, which are listed in the Federation of Malaysian Manufacturers (FMM). The total number of the questionnaire distributed online was 193 questionnaires, and the number of questionnaires returned was 83 (43% response rate).

4IR leadership attributes consisted of 81 items which could be categorized into 22 factors. The attributes comprise of visionary, contingent reward, courage, idealized influences, inspiration, intellectual stimulation, passion, strategic thinking/planner, focus, collaboration, innovation, willingness to change, communication, emotional intelligence, spiritual intelligence, responsibilities and accountability, technology, entrepreneurial, adaptive, shaping societies, problem-solving and critical thinking. These factors were adapted and adopted from Wan Noordiana et al. (2018), Helena and Ellyn (2019), and Nur Lyana et al. (2015).

Previous studies suggested that the use of Partial Least Square Structural Equation Modeling (PLS-SEM) is more suitable when the goal of the developed model is to identify key drivers and predict and explain the target constructs (Hair et al., 2019). Other than that, to confirm the validity and reliability of the instrument used, confirmatory analysis was performed. Accordingly, this study adopted the PLS-SEM approach for data analysis

4. Results and Discussion

4.1. Respondent Profile

The respondents consisted of respondents aged from 31-40 years old, with 69 respondents, which is the highest number of respondents. In terms of race, the highest number of respondents are the Malays, with a total number of 59 respondents. Next was the education level, which was divided into four categories: STPM/diploma, Bachelor's degree, Master's degree, and Ph.D. Bachelor's degree received the most responses, with 60 people responding. As for their job positions, 50 respondents were senior executives. In terms of years of work experience, 63 of the 83 respondents had between one and five years of experience- the group with the most respondents, and 60 had between one and five years of experience.

4.2. Confirmatory Factor Analysis

The purpose of confirmatory factor analysis (measurement model assessment) is to confirm the reliability and validity of construct measures, therefore providing evidence of the suitability of their inclusion in the path model (Hair et al., 2014). The reliability test is accomplished using indicator reliability and internal consistency reliability. First, for indicator reliability, it was executed by examining their factors loading. According to Hair et al. (2017b), the acceptable factor loadings are between 0.60 to 0.70 for social science studies. In the present study, values greater than 0.70 were accepted. Based on this criterion, sixteen items which were less than 0.70 were removed (CR9, F31, F32, CLBRTE36, CLRBTE38, CLRBTE40, INVTE41, EI52, EI54, SI55, SI59, RA60, RA62, T64, E69, and E71), while the remaining indicators had appropriate loadings to remain in the model. As shown in Table 2, all the indicator loadings exceed the criterion of being greater than 0.70, and no cases present loadings less than 0.70.

Composite reliability (CR) was utilized instead of Cronbach Alpha for internal consistency reliability because CR recognizes that the indicators have varying loadings. (Henseler et al., 2009). The CR is generally interpreted as equal to Cronbach's coefficient alpha and has values between 0 and 1, where the higher values indicate a higher level of reliability (Hair et al., 2014). Therefore, in the current study, internal consistency reliability is measured through CR. As shown in Table 3, the scales were reliable, with all items achieving composite reliability (CR) > 0.70 as suggested by Hair et al. (2017b).

Next, for validity, two types of validity were analyzed: (1) convergent validity and (2) discriminant validity. Convergent validity is examined using the Average Variance Extracted (AVE) and as recommended by Hair et al. (2017a); threshold values of AVE are 0.50 and above. Consequently, as illustrated in Table 3, the AVE values of all the constructs of this study fall between 0.50 to 0.75. Therefore, based on these results, convergent validity is confirmed in all the constructs in this study. As for discriminant validity, it is analyzed using the Heterotrait–Monotrait ratio of correlations (HTMT), which is an estimate of the factor correlation (more precisely, an upper boundary). To discriminate between two factors, the HTMT should be significantly less than one (Henseler et al., 2015). With reference to Table 4, all the variables also achieve discriminant validity following the HTMT criterion.

4.3. Discussion

As Industry 4.0 is currently taking place, the 4IR leaders will be the game changers of tomorrow as they lead their organizations into the Fourth Industrial Revolution by embracing technological changes and inspiring their workers to do the same. A leader must recognize and embrace technologies early on and transfer enthusiasm and empower employees to use the technology. They must be able to perform a variety of leadership positions, including entrepreneurial, agile, strategic, and innovative leadership.

Table 2: Confirmatory Factor Analysis – Factor Loading

Variables	Item Code	Loading
1. Visionary	V1	0.79
	V2	0.788
	V3	0.768
	V4	0.792
	V5	0.747
2. Contingent reward	CR6	0.852
	CR7	0.731
	CR8	0.795
	CR9	0.533
3. Courage	C10	0.731
	C11	0.840
	C12	0.819
4. Idealized influences	II13	0.782
	II14	0.817
	II15	0.852
	II16	0.756
5. Inspiration	I17	0.816
	I18	0.792
	I19	0.777
	I20	0.831
6. Intellectual stimulation	IS21	0.821
	IS22	0.862
	IS23	0.805
7. Passion	P24	0.871
	P25	0.856
	P26	0.745
8. Strategic thinking	ST27	0.831
	ST28	0.890
	ST29	0.771
	ST30	0.872
9. Focus	F31	0.666
	F32	0.680
	F33	0.741
	F34	0.704
	F35	0.766
10. Collaborate	CLBRTE36	0.608
	CLBRTE37	0.741
	CLBRTE38	0.602
	CLBRTE39	0.722
	CLBRTE40	0.637

Table 2: Continued

Variables	Item Code	Loading
11. Innovative	INVTE41	0.686
	INVTE42	0.739
	INVTE43	0.835
	INVTE44	0.825
13. Communication	COM48	0.811
	COM49	0.850
	COM50	0.807
14. Emotional intelligence	EI51	0.695
	EI52	0.550
	EI53	0.851
	EI54	0.525
15. Spiritual intelligence	SI55	0.662
	SI56	0.789
	SI57	0.715
	SI58	0.754
	SI59	0.670
16. Responsibility and accountability	RA60	0.595
	RA61	0.670
	RA62	0.581
	RA63	0.734
17. Technology	T64	0.694
	T65	0.868
	T66	0.773
	T66	0.771
18. Entrepreneurial	E68	0.700
	E69	0.550
	E70	0.851
	E71	0.525
19. Adaptive	ADPTVE72	0.785
	ADPTVE73	0.816
	ADPTVE74	0.799
20. Shaping society	SS75	0.848
	SS76	0.815
	SS77	0.790
21. Problem-solving	PS78	0.758
	PS79	0.781
	PS80	0.826
22. Critical thinking	CT81	0.730
	CT82	0.776
	CT83	0.627

Note: Bold figure will be removed (CR9, F31, F32, CLBRTE36, CLRBTE38, CLRBTE40, INVTE41, EI52, EI54, SI55, SI59, RA60, RA62, T64, E69 and E71).

Table 3: Confirmatory Factor Analysis - Indicator Reliability and Validity

Variables	CR	AVE
1. Visionary	0.88	0.61
2. Contingent reward	0.86	0.68
3. Courage	0.84	0.64
4. Idealized influences	0.88	0.64
5. Inspiration	0.88	0.65
6. Intellectual stimulation	0.87	0.69
7. Passion	0.86	0.68
8. Strategic thinking	0.87	0.69
9. Focus	0.79	0.65
10. Collaborate	0.83	0.70
11. Innovative	0.89	0.72
12. Willingness to change	0.88	0.71
13. Communication	0.86	0.68
14. Emotional intelligence	0.86	0.75
15. Spiritual intelligence	0.84	0.64
16. Responsibility and accountability	0.74	0.59
17. Technology	0.87	0.70
18. Entrepreneurial	0.79	0.56
19. Adaptive	0.84	0.64
20. Shaping society	0.86	0.67
21. Problem-solving	0.83	0.62
22. Critical thinking	0.76	0.51

Industry 4.0 requires leaders to comprehend their company's superior vision, think entrepreneurially, and encourage their workers to act similarly.

Findings from this research have identified the determinant factors for the 4IR leadership attributes, which are 1) visionary, 2) contingent reward, 3) courage, 4) idealized influences, 5) inspiration, 6) intellectual stimulation, 7) passion, 8) strategic thinking/planner, 9) focus, 10) collaboration, 11) innovation, 12) willingness to change, 13) communication, 14) emotional intelligence, 15) spiritual intelligence, 16) responsibilities and accountability, 17) technology, 18) entrepreneurial, 19) adaptive, 20) shaping societies, 21) problem-solving and 22) critical thinking. Table 5 summarizes the findings, where from the total of 81 items, 65 items could be used to measure the 4IR leadership attributes in future research

Table 5 tabulates all of the important attributes in industry 4.0, as industry 4.0 requires both the existing characteristics and the newly required characteristics. The importance of the first attribute which is visionary is supported by Prestiadi, Zulkarnain, and Sumarsono (2019). He stated that a leader must have a vision, which is able to direct and bring the organization into clear goals in industry 4.0. Courage and contingent reward are essential ingredients for effective leaders to see difficult situations and accept responsibility for the outcomes of decisions and actions. Both could work as a tool that could help leaders in improving employee's motivation in industry 4.0.

A study by Wan Noordiana et al. (2018) on leaders in the fourth industrial leadership also highlights the importance of vision, courage, passion, strategic thinking/planning, focus, collaboration, innovation, willingness to change, and communication. Other attributes such as agility, courage, focus, collaboration, accountability, tech-savvy, and emotional intelligence are identified by Bernard (2019) as important attributes in industry 4.0. These successful leaders in industry 4.0 will see changes not as a burden but as an opportunity to grow and innovate. Besides that, according to Helena and Ellyn (2019), attributes such as responsibility and accountability, technology, entrepreneurship, adaptive, and shaping societies will help leaders to understand the issues and forces driving transformational change across economies and industries. Other than that, according to Rusliati et al. (2020) anticipating changes early will also require the ability of leaders to see changes, both from external factors (scientific, political, social, economic, consumer tastes, shopping habits, and all factors that cannot be controlled by the company) or internal factors (HR, finance, marketing, information systems, operating processes, and all factors that can be controlled by the company).

The journey toward Industry 4.0 involves the development of new business models, technologies, and processes. This process is an evolutionary one, which means that various aspects of the organization have to be adapted to meet the needs of the new environment. An interesting finding from this study is that the 4IR leadership style offer leaders a vision and strategic plan to achieve the organization's goals. It also underlies managerial strategies such as innovativeness, communication, technology, and critical thinking which could help leaders in focusing on what is important in Industry 4.0. Likewise, not only do leaders equip themselves with professional knowledge and skills, but also enable employees to confidently make bold efforts to innovate (Nguyen, 2020). This study, therefore, suggests the dimension for each attribute, which contributes towards a new instrument measurement for the 4IR leadership style. Findings also provide an overview of the validity and reliability of the 4IR leadership attributes in the context of manufacturing companies. It is supported by the CFA

Table 4: Discriminant Validity – HTMT

Variables	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22
1. Visionary																						
2. Contingent reward	0.62																					
3. Courage	0.36	0.71																				
4. Idealized influences	0.52	0.51	0.59																			
5. Inspiration	0.36	0.32	0.60	0.41																		
6. Intellectual stimulation	0.23	0.40	0.61	0.26	0.72																	
7. Passion	0.52	0.55	0.69	0.63	0.66	0.57																
8. Strategic thinking	0.69	0.61	0.48	0.30	0.63	0.77	0.55															
9. Focus	0.60	0.43	0.47	0.57	0.73	0.46	0.85	0.28														
10. Collaborate	0.59	0.56	0.56	0.37	0.57	0.58	0.59	0.41	0.66													
11. Innovative	0.59	0.72	0.29	0.80	0.66	0.46	0.57	0.26	0.57	0.66												
12. Willingness to change	0.54	0.58	0.40	0.49	0.58	0.55	0.52	0.63	0.60	0.70	0.65											
13. Communication	0.64	0.62	0.64	0.46	0.64	0.48	0.80	0.30	0.92	0.83	0.65	0.72										
14. Emotional intelligence	0.47	0.84	0.26	0.25	0.66	0.57	0.64	0.57	0.98	0.61	0.48	0.66	0.57									
15. Spiritual intelligence	0.48	0.67	0.36	0.64	0.71	0.98	0.25	0.37	0.53	0.62	0.46	0.63	0.49	0.84								
16. Responsibility and accountability	0.69	0.69	0.67	0.23	0.60	0.61	0.75	0.80	0.54	0.75	0.65	0.73	0.62	0.49	0.77							
17. Technology	0.63	0.57	0.52	0.24	0.56	0.48	0.76	0.49	0.49	0.66	0.57	0.57	0.82	0.44	0.58	0.61						
18. Entrepreneurial	0.55	0.62	0.66	0.57	0.52	0.57	0.58	0.25	0.75	0.76	0.63	0.58	0.77	0.56	0.68	0.69	0.60					
19. Adaptive	0.46	0.40	0.60	0.62	0.41	0.37	0.82	0.31	0.63	0.36	0.75	0.63	0.57	0.81	0.81	0.80	0.75	0.55				
20. Shaping society	0.80	0.65	0.40	0.67	0.56	0.49	0.29	0.49	0.49	0.66	0.57	0.57	0.82	0.44	0.58	0.61	0.93	0.69	0.78			
21. Problem-solving	0.40	0.61	0.39	0.63	0.76	0.68	0.84	0.64	0.46	0.44	0.60	0.56	0.72	0.52	0.66	0.66	0.70	0.81	0.71	0.48		
22. Critical thinking	0.51	0.60	0.66	0.69	0.72	0.66	0.63	0.46	0.41	0.78	0.48	0.66	0.54	0.63	0.62	0.93	0.59	0.41	0.68	0.41	0.51	

Table 5: Summary of Items

Variables	No of item	
	Initial	Final
1. Visionary	5	5
2. Contingent reward	4	3
3. Courage	3	3
4. Idealized influences	3	3
5. Inspiration	4	4
6. Intellectual stimulation	3	3
7. Passion	3	3
8. Strategic thinking	4	4
9. Focus	5	3
10. Collaborate	5	2
11. Innovative	4	3
12. Willingness to change	3	3
13. Communication	3	3
14. Emotional intelligence	4	2
15. Spiritual intelligence	5	3
16. Responsibility and accountability	3	2
17. Technology	4	3
18. Entrepreneurial	4	2
19. Adaptive	3	3
20. Shaping society	3	3
21. Problem-solving	3	3
22. Critical thinking	3	3
Total	81	66

results, where it meets all the criteria for convergent validity, discriminant validity, as well as reliability. This highlights the significance of 4IR leaders in manufacturing companies

5. Conclusion

Based on the results and discussion above, it can be concluded that all the factors for 4IR leadership meet the validity and reliability of good constructs, and all variables of 4IR leadership can form the measurement for 4IR leadership style. As a result, the validation of 4IR leadership can provide predictive implications on improving leaders' performance, given the different attributes confirmed by the findings. Other than that, this research has several limitations, as the research carried out is limited to one sector with a small number of respondents. However, the results of this study cannot be generalized to all types of organizations. Therefore, it is recommended that further research could expand the research units or employ different contexts so that the research results obtained can be generalized.

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