Enterprise Architecture Embrace Digital Technology in Malaysian Transportation Industry

Mailasan Jayakrishnan, Abdul Karim Mohamad, Abu Abdullah

*Abstract***:** *This research paper aims to emerge Enterprise Architecture (EA) as the real strategic performance management game changer in Malaysian Transportation Industry (MTI) towards the digital revolution. We had scrutinized and propound the characteristic of EA and Big Data Analytics (BDA) in perceiving the digital disruption on assimilation how technology "Industry Revolution 4.0 (IR 4.0)" is transforming industries and how leaders and industries can respond on digital technology. We are interested in drive EA and BDA as enterprising research that optimizing digital performance to realize higher knowledge formation and digital strategy to look beyond the areas of MTI on data analytics-Descriptive-Diagnostics-Predictive-Prescriptive Analytics as an integrated and mapped with IR 4.0 features towards emphasizing the analytical process for complex, unstructured data and data sources. We are aiming to emerge EA in MTI and present the dominant excellent operation, characteristics and features cognate to IR 4.0 paradigm as High Technology High-Value perspectives.*

*Keywords***:** *Big Data Analytics, Enterprise Architecture, Game Changer, Industry Revolution 4.0, Information System and Malaysian Transportation Industry.*

I. INTRODUCTION

Industries today are relied on Information System (IS) as an integrated and comprehensive section about their daily activity, counting fundamental capability on given important advantages [1]. Nowadays, current Big Data (BD) dilemma has encountered various industries to implement Enterprise Architecture (EA) framework for managing the complexities and transform their business model and industrial environments to optimize enterprise-wide systems [2]. EA approaches have prevailed widely utilized for digital disruption in the Malaysian Transportation Industry (MTI) with the determination to obtain the principal of real strategic performance management game changer of Information Technology (IT) [3]–[5]. IS and IT simulate a very vital character in current industry for better efficient and effective by aligning their industry schemes for digital technology strategic planning decisions in their industries, to enhance the

quality of decision making process, to hone their top administration and to upgrade their management innovation towards Industry Revolution 4.0 (IR 4.0) [6], [7]. EA is a description function that comprises architectural models of an industry for developing and managing their integrated business model with IT perspective that assures that the IS role within the industry is not overload and information bottleneck [7]. According to [8], EA yields a long-term perspective of industries current architecture systems, technology, and processes, that impart their vision of a future architecture for MTI and perform adaptation strategy expounding how to achieve it. Therefore, we are scrutinizing in today's continually further technology-centric revolution, the real strategic performance management game changer by the execution of this advance paradigm constitute a massive game changer for industries, which are an encounter with High Technology High Value (HTHV). In structure to avail from the digital disruption, the possibility provided by the IR 4.0, industries should possess the prerequisites to demand to endure changes triggered by digital technology [9]. In addition, MTI visage on the data analytics with IR 4.0 features on advanced expertise in automation, towards integration and transformation of industry digitization and IT, without neglecting soft skills [4]. In this research paper, we are aiming to emerge EA as the real strategic performance management game changer in MTI and present the dominant excellent operation, characteristics and features cognate to IR 4.0 paradigm as HTHV perspectives.

II. RESEARCH PROBLEM

The complex industry environment is now becoming more competitive as an industry in a digital world so that information is easily gained through EA for supporting decision making on strategic performance management [10]. Despite that, the current industry environment could restraint from making an effective strategic decision on getting the relevant data because of data and information and data functionally are not integrated and yet the information becomes overload [11]. The industry needed the real strategic performance management game changer that enables them to display strategic decisions in a form of performance benchmark based on their operation data analysis [12]. To develop the real strategic performance management game changer, discovering the contradictory pressures and explaining the features of IR 4.0 in an industry will create information equivalent about industry strategic execution adopting Big Data Analytics (BDA) together with EA instrument [13].

We can observe using EA over time together with their percussion about strategy implementation including the development of real strategic performance management. BDA along with EA had enabled industry in deriving better knowledge creation and decision making [5], [13], [14]. Therefore, the industry needs a game changer that reveals the present BDA together with EA transition phase in strategy implementation and adoption in optimizing the MTI performance [6]. Moreover, this real strategic performance management game changer is a typical strategic application that will be explaining the features of IR 4.0 and EA in viewing the big picture of industry performance descriptive-diagnostics-predictive and prescriptive analytics. Our research intention is to furnish a real-world perceptive of emanating insight from structure BD along with EA development for an executive real strategic performance management of specific use such as for MTI. We have come up with the possible scenarios and problem statements faced by the MTI in Table 1.

Paradigm	Scenarios	Gaps	Problem Statements	Authors
Ideal	Today's industry is so keen on striving for excellence by exploring the business in a digital business environment that creates BDA and delivers innovation.	However, this BDA is not easy to be implemented without the right operational tool.	BD phenomena are about dealing with voluminous data for information overload that must be timely processed by relevant data and high availability in getting insight and yielding good decisions.	[6], [15], [16]
Reality	Nowadays, many industries are still encountering operational difficulties and failing to leverage their innovative capabilities and creativity for attaining long-term success.	This can be defined as the role of high involvement work by employees with the complex work environment conditions continue to fail in resolving strategic issues.	These phenomena occur due to data silos-isolated information repositories, data errors and information bottleneck.	[17]–[19]
Consequence	Without a clear BD context, many industries are experiencing problematic data area of incompetent information management and analytics inability at the strategic level, information blind spot on a typical pattern of affective responses.	These have resulted in severe performance and losing competitiveness.	These industries are affected and triggered by human lacking knowledge, incompetent information management and analytics inability to characterize strategic levels.	[20]–[22]
Purpose	Identifying and understanding data value on industry real strategic performance management using BDA and EA engine in a different game changer over time together with their encounter on strategy implementation including development on real strategic performance management should be the main purpose.	To develop and extract integrated strategic views and technological views for real strategic performance management MTI by using the role of EA.	This can be signified by emerging features of IR 4.0 and EA transition stages as the baseline transformation of technology in viewing the big picture of industries characteristics, designing the real strategic performance descriptive-diagnostics-predictive and prescriptive analytics.	[10], [23], [24]

Table 1: The Problem Statements Paradigm.

Based on Table 1, strategizing and complimenting decision-making process should be achieved by adopting a data analytical approach of EA. EA is now on a solid platform with the need to prepare for the future through breakthrough strategies as the MTI moves forward towards National Transformation 2050 [3]. EA the real strategic performance management game changer is focused on aligning industries priorities. It is therefore imperative for the MTI to make an informed decision in optimizing performance for the next 8 years [13]. We regulate that EA the real strategic performance management game changer directions take into account the current trends in digital disruption on IR 4.0 paradigm as HTHV perspectives to dramatically redesign its future. As such, the MTI is fully committed to optimizing its performance to embrace change and infuse digital technology in an effort to become a high-technology industry moving forward synergistically and in consonance with digital strategy.

III. RESEARCH QUESTIONS

The competitiveness and the globalization are pressuring industries to innovate and to rethink their performance subsequent the IR 4.0 [9]. It constitutes the combination of tools such as BD, 3D printing, cloud, simulation, and robot, that ensue currently adhere to a comprehensive network by diffuse digital information [13]. Industries need a lot of information and data to capture and process in order to make rapid and best decisions [19]. BD phenomena occur due to failures of industry dealing with voluminous data for good decisions [10]. Moreover, the industry is also encountering BDA deficiency, considering the advancement about the integrated perspective in optimizing digital performance to realize higher knowledge formation and digital strategy to look beyond the areas of MTI on data analytics-descriptive-diagnostics-predictive-prescriptive analytics as an integrated and mapped with IR 4.0 features. This phenomenon occurs due to human lacking of knowledge on incompetent information management and analytics inability to a characterized strategic level, information blind spot on typical patterns of affective responses [20], [21]. This research has identified these problematic scenarios as the key factors of the research questions:

1. What is the hindrance along with applicable analytics exist in EA?
2. How to perceive the digital performance with IR 4.0 features?
3. What is the proposed real strategic performance management game changer in MTI?

853

IV. RESEARCH OBJECTIVE

Digital disruption can ensue designate as a digital transformation that appears directly to everyday venture that intimidates to obstruct, destroy or delay your industries goals [9]. EA performance broach to a position of venture eventually pursues to situate industry aims with IT infrastructure in industry [8]. EA application is a complicated, endless process and multidisciplinary, thus calls for enough training and education programs that will augment a highly professional workforce with various capability [25]. The real strategic performance management is an integrated, user-machine system for providing strategic BD scenario information and changing data analytics in industry to support decision-making functions and operation management in MTI [16]. Unfortunately, one of the major problems with the existing IS provision is the lack of coherence between the gaps for excellence [26]. This can be viewed by mapping BDA and EA as a game changer in building MTI data architecture and infrastructure with IR 4.0 features. This research has identified these problem-solving mechanism elements as its research objectives:

1. Observing several integrated BDA and EA analytics for the industry.
2. Proposing and observing relevant digital performance with IR 4.0 features.
3. Designing the real strategic performance management game changer in MTI.

V. LITERATURE REVIEW

One of the most challenging scenarios in many industries facing nowadays is the sudden rise of BD [27]. In other words, BD has attracted the attention of an industry by their unpredictable volume, velocity and variety of data exceed industry storage [10]. According to [28], EA is introduced as a platform of application for supporting industry decisions by emphasizing the analytical process for complex, unstructured data and data sources. Development of the EA framework started with the proper mindset followed by intense discussion and collective wisdom [29].

We can plan and develop through the team approach, sharing views, accumulated knowledge and industry memory about the MTI current standing and taking into account the global trends in the transportation industry. The main concept of high-level industry strategies is form by EA transformation framework [30]. Furthermore, the strategic EA framework was developed from a series of dialogues amongst the strategic planning team, adopting various planning frameworks such as the Blue Ocean Strategy and Futures Scenario Planning. We have come up with four (4) breakthrough strategic changer that will steer MTI toward global excellence in the transportation industry by 2030 are:

1. Information Management (Enabler) on human science toward culture.
2. Big Data (Driver) on human science as driven science to conceive and design new ways.
3. Knowledge Management (Driver) on human science focusing on science-driven to solve industrial issues.
4. Software Engineering (Enabler) on theoretical science only that make an effective change of the processes.

The focus is on new and emerging technology that extremely fast [31]. We need to be prepared for multiple reskilling to strengthen relationships on adopting technology at a far greater speed for the digital enterprise to denote the desired and significant breakthroughs to bring about change for the next 8 years up till the year 2030 for MTI. We focus on the strategic EA spread over MTI perspectives and based on logical cause and effect manner to form a framework using Kaplan's Balanced Scorecard methodology. On the other hand, EA and BDA have emerged as architecture, analytical tools, applications and technique to aid in decision making as strategic performance management [13][32].

Therefore, understanding the sudden rise of this scenario in many industries had triggered the management concern in making significant changes in their operational production of data and information [7]. These phenomena are due to characteristics of BD scenarios that occurred in an industry typically psychological mechanism guides, five (5) characteristics define BD: volume, variety, velocity, value and veracity [27]. Together, these characteristics define what we called HTHV to conceive the demand for an advanced class of efficiency facing strengthen the approach things are concluded today to furnish improved edge of a section along with discipline by our current expertise discipline along with the intelligence to move on them.

The BD podium permits us the different moment to abstract insight from massive velocity, variety, volume, value and veracity of information, in the background, apart from what endure formerly desirable in MTI, as shown in Table 2.

Characteristics	Big Data Scenarios	Game Changer	Malaysian Transportation Industry Perspectives
Volume	The size of the data.	The scale of data.	Converting data into valuable information.
Variety	The different types of data.	Different forms of data.	Extracting knowledge by integrating all types of data together.
Velocity	The velocity at which the information is provoked.	Analysis of streaming information.	Increasing speeds to enable decisions within a second.

Value	Useful data.	Ability to turn the data into value.	Insight and intelligence.
Veracity	The trustworthiness of the data in terms of accuracy.	The uncertainty of data.	Automated decision making.
Validity	Governance, data management together with data quality about immense.	Precise systematic together with perfect the information is being its expected value.	Accept positive information method to assure persistent information element.
Variability	Dynamic along with evolving behavior in the data source.	Meaning is changing in the data source.	Easy to understand and read information expert.
Venue	Dispersed heterogeneous along with information from numerous podiums.	Clear information platforms in clouds and workstations.	Integrated access data podium.
Vocabulary	Information models, semantics that characterize information complex.	Providing data structure for addressing a variety of domains.	Integrated modeling approaches.

Table 2: The Characteristics of Big Data as A Game Changer in Malaysian Transportation Industry.

Based on Table 2, the characteristics of BD as a game changer in MTI on the existing data environment, processes, operation and practices involved in a unique pattern combination with EA as characteristic reactions architecture in building industry real strategic performance management analytical tools. With respect to these intents, existing task requirements, processes, data environment, practices, elements of industry excellence, real strategic performance management, and MTI operations have to be probed with certain game changer approaches and intelligence. Moreover, these MTI are lacking combining individuals knowledge and skills to achieve the industry objectives, on the sustainability EA platform as an isolate knowledge by identifying the technical problems that occur in the industry that needs the suitable generic game changer [16]. Furthermore, systematic literature review approaches need to be implemented an enabling analytical capability of the EA tools for data mining and analytics and developing an integrated digital performance for analysis purposes, focusing on game changer and also real strategized EA tools on current knowledge that includes substantive findings on methodological and theoretical contribution, answering the research question as shown in Table 3.

Research Question	1.What is the hindrance along with applicable analytics exist in EA?		
Author	**Title**	**Objective**	**Application**
[10]	The Efficacy of the "Big Data" Syndrome and Organizational Information Governance.	To address the state of an organization by their unpredictable volume, velocity and variety of data exceed organization storage.	BDA and Big Innovation Context in strategic.
[27]	Transformational issues of big data and analytics in networked business	To prepare a platform of application for supporting business decisions by emphasizing the analytical process.	Encountering BDA for strategic decisions.
[33]	Business Analytics in the Context of Big Data: A Roadmap for Research	To discuss BDA emerging as architecture and analytical tools.	Analyzing unique patterns of gaps.
Research Question	**2.How to perceive the digital performance with IR 4.0 features?**		
Author	**Title**	**Objective**	**Application**
[9]	Fourth Industrial Revolution: Current Practices, Challenges, and Opportunities	To present IR 4.0 paradigm and digital transformation that occurred in an organization.	Paradigm mechanism guides digital transformation.
[6]	Ministry of International Trade and Industry Report 2015	Understanding the fundamentals of IR 4.0 elements of EA central process.	Strategic performance structure of EA.
[3]	Blueprint 2010 -2030 for Iskandar Malaysia Transportation	To apply knowledge management with IR 4.0 to present a complex decision.	Turning data information into knowledge for industry actions.
Research Question	**3.What is the proposed real strategic performance management game changer in MTI?**		
[16]	Blueprint for 1Government Enterprise Architecture A Quick Guide to 1GovEA	To integrate BD scenario information and changing data analytics in an industry.	Decision-making functions and operation management in industry.
[8]	Transformation Plan 2015-2020	Strategy implementation using EA as a roadmap for the next six years.	Designing a strategic performance architecture.
[23]	Enterprise Architecture Development and Implementation In Public Sector: The Malaysian Perspective	To determine the threat, endure by the Malaysian public sector agencies that are in the development along with the implementation stage of EA.	Strategic plan for greater effectiveness of public sector agencies.

Table 3: The Systematic Literature Review on Methodological and Theoretical Contribution Answering Research Question

Based on Table 3, we have come up with the systematic literature review on methodological and theoretical contribution answering the research question. Furthermore, the research methodology also focusses on utilizing this systematic literature review to develop an architecture for generic information and real strategic performance management that optimizing digital performance to realize higher knowledge formation and digital strategy to look beyond the areas of MTI.

VI. ANALYSIS

In Malaysia industries, BD acquires stimulate fully advanced business models focusing onset of the algorithmic, an enormous volume of information is captured, which helps to spot activities in real time [6]. Although every industry needed divergent access including the focal point on divergent condition, practically all are engaged in a revolution that advantage analytics along with BD [9]. Based on our literature review analysis, we have come up with Malaysia industry BD scenarios as shown in Table 4.

Malaysia Industry	BD Scenarios
Government	Health informatics, Econometrics, Weapon systems & counter-terrorism, and Market governance.
Energy & Utilities	Power-line sensors, Operational modeling, Exploration, and Smart grid.
Transportation	Traffic control, Intelligent transport system, Route planning, Technological enhancements and Revenue management.
Advertising & Public	Sentiment analysis, Customer Acquisition, Targeted advertising, and Demand signaling.

Relations	
Financial Services & Securities	Portfolio analysis, Fraud detection, Algorithmic trading, and Risk analysis.
Manufacturing & Natural Resources	Predictive maintenance, Distribution optimization, Engineering analysis, Product research and Process & Quality metrics.
Healthcare & Life sciences	Bioinformatics, Clinical outcomes research, Pharmaceutical Research, and Pharmacogenomics.
Media & Telecommunications	Churn prevention, Fraud prevention, Customer scoring, and Network Optimization.
Retail & Wholesale Trade	Store Location & Layout, Dynamic Pricing, Supply-Chain optimization, Fraud Detection & Prevention, and Customer Relationship Management.

Table 4: The Malaysia Industry Big Data Scenarios.

Based on Table 4, the Malaysia Industry BD scenarios have fully grasped with the need for future as a game changer. The understanding of the interrelations between the industries processes, data, applications, and concealed technologies will be foundational to obtain this synergy between all portion of the industries. The drive of an EA will become primitive in optimizing digital performance; thus, we intend to analysis knowledge value across industries in BD perspective as shown in Table 5.

Malaysia Industry	Volume of Data	Variety of Data	Velocity of Data	Digital Performance Value	Digital Strategy Game Changer
Government	High	High	High	Medium	Medium
Energy & Utilities	Medium	Medium	Medium	Medium	Medium
Transportation	Medium	Medium	Medium	Low	Low
Advertising & Public Relations	High	High	High	Medium	Medium

Financial Services & Securities	**High**	**Medium**	**High**	**High**	**Medium**
Manufacturing & Natural Resources	**High**	**High**	**High**	**High**	**High**
Healthcare & Life sciences	**High**	**High**	**High**	**High**	**High**
Media & Telecommunications	**High**	**High**	**High**	**High**	**Medium**
Retail & Wholesale Trade	**High**	**High**	**High**	**High**	**Medium**

Table 5: The Digital Performance Value Across Malaysia Industries.

Based on Table 5, the digital performance value across Malaysia industries focus on digital strategy game changer that empowers them to embrace an architecture that could integrate industry vision with IT. From this viewpoint, it will originally be requisite to inaugurate a roadmap that signifies us insightful understanding and combine higher knowledge formation that indicates Malaysia industry in digital performance. Based on literature analysis, we can determine that MTI is still evolving and ensuring that their day to day activities are synchronized and aligned with the aim of achieving the desired future that the industry envisions. Yet, MTI is still medium performance on volume of data, a variety of data and velocity of data that makes its digital performance value and digital strategy game changer as low. We can define the indicators as an analytics process maturity of industry towards the real strategic performance management game changer, as shown in Table 6.

Strategic Level	Game Changer Indicator	Analytics Process Maturity	The Real Strategic Performance Management Classification
	High	Optimized and Predictive	Desire large element integrated information & compound mathematical modeling efficiency and others dynamic, ahead-glance insights along quantified trade-offs. (Simulation, optimization and predictive modeling)
	Medium	Repeatable and Defined	Operation processes & systems to execute a scope of descriptive analysis and conceive clarity into former & probable prospective performance drivers. (Statistical analysis, segmentation analysis, and sensitivity analysis)
	Low	Initial	Proves a fixed, historical aspect of industry performance and draws on primary static reports & scorecards. (Ad-Hoc Reporting, Standard Reporting, and Query & Drill-Down)

Table 6: The Analytics Process Maturity of an Industry Towards the Real Strategic Performance Management Game Changer Indicator.

Based on Table 6, the analytics mechanism maturity levels assist the industry to diagnose where they are at current and then provide them a roadmap to obtain to the desired higher levels of maturity. We will tabulate in detail the game changer needed to be successful in developing and implementing BDA in MTI for better data visualization techniques. In order to change at the velocity of the industry together with retaining competitive advantage, EA quickness is enhancing critical [34]. This aid that game changer elements demand to be advanced immediately for MTI quickly respond to changing industry conditions on data sets, analyzed and provide better insights, as shown in Table 7.

Strategic Performance Levels	Real-time Monitoring Metrics	Data Analytics Process	Strategic Performance Management
Level 1 (Corrective) Manage the data	Reactive (Past)-Information management. Alerts that occur at failure. (Solid information foundation)	Descriptive Information-What is…? (BI & Data Mining) Diagnostic Information-What is wrong...? Skills developed as a core discipline.	Information & Knowledge Key Performance Indicator (KPI) (Fact-driven leadership)

Level 2 (Detective) Understand the data	Active (Present)-Analytic skills and tools. Alerts that occur before failure. (Standardized data management practices)	Predictive Information-What would happen if…? (Forecasting) Enabled by a robust set of tools and solutions.	Experience & Norms KPI (as is now) Analytics used as a strategic asset
Level 3 (Preventive) Act on the data	Proactive (Future)-Data-oriented culture. Alerts that trend on possible failure. (Insights accessible and available)	Prescriptive Information-What should be done…? (Optimization & Simulation) Delivers actionable insights embedded in processes	Culture KPI (to be) Strategy and operations guided by insights

Table 7: Game Changer Analytics for Malaysia Transportation Industry.

Based on Table 7, the game changer analytics for MTI will produce an adapted policy and strategy implementation for measuring quality objectives, standards and features IR 4.0. This will be the analytical infographic mechanism for implementing with game changer loaded for BDA. We utilize a systematic literature review to develop and extract an integrated strategic level EA for generic information and real strategic performance management and using the role of EA analyzing the quality of data presented from operational management through BDA in strategic performance management of MTI.

VII. CONCLUSION

The research focuses on digital performance to realize higher knowledge formation and digital strategy to look beyond the areas of MTI on BD phenomena in an industry using EA as an application tool for real strategic performance management. Moreover, this research utilized systematic literature review to develop and extract an integrated real strategic level game changer for generic information and strategic performance management by using the role of EA analysing the quality of data presented from operational management through BDA, which will be brought together to support the best processes and tools in real strategic performance management of MTI. This game changer ensures that an industries real strategic plans and activities will be effectively and efficiently implemented using EA and BD technology by monitoring and controlling mechanisms and processes in the context and complexities of BDA and EA maps of real strategic performance management. Further work had forwarded to an effort of designing and developing specific and real strategic performance management architecture for MTI.

ACKNOWLEDGMENT

REFERENCES

1. B. P. Kaur and H. Aggrawal, "Critical Failure Factors in Information System: an Exploratory Review," *J. Glob. Res. Comput. Sci.*, vol. 4, no. 1, pp. 76–82, 2013.
2. M. Jayakrishnan, A. K. Mohamad, and A. Abdullah, "The Taxonomy of Enterprise Architecture towards High Technology High Value Approach In Malaysian Transportation Industry," *Int. J. Civ. Eng. Technol.*, vol. 9, no. 11, pp. 351–368, 2018.
3. Ismail Ibrahim, *Blueprint 2010 -2030 for Iskandar Malaysia Transportation*. Kuala Lumpur: Iskandar Regional Development Authority (IRDA), 2011.
4. M. Jayakrishnan, A. K. Mohamad, F. R. Azmi, and A. Abdullah, "Adoption of business intelligence insights towards inaugurate business performance of Malaysian halal food manufacturing," *Manag. Sci. Lett.*, vol. 8, no. 7, pp. 725–736, 2018.
5. M. Murugesan and K. Karthikeyan, "Business Intelligence Market Trends and Growth in Enterprise Business," *Int. J. Recent Innov. Trends Comput. Commun.*, vol. 4, no. 3, pp. 188–192, 2016.
6. MITI, "Ministry of International Trade and Industry Report 2015," *Minist. Int. Trade Ind.*, p. 144, 2016.
7. M. A. Jayakrishnan, A. K. Bin Mohamad, and M. B. M. Yusof, "The Holistic View Of Business Intelligence (BI) And Big Data Analytics (BDA) Towards Designing Strategic Performance Management Framework: A Case Study," *J. Theor. Appl. Inf. Technol.*, vol. 96, no. 7, pp. 2025–2045, 2018.
8. W. Omar, "Transformation Plan 2015-2020," *Dep. Stat. Malaysia*, vol. 1, no. 1, p. 79, 2017.
9. A. Petrillo, F. De Felice, R. Cioffi, and F. Zomparelli, "Fourth Industrial Revolution: Current Practices, Challenges, and Opportunities," in *Digital Transformation in Smart Manufacturing*, InTech, 2018, pp. 1–20.
10. [A. E. Bestman, P. Harcourt, R. State, P. Harcourt, and R. State, "The Efficacy of the ' Big Data ' Syndrome and Organizational Information Governance," *J. Inf. Eng. Appl.*, vol. 6, no. 4, pp. 31–42, 2016.
11. P. S. Aithal and P. M. S. Kumar, "Organizational Behaviour in 21 st Century – ' Theory A ' for Managing People for Performance," *IOSR J. Bus. Manag.*, vol. 18, no. 7, pp. 126–134, 2016.
12. Rutendo Mushore, "Leveraging Business Intelligence and Analytics to Improve Decision-making and Organisational Success," University of Cape Town, 2017.
13. S. Shukri and B. Embong, "Future Trend in Transportation," *MIMOS*, vol. 1, no. November, p. 29, 2017.
14. M. A. Jayakrishnan, A. K. Bin Mohamad, and M. B. M. Yusof, "Integrating the Features of Knowledge Management (KM) and Business Intelligence (BI) for Developing Organizational Performance Framework—A Diagnostics Dashboard," Adv. Sci. Lett., vol. 24, no. 3, pp. 1795–1799, 2018.
15. A. Caroline, "Kajian Konsep MIT 90 ' s Sebagai Salah Satu Kerangka Kerja untuk Membangun Sistem Informasi Bisnis," vol. 4, no. April, pp. 93–102, 2018.
16. MAMPU, "Blueprint for 1Government Enterprise Architecture A Quick Guide to 1GovEA," Malaysia Adm. Mod. Manag. Plan. Unit, p. 36, 2017.
17. M. A. Jayakrishnan, A. K. Bin Mohamad, and M. B. M. Yusof, "Understanding Holistic View and Complexities in Big Data Analytics and Business Intelligence (BI) Towards Establishing Strategic Performance Management: A Case Study," Adv. Sci. Lett., vol. 24, no. 3, pp. 1775–1779, 2018.
18. N. Kumari, "Business intelligence in a nutshell," Int. J. Innov. Res. Comput. Commun. Eng., vol. 1, no. 4, pp. 969–975, 2013.
19. G. E. O. F. I. Nsights, O. A. El Sawy, and P. A. Pavlou, "DIGITAL BUSINESS STRATEGY: TOWARD A NEXT GENERATION OF INSIGHTS," MIS Quarterley, vol. 37, no. 2, pp. 471–482, 2013.
20. D. Bailey, "The Metrology of Organizational Performance: How Baldrige Standards Have Become the Common Language for Organizational Excellence Around the World," no. July, pp. 1–17, 2015.
21. D. H. Olsen and K. Trelsgård, "Enterprise Architecture Adoption Challenges: An exploratory Case Study of the Norwegian Higher Education Sector," Procedia Comput. Sci., vol. 100, no. 1877, pp. 804–811, 2016.
22. E. M. Rogers, Diffusion of innovations. 1995.

23. H. Nur azaliah, Nazri kama, "Enterprise Architecture Development And Implementation In Public Sector: The Malaysian Perspective," J. Theor. Appl. Inf. Technol., vol. 88, no. 1, pp. 176–188, 2016.
24. C. Van Zijl and J.-P. Van Belle, "Organisational Impact of Enterprise Architecture and Business Process Capability in South African Organisations," Int. J. Trade, Econ. Financ., vol. 5, no. 5, pp. 405–413, 2014.
25. F. Rahimi, J. Gøtze, and C. Møller, "Enterprise architecture management: Toward a taxonomy of applications," Commun. Assoc. Inf. Syst., vol. 40, no. 1, pp. 120–166, 2017.
26. M. Avital, L. Mathiassen, and U. Schultze, "Alternative genres in information systems research," Eur. J. Inf. Syst., vol. 26, no. 3, pp. 240–247, May 2017.
27. B. Baesens, R. Bapna, J. R. Marsden, J. Vanthienen, and J. L. Zhao, "Transformational issues of big data and analytics in networked business," MIS Q., vol. 38, no. 2, pp. 629–631, 2016.
28. F. Amarilli, "A Framework for Business IT Alignment in Turbulent Environments," Athens J. Technol. Eng., vol. 1, no. 2 (June), pp. 103–118, 2014.
29. M. Jayakrishnan, A. K. Mohamad, and A. Abdullah, "Digitalization Approach Through An Enterprise Architecture For Malaysia Transportation Industry," Int. J. Civ. Eng. Technol., vol. 9, no. 13, pp. 834–839, 2018.
30. N. Razak, "Rancangan Malaysia Kesebelas 2016-2020," Percetakan Nas. Malaysia Berhad, vol. 1, no. 2, pp. 1–40, 2016.
31. D. Kohtamäki, M. and Farmer, Real-time Strategy and Business Intelligence. Cham: Springer International Publishing, 2017.
32. M. Jayakrishnan, A. K. Mohamad, and M. M. Yusof, "Assimilation of Business Intelligence (BI) and Big Data Analytics (BDA) To- wards Establishing Organizational Strategic Performance Management Diagnostics Framework : A Case Study," J. Digit. Inf. Manag., vol. 16, no. 1, pp. 22–32, 2018.
33. G. Phillips-wren and G. Phillips-wren, "Business Analytics in the Context of Big Data: A Roadmap for Research," vol. 37, 2015.
34. M. Jayakrishnan, A. K. Mohamad, F. R. Azmi, and A. Abdullah, "Implementation of business intelligence framework for Malaysian halal food manufacturing industry towards initiate strategic financial performance management," Manag. Sci. Lett., vol. 8, no. 10, pp. 1059–1076, 2018.

AUTHORS PROFILE

Mailasan Jayakrishnan, is a Graduate Technologist and a member of Malaysia Board of Technologists (MBOT). He earned his M.Sc in Information and Communication Technology from Universiti Teknikal Malaysia Melaka (UTeM), B.Sc in Information Technology from Universiti Utara Malaysia (UUM) and Diploma in Technology Management from Universiti Teknologi Malaysia (UTM). He is currently persuading Ph.D. Degree in Information and Communication Technology at UTeM.

Abdul Karim Mohamed is a senior lecturer under the Department of Intelligent Computing and Analytics at Faculty of Information Technology and Communication, Universiti Teknikal Malaysia Melaka (UTeM). He received his Ph.D. Degree in Information Technology from UTeM. He earned his M.Sc in Software Engineering from Universiti Putra Malaysia (UPM). His research interest is in artificial intelligent system.

Abu Abdullah is currently a Professor at Faculty of Manufacturing Engineering, Universiti Teknikal Malaysia Melaka (UTeM). He is the Chairman for Majlis Profesor Universiti of UTeM and the Director for Advanced Manufacturing Centre of UTeM. He received his Ph.D. Degree in Manufacturing Engineering from the University of Warwick, UK in 1996. He has served various government agencies including as Director for the Office of Science Advisor to the Prime Minister in the year 2004 & 2005.