



The Role of Business Intelligence Tools in the Decision Making Process and Performance

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ABSTRACT In the current turbulent business markets, the way companies address and tackle unexpected events is reflective of its success. Different varieties of technological tools have been created to assist in overcoming unpredictable and unexpected events in businesses that could impact them, and one such tool is the business intelligent. Such systems assist in gathering data concerning business operations and environments transforming information into something that can be easily understood. Major firms have adopted big data analytic systems but this does not hold true for most universities and organizations literature has yet to present the way business intelligence tools affect businesses of different types. Therefore, in this study, the impact of business intelligence tools on the decision-making and performance of public universities in Jordan is investigated.

This qualitative study was conducted on 200 members in 10 chosen universities. Based on the interview results, BI tools deployed in the universities assist in facilitating timely decision-making, enhances efficiency of performance and meets client's needs suitably, leading to employee satisfaction.

KEYWORDS: business intelligence tools, competitive advantage, customer satisfaction, employee satisfaction and universities.

JEL Classification: M15

1. INTRODUCTION

There are two fundamental meanings to business intelligence (BI) based on its relationship with the term, 'intelligence'. The first less often used meaning is the capacity of human intelligence used in business activities or affairs. In other words, business intelligence as a new field of investigation of the application of the human cognitive faculties and AI technologies to decision-making and management support for resolving business issues. The second meaning is related to intelligence as valuable information where value is in terms of currency and relevance – it refers to expert information, knowledge and technologies used in managing businesses. Under this meaning, business intelligence is a general category of applications and technologies used for collecting, accessing, and analyzing data to assist in decision-makers to make

informed decisions. Moreover, business intelligence is a term that indicates the ownership of comprehensive knowledge of the entire factors affecting business and thus, firms need to know about these factors (e.g., customers, rivals, business partners, economic surrounding and internal operations) for effective and informed quality business decisions. Moreover, a distinct business intelligence field referred to as competitive intelligence is focused only on the external competitive surroundings of the firm. The firm collects information regarding the competitors' actions and makes decisions on its basis. No serious attempt has been made to gather internal information.

However, in current business organizations, because of automation, technological development and increasing standards, vast amounts of data are being generated, and data warehouse technologies have been developed for data storage. Such warehouse

technologies include Improved Extract, Transform, Load (ETL) and Enterprise Application Integration tools enabling timely data collection. Similarly, OLAP reporting technologies enabled the faster reports generation which carries out data analysis. On the whole, business intelligence has become an art of going through vast data amounts, extracting what is important, and transforming it into knowledge that is useful for decision-making. Therefore, in this paper, the author examines the BI concept, its components, emergence, benefits, and the factors that influence it, technology requirements, BI design and implementation, cultural imperatives and different BI techniques. The paper would contribute to the understanding of the basic concepts of BI.

2. BUSINESS INTELLIGENCE

Business intelligence is the process of obtaining vast data mounts, analyzing them and presenting them in the form of quality reports that contain a summarized version of the data essence based on business actions, allowing management to make daily business decisions (Abusweilem & Abualoush, 2019). According to (Alyan, 2022), BI is a method of enhancing the performance of business through the provision of robust assistance to decision-making, enabling access to actionable information. Essentially, BI tools are technology that facilitates efficient business operations through the provision of increased value to information for effective use. BI, based on Alzghoul et al. (2022) refers to the process of gathering, treating and diffusing information to reduce uncertainty in decision-making. Other researchers described it as a business management term that describes applications and technologies functioning together to collect, access and analyze data concerning the business for informed decisions.

Moreover, Arefin et al. (2022) described one of the fundamental characteristics of BI tool as its ability to gather data from a source that is heterogeneous and through the use of advanced analytical methods, the demands of users can be met. BI technology was classified by Bach et al. (2018) based on the information delivery method, namely

reporting, statistical analysis, ad-hoc analysis and predictive analysis and the Gartner Group brought up the BI concept and defined it as, a set of methodologies and technologies (J2EE, DOTNET, Web Services, XML, data warehouse, OLAP, Data Mining, representation technologies, among others, to enhance the effectiveness of enterprise operations, and support decision-making for competitive advantages.

In the current times, BI is no longer a new technology but rather it is considered as an integrated solution for firms that focus on their requirement as a key factor driving technology innovation. Thus, the way key business issues are identified and addressed is the major challenge of BI applications to achieve valuable impact on business. BI was stated to include effective data warehouse and reactive element that oversees the time critical operations, enabling tactical and operational decision-makers to modify their actions based on the strategy of the company (Božič, K., & Dimovski, 2019). Another definition came from Chen & Lin (2021), who described BI as the result of in-depth analysis of detailed business data, with the inclusion of database and application technologies and practices of analysis. The authors further extended the definition of to include technical tools that cover knowledge management, decision support systems, enterprise resource planning and data mining. Other authors included several software for Extraction, Transformation and Loading (ETL) data warehousing, database query and reporting under BI (Gauzelin & Bentz, 2017) as well as multidimensional/online analytical processing (OLAP) data analysis, data mining and visualization.

3. BUSINESS INTELLIGENCE TOOLS

The following are tools of BI: OLAP (on-line analytical processing) – this is the way business users can go through data through the use of sophisticated tools that enable dimensional navigation (e.g., time and hierarchies). OLAP provides multidimensional, summarized business data and is utilized for the purpose of reporting, analysis, business modeling or

planning optimization. OLAP has methods and tools that are useful in working with data warehouses or data marts created for state-of-the-art enterprise intelligence systems. The systems are essentially used to process questions directed towards trends determination and critical factors analysis. Reporting software produces the aggregated data views to maintain an informed management concerning their business status.

BI tools used for storing and analyzing data like data mining and data warehouses, decision support systems and forecasting, document warehouses and document management, mapping, information visualization, and knowledge management. This also includes dash boarding, geographic information systems, management information systems, trend analysis, software as a service (SaaS), advanced analytics, and forecasting/predictive analytics, which leverages statistical analysis methods for the prediction of accurate facts measurements.

Corporate Performance Management (Portals, Scorecards Dashboards) – under this category, a container exists for the pieces to plug into in order to create an aggregate story; for instance, a balanced scorecard displays portlets for financial metrics coupled with universal learning and growth metrics. In this regard, real time BI enables the real time distribution of metrics using email, messaging systems and interactive displays.

Data Warehouse and Data Marts – this is an important BI component, which is subject and oriented and integrated. It supports the physical data propagation through the several enterprise records integration, cleansing, aggregation and query tasks. Often times it contains the operational data, which is referred to as updateable set of integrated data used for the wide tactical decision-making in the enterprise. It constitutes live data and not snapshots with minimal history retained.

Data Sources - data may be sourced from historical data, operational data, external data, market research firms, online data or information from an existing data warehouse. Also, the data sources may take the form of relational databases or data

structure supporting the existing business applications, and they may also exist in various platforms and can possess structured information (e.g., tables, spreadsheets) or unstructured ones (e.g., plaintext files, pictures and multimedia information).

Moving on to data mart, it is referred to as a collection of subject areas that are organized to support decisions that are made by specific departments, with every department, having their separate data mart. Marketing data mart is similar to other data marts but it should be noted that individual departments do have their own hardware, software, data and programs that comprise the data mart and each interpret their data mart's structure that meets specific needs.

Moreover, data marts are like data warehouses in that they store operational data that is useful for strategizing based on past trends and experiences analysis. The major difference is that the data mart is developed based on distinct, pre-defined needs for a specific grouping and configuration of chosen data – which is why there can be several data marts within a business enterprise. It can support a specific function, process or unit in the business organization and it is a collection of subject areas organized to support decisions of a specific department concerning its needs.

BI tools have been extensively accepted as the new middleware between transactional applications and decision support applications, thereby decoupling systems focused on facilitating business transactions efficiency from those focused-on business decisions support efficiency. BI is capable of decision support, online analytical processing, statistical analysis, forecasting and data mining.

4. ISSUES IN BI: EXPERTS DIFFERENT VIEWS OF BI

Experts in data warehousing consider BI as a supplementary system that is still a novelty. They view it as a technology platform that supports decision-making and it appears that data mining experts also view it as a set of advanced decision support system coupled with data mining methods and algorithms applications. In the viewpoint of statisticians, BI is a forecasting

analysis-based tool that has several dimensions. It has been mentioned time and time again that the key to BI system success is the consolidation of data from various different enterprise operational systems into an enterprise data warehouse but in the case of universities, a full-fledged enterprise data warehouse is still a rarity because of the effort scope required towards the consolidation of the whole enterprise data. According to Daradkeh et al. (2022), because of the newly emerging highly dynamic business environment, only enterprises that are competitive will be successful in sustaining their market status. With regards to universities, they can only stand out if they leverage information on their market place, customers and operations to grab business opportunities. In this regard, the right information needs to be analyzed and several commonly used surveys like Gartner, Forrester and International Data Center indicated that majority of the firms all over the world are inclined towards investing in BI, with the top major investments poured into Enterprise Resource Planning (ERP) and Customer Relationship Management (CRM) in the past decade because due to the information gathered by the systems most of them achieve competitive advantage. The main objective of any corporate entity is to aim for the right access to information at the right time and thus firms need to facilitate information analysis and application to make timely decisions for their operations and processes. This may be exemplified by the marking of seasonal merchandise or provision of specific customer recommendations, where the firms have to access information as fast as they can and through the implementation of smarter business processes like business intelligence tools, such processes may influence the firm's bottom line and value of returns.

5. FUTURE OF BUSINESS INTELLIGENCE

In the rapidly evolving business world, consumers demand efficient and timely services and to remain competitive, it is crucial for firms to meet or exceed the consumers' demands or expectations. Firms need to largely depend on BI systems to be

able to lead trends and future events. BI users have been demanding real time BI or the next best thing, specifically to use in their frontline operations, expecting to obtain up to date information in a way that is similar to monitoring stock quotes online. In other words, weekly/monthly analysis is no longer sufficient and in the near future, businesses will become dependent on real time business information in the same way that they obtain information by just clicking on the internet. The near future also sees businesses to expect democratized information whereby university users will be enabled to see information on their specific segment in light of performance. The future demands BI tools to increase to match the increase in the expectations of consumers. Therefore, it is crucial for businesses to increase the pace of services to remain relevant.

6. REASONS FOR ADOPTING BUSINESS INTELLIGENCE

In the context of universities, BI facilitates accurate and informed decisions and hence, it can function as a tool of competitive advantage – this is particularly true for firms that extrapolate information from indicators in their surroundings, based on which they can accurately predict future trends and economic conditions. After gathering BI effectively and proactively used, decisions can be made for their benefit, with the ultimate aim being to improve the timeliness and quality of information generated. This is akin to having a lead on a race with the clear road ahead. BI reveals the firm's position compared to its rivals, customer behavior changes and patterns of spending, firm capabilities, market conditions, future trends, demographic and economic information, and social, regulatory and political environment.

7. RESEARCH METHOD

This qualitative descriptive study used semi-structured interviews with members of the universities for data collection regarding BIT issues (Grublješić et al., 2019) and the emerging themes deciphered from the interviews were highlighted. Two hundred

(200) research participants were recruited from public Jordanian universities staff the semi-structured interview (refer to Appendix I and II) comprised of questions concerning BIT aspects and the participants were queried on each of them after which the answers were coded and analyzed and the emerging themes listed (refer to Table 1).

Table 1. A summary of universities academic staff responses on several parts of BI tools

Business Intelligence tools Aspects Tested Through Interviews	Yes%	No%
Placement of Business Intelligence tools	50	65
Usage of Business Intelligence tools at all universities levels	20	80
Difficulty of the Business Intelligence tools deployed	40	60
Obtainability of expert staffs for accomplish Business Intelligence tools	30	80
Business Intelligence tools support in decision making	90	10
Different influences of Business Intelligence tools different than helping in decision making	99	10
Awareness on maintenance of the practice of Business Intelligence tools	95	5

8. RESEARCH RESULTS

On the basis of the obtained results, the summarized responses of the respondents concerning several BI system aspects and the perceptions of universities academic staff are displayed in Table 1 and Table 2.

Business intelligence tools aspects tested through junior employee interviews	Yes%	No%
Practice of at the universities	20	90
Familiarity with BIT	30	90

BIT influence on employee production and presentation	75	35
BIT impact on firm performance	70	30
Opinions on continuation of BIT use	90	20

9. ANALYSIS

The themes that emerged from the interview responses were regarding BIT deployment and use among universities from the perception of junior employees and managers.

9.1. BIT Deployment and Usage

Majority of the universities have not deployed BIT and among the 50 top management employees who were part of the interviews, only 45% acknowledged their universities implementation of BIT. The junior employees were generally unsure as to their universities have implemented BIT or not, and only 15% were of the consensus of BIT use. From the managers, 19% indicated the use of BI throughout the levels of universities, indicating the deployment and use of BIT has not yet proliferated throughout all the employees. The results are consistent with (Vallurupalli, & Bose, 2018) result which showed that small businesses have not completely embraced BIT. The authors proceeded to explain that the costly BIT are the reasons for their economic unfeasibility for universities and this makes them unattractive to such institutions. Universities are often on a tight budget and are thus convinced that BIT investments would be a waste of resources. The second barrier to universities adoption of BIT is the lack of IT systems in the institutions as noted Wahua & Ahlijah (2020). It appears that small business entities lack sufficient computer equipment for hosting BIT (Yiu & Cheng, 2021; Tripathi et al., 2020). Generally speaking, computer equipment's are capital intensive and universities just do not have enough budget to invest them being cost-saving institutions and thus, this limits their opportunities to adopt BIT. According to Yeboah-Boateng and Tripathi et al., (2020) universities lack the right installation capabilities and they are

not inclined towards business functions online as this may compromise security. In cloud-based services, business intelligence functions are sometimes hosted online and thus, owing to the universities lack of trust in online processes, they prefer not to adopt BIT.

9.2. BIT Complexity and Availability of BI Maintenance Personnel

Another theme that arose from the interviews is the lack of available skilled BI maintenance personnel and BIT complexity. Based on the results, majority of the managers (61%) are of the consensus that BIT implementation would be full of complexity and 39% stated that they only have basic BIT in their firms. Moreover, regardless of the confirmation of the majority of respondents that universities have deployed complex BIT, the results indicated that personnel needed to maintain the systems are lacking. The results showed that only 25% of the managers agreed to the capable handling of their skilled employees of BIT, and the managers' responses are aligned with those of the employees in that 20% of the latter possess BIT knowledge. Therefore, universities who had enough skilled employees been the ones who embraced complex BIT.

In a related study, Huang et al., (2022) described complexity as the level to which an innovation is viewed as difficult to understand or use. In this regard, complexity remains one of the barriers to innovation/technology adoption as less complex technologies are more likely to be adopted compared to complex technologies, which is why in the former, high adoption rate was noted (Jaklič et al., 2018). BIT complexity stems from the mathematical functions that are useful for predicting a specific phenomenon to resolve an issue. Skills in IT are crucial for BIT use (Jaradat et al, 2022). The interviews revealed that majority of the employees do not have sufficient knowledge on BIT and this could have been affected by their lack of IT skills.

Added to the IT skills are the mathematical skills which are needed for BIT adoption and

use. Universities lack the resources and personnel for BIT management – they have limited resources that may prevent them from adopting BIT (Jayakrishnan et al., 2018). Furthermore, universities have high rate of failure in attracting qualified personnel for BIT management as they do not have the resources to pay them.

9.3. Impact of BIT on Universities performance

The third theme noted in the interviews is the impact of BIT on the institutions of higher learning as based on the results, 89% of the interviewed managers contended that BIT facilitate decision-making in their institutions. For instance, one of the managers admitted, "Our company, though categorized as a university has deployed BIT, which provide real-time data". Information from BIT is essential for a lot of processes, like the registration of low number of sales which was later attributed by the system to the expensive price of the product. This information is real-time stemming from market intelligence, enabling the companies to resolve the product price, and ultimately enhance sales". This admission shows that BIT is capable of providing technological tools that facilitate decision-making based on accurate data. Essentially, owing to the high uncertainty in market trends and the competitiveness, valuable information is difficult to come by and in this regard, BIT enable business efficiency as they generate timely information for decision-making. Aside from generating such information, BIT also provides data quality in that information is free from error and highly analyzed, ready for the leaders to interpret the results. BIT is thus significant as it enables firms to identify changing trends and emerging threats to resolve them before they can do any damage. According to one of the respondents, "In our company, we rely on business intelligence solely for market scanning.

The interview results are consistent with Khan., (2022), who contended that a firm needs constant provision of information regarding consumer behavior and changing preferences and this is provided by BIT in a timely manner so that informed decisions

can be made (Masa'Deh et al., 2021). Apparently, BIT is crucial for assisting leaders of companies to take timely decisions and front-line employees and executives to make informed decisions. BIT include historical data and combine it with real-time data as needed by the business leaders, empowering them to make quick decisions with confidence as the provided information is valid and reliable. The system generates information based on the past while at the same time considering the present situation, and incorporating expected changes (Torres et al., 2018). They extract factual data from a vast amount of unstructured data and transform it into meaningful and actionable reports, which is important for making informed decisions in the universities. Businesses largely depend on BIT to source reliable data for their decisions and aside from reliable information, BIT also has several other benefits.

The interview results showed that almost all of the interviewed managers (95%) were of the consensus that BIT provides several benefits aside from timely decision making. For instance, one of them contributed that, "BI is not just amount timely decision-making as it helps businesses in many other ways, like providing vital information used to mitigate errors in production, enabling the company to achieve efficiency in operations". Notably, one of the benefits of BIT that were mentioned by the managers is the increased efficiency and productivity of the universities. This is consistent with Melo & Machado (2019), who stated that informed strategic decisions obtained from BIT are important in enhancing efficiency in operations and productivity in business. In this line of argument, BIT is capable of analyzing emails and chats between customers and the company to determine customer characteristics and demands, paving the way form higher strategic plans to address such needs through enhanced operations for competitive advantage and goal achievement.

From the interview results, the interviewees perceived that BIT provides information that is important and accurate directed towards enhancing the company's efficiency and productivity. BIT was also mentioned to affect return on investments (ROI) and

similar to this, Wieder Nithya & Kiruthika, R. (2021) revealed that BI paves the way for businesses to mitigate costs, increase revenues and profit margins and it impacts ROI by offering a cost-effective method of collecting business information. Businesses used to channel vast amounts of cash to conduct market research to obtain information how to increase their efficiency but currently, BI provides cost and time-saving strategy of gathering the same if not more information. Hence, financial resources that were used to carry out market research can be directed towards other functions that need it. The ROI is also affected by BIT as they enhance the productivity of employees (Nuseir et al., 2021).

As for the interviewed employees, majority of them (70%) were in agreement that BI fosters their work performance and productivity, and in turn, enhance the overall company performance. One junior employee stated, "Our company has made use of BIT as a norm in all operations. At the onset, after the system's implementation, we thought that it was a way for the leaders to control use but eventually we were convinced that the system noted each employee's productivity, which is a vital owing to the need to support and empower those who are low-performing. The report may also be used by managers and supervisors to find the right strategy to motivate low-performing employees to enhance their performance and thus, I find BIT to be crucial to both performance and productivity". It is notable that BIT assists in the productivity and performance enhancement of employees and they assist leaders in how to encourage and motivate such performance (Rahardja & Harahap, 2019). Motivating employees is a must if the company is to meet their satisfaction and obtain their loyalty.

10. PERCEPTIONS OF UNIVERSITY MEMBERS ON THE USE OF BIT

It is evident from the results that managers and junior employees alike in the universities hold positive views on BIT use, with 96% of managers convinced of the need for continued usage. This held true for 85% of the employees who were also convinced of its usefulness and the need for ongoing use.

Such responses may be related to the BIT provided benefits. Regardless of the company size, BIT provides enhanced and timely strategic decision-making, meets customer satisfaction and motivates the work force (Rahman, 2021). These benefits are coupled with enhanced performance of the universities.

11. CONCLUSION

The study findings evidenced the extensive effects of BIT on the university's operations. BIT brings about decision-making of management through the provision of data that is timely, quality and accurate, considering the past, present and future events, thereby enabling leaders to reach informed decisions. Added to this, BIT deployment in universities goes beyond decision-making resolution but also enhancing employees' performance, customer satisfaction and firm functions and processes. They promote and maintain efficient operations to meet customer needs and present reports on the individual performance of employees in order to support and motivate them. On the whole, BIT impact enhances the performance of companies, which is a result that is consistent with that found in universities in Sweden, and thus, it can be argued that there appears to be universal behavior among universities. Finally, BIT enhancement of universities performance can be used as a BIT outcome indicator – one of the top challenges that businesses generally face. BIT is important for monitoring universities performance (Richards et al., 2019), with performance generally determined through the comparison between goals and outcomes. BIT performance among universities calls for focusing on several dimensions (i.e., financial, operational and overall effectiveness), which need to be determined through subjective and objective means (Saleem & Ilkhanizadeh, 2021; Siripipatthanakul & Phayaphrom, 2021). There is thus a need to conduct a holistic determination of the overall impact and

outcome in universities ranging from financial performance, to employee satisfaction, and customer satisfaction.

Author Contribution

Business intelligence (BI) is the decision-making serving structure. Therefore, BI aids in improved choices, and it has developed prevalent in numerous administrations, it is significant to illustrate BI's rule concluded DMPs and to display how the paraphernalia used in BI enable the DMP. "Higher teaching organizations global are working nowadays in an actual active and multifaceted situation" As an outcome, universities that are within advanced teaching are vulnerable for rivalry is thoughtful. Additionally, developed teaching is an additional part that will theoretically influence large statistics study. Therefore, the request and usage of big data in advanced instructive organizations might have a consequence in improved excellence teaching for scholars and a better involvement for the university members. This study the first study in my country explains the role of BI tools in the decision-making process at the public universities.

REFERENCES

- Abusweilem, M., & Abualoush, S. (2019). The impact of knowledge management process and business intelligence on organizational performance. *Management Science Letters*, 9(12), 2143-2156.
- Alyan, M. A. A. (2022). The Impact of Business Intelligence on Employee Empowerment, the Mediating Role of Information and Communication Technology (ICT), A Field Study on Jordanian Universities-Zarqa Governorate. *Diss. Zarqa University*.
- Alzghoul, A., Khaddam, A. A., Abusweilem, F., Irtameh, H. J., & Alshaar, Q. (2022). How business intelligence capability impacts decision-making speed, comprehensiveness, and firm performance. *Information Development*, 02666669221108438.
- Arefin, M. S., Hoque, M. R., & Rasul, T. (2020). Organizational learning culture and business intelligence systems of

- health-care organizations in an emerging economy. *Journal of Knowledge Management*.
- Bach, M. P., Jaklič, J., & Vugec, D. S. (2018). Understanding impact of business intelligence to organizational performance using cluster analysis: does culture matter?. *International Journal of Information Systems and Project Management*, 6(3), 63-86.
- Božič, K., & Dimovski, V. (2019). Business intelligence and analytics use, innovation ambidexterity, and firm performance: A dynamic capabilities perspective. *The Journal of Strategic Information Systems*, 28(4), 101578.
- Chen, Y., & Lin, Z. (2021). Business intelligence capabilities and firm performance: A study in China. *International Journal of Information Management*, 57, 102232.
- Daradkeh, M. (2022). Innovation in Business Intelligence Systems: The Relationship Between Innovation Crowdsourcing Mechanisms and Innovation Performance. *International Journal of Information Systems in the Service Sector (IJISSS)*, 14(1), 1-25.
- Gauzelin, S., & Bentz, H. (2017). An examination of the impact of business intelligence systems on organizational decision making and performance: The case of France. *Journal of Intelligence Studies in Business*, 7(2).
- Grublješič, T., Coelho, P. S., & Jaklič, J. (2019). The shift to socio-organizational drivers of business intelligence and analytics acceptance. *Journal of Organizational and End User Computing (JOEUC)*, 31(2), 37-64.
- Huang, Z. X., Savita, K. S., & Zhong-jie, J. (2022). The Business Intelligence impact on the financial performance of start-ups. *Information Processing & Management*, 59(1), 102761.
- Jaklič, J., Grublješič, T., & Popović, A. (2018). The role of compatibility in predicting business intelligence and analytics use intentions. *International Journal of Information Management*, 43, 305-318.
- Jaradat, Z., Al-Dmour, A., Alshurafat, H., Al-Hazaima, H., & Al Shbail, M. O. (2022). Factors influencing business intelligence adoption: evidence from Jordan. *Journal of Decision Systems*, 1-21.
- Jayakrishnan, M., Mohamad, A. K., & Yusof, M. M. (2018). Assimilation of Business Intelligence (BI) and Big Data Analytics (BDA) Towards Establishing Organizational Strategic Performance Management Diagnostics Framework: A Case Study. *Journal of Digital Information Management*, 16(1).
- Khan, S., Qader, M. R., Thirunavukkarasu, K., & Abimannan, S. (2020, October). Analysis of business intelligence impact on organizational performance. In *2020 International Conference on Data Analytics for Business and Industry: Way Towards a Sustainable Economy (ICDABI)* (pp. 1-4). IEEE.
- Masa'Deh, R. E., Obeidat, Z., Maqableh, M., & Shah, M. (2021). The impact of business intelligence systems on an organization's effectiveness: the role of metadata quality from a developing country's view. *International Journal of Hospitality & Tourism Administration*, 22(1), 64-84.
- Melo, P. N., & Machado, C. (Eds.). (2019). *Business intelligence and analytics in small and medium enterprises*. CRC Press.
- Nithya, N., & Kiruthika, R. (2021). Impact of Business Intelligence Adoption on performance of banks: a conceptual framework. *Journal of Ambient Intelligence and Humanized Computing*, 12(2), 3139-3150.
- Nuseir, M. T., Aljumah, A., & Alshurideh, M. T. (2021). How the business intelligence in the new startup performance in UAE during COVID-19: The mediating role of innovativeness. In *The effect of coronavirus disease (covid-19) on business intelligence* (pp. 63-79). Springer, Cham.
- Rahardja, U., & Harahap, E. P. (2019, July). Implementation of Information Planning and Strategies Industrial Technology 4.0 to Improve Business Intelligence Performance on Official Site APTISI. In *Journal of Physics: Conference Series* (Vol. 1179, No. 1, p. 012111). IOP Publishing.

- Rahman, A. A. A. (2021). Bibliometric approach of Business Intelligence as technical infrastructure to enhance the organizational performance, competitiveness and decision making. *Journal of Legal, Ethical and Regulatory Issues*, 24, 1-12.
- Richards, G., Yeoh, W., Chong, A. Y. L., & Popovič, A. (2019). Business intelligence effectiveness and corporate performance management: an empirical analysis. *Journal of Computer Information Systems*, 59(2), 188-196.
- Saleem, N., & Ilkhanizadeh, S. (2021). The mediating role of organizational culture in the effect of business intelligence on corporate performance management. *Int. J. Res. Human. Soc. Stud*, 8, 1-14.
- Siripipatthanakul, S., Phayaphrom, B., & Tong-On, P. (2021). The implementation of business intelligence using data analytics and its effects towards on performance in the hotel industry in Thailand. *International Journal of Behavioral Analytics*, 1(2).
- Torres, R., Sidorova, A., & Jones, M. C. (2018). Enabling firm performance through business intelligence and analytics: A dynamic capabilities perspective. *Information & Management*, 55(7), 822-839.
- Tripathi, A., Bagga, T., & Aggarwal, R. K. (2020). Strategic impact of business intelligence: A review of literature. *Prabandhan: Indian Journal of Management*, 13(3), 35-48.
- Vallurupalli, V., & Bose, I. (2018). Business intelligence for performance measurement: A case based analysis. *Decision Support Systems*, 111, 72-85.
- Vucec, D. S., Vukšić, V. B., Bach, M. P., Jaklič, J., & Štemberger, M. I. (2020). Business intelligence and organizational performance: The role of alignment with business process management. *Business Process Management Journal*.
- WAHUA, L., & AHLIJAH, Y. (2020). Business intelligence costs and firm performance: Evidence from selected top ECOWAS'banks. *Journal of Economics and Trade*, 5(1), 1-17.
- Yiu, L. D., Yeung, A. C., & Cheng, T. E. (2021). The impact of business intelligence systems on profitability and risks of firms. *International Journal of Production Research*, 59(13), 3951-3974