HR Analytics and Organizational Effectiveness

S. Zeidan[1] and N. Itani[2]
[1]*Associate Professor, Department of Management and Commerce,*
Amity University Dubai, Dubai, UAE.
[2]*Research Scholar, Dubai, UAE.*

(Corresponding author: S. Zeidan)

ABSTRACT: The purpose of this paper is to conduct a systematic review by collecting secondary data from published journals on Human Resource Analytics in an effort to shed more light on different issues that relate to the topic such as the processes involved, the emerging trends, the antecedents, the consequences (specifically, organizational effectiveness), and the influences impacting the success of its adoption. This study is of considerable practical relevance as despite having numerous empirical research linking the positive impact of HR Analytics to organizational effectiveness and business competitiveness, the adoption and implementation rates of HR Analytics remain comparatively low. During the time we conducted the research, we faced several issues with the data collection process due to the novelty of the topic but also due to the relevancy and availability of research around the implementation and impact it has on businesses. The results indicate that despite the increase in popularity and interest in HRA, HR professionals still have a long way to go before reaching analytical maturity. Moreover, our research shows that HR is pivoting towards a more strategic function and playing a more curtail role in the organization's decision making. Workforce Analytics is facing many challenges in regard to its implementation and our study highlights some of these obstacles such as a shortage in data analytics skills within HR, poor IT infrastructure, and insufficient investment from the business. As more organizations integrate analytics into their daily HR operations, we will start to see more challenges and obstacles that will completely change or even disrupt the way we know HR today. Therefore, we urge further exploration and investigation around the implementation of HRA.

Keywords: Human Resource Analytics, People Analytics, Human Resource Information System, Strategic HRM, Organizational Effectiveness**.**

Abbreviations: HRA, Human Resource Analytics; HRIS, Human Resource Information System*.*

I. INTRODUCTION

HR Analytics (HRA) has been around for a while now but has only gained popularity in recent years. Moving forward in this paper, we might refer to HRA in other terms that are used interchangeably with HR analytics such as workforce analytics and people analytics [1]. Analytics, in general, refers to "the use of analysis, data and systematic reasoning to make decisions" [2]. More and more organizations are taking interest in HR Analytics and the various tools and functionalities it encompasses when it comes to data-driven decisions. The idea behind analytics is quite interesting and important to organizations as it is well known that things cannot be improved if they cannot be measured to begin with. The need for such a change in HR was argued by Boudreau and Ramstad (2005) who maintained "the traditional service-oriented HR focus must be extended to a "decision science" that enhances decisions about human capital" (p. 129). HR Analytics has become a vital instrument for success using existing data to predict future return on investment, thus giving organizations a competitive advantage [3].

The information about employees, processes, performance indicators and business outcomes all come down to workforce analytics. According to Jones (2014), HR professionals view HR analytics as a tool that provides them with the data needed to make decisions to help them battle high turnover rates, improve the quality of new hires, and better predict organizational effectiveness and success [4]. Thus, people analytics is a curtail part to any organization seeking to maintain competitiveness. The research gap, mainly drawn by the novelty of workforce analytics within the field of HR, has caused academics to face numerous challenges and drawbacks when researching the topic. These gaps include insufficient literature available and temporal factors hindering the results. First, People analytics has been under-explored and under-theorized until today. Although many HR metrics have been developed to analyze HR data, there's very little advise on how, when and where to apply these metrics. When it comes to HRA implementation, we have not begun to grasp the challenges around it. For instance, an increase in the adoption of nonaligned analytics strategy has been observed causing serious stagnation to the implementation of HRA. Second, it is important to note that temporal factors play a major role in the assumptions and conclusions drawn today by academics which makes it difficult for researchers to come with accurate conclusions as the value of analytics can only been determined overtime. Hence, the real challenges and obstacles of people analytics has not been fully understood nor theorized [5]. These are some of many barriers holding people analytics from

unlocking its true potential to increase its value and benefit to the organization.

In order to add to the body of knowledge in this field (Dulebohn and Johnson, 2013; Hota and Gosh, 2013), this paper will be addressing the latest trends and issues around HRA while shedding light on its implementation and the related antecedents and consequences to ensure organizational effectiveness and business competitiveness [6, 7]. Thus, our proposed approach intends to create a better understanding of the current challenges surrounding workforce analytics and to provide guidelines to overcome these drawbacks and challenges for a successful implementation of HRA. Our contributions add value in both the context of academic work and HR practice on the effective implementation of HR Analytics to improve business outcomes by pinpointing the antecedents and consequences of adopting HRA.

II. PREVIOUS RELATED RESEARCH

A. Defining HR Analytics

The use of data in the field of Human Resources is referred to as HR Analytics, Talent Management Analytics, Human Capital Analytics, Workforce Analytics, or Talent Analytics, which all have the same meaning. In this study, we will use the term HR Analytics (HRA).

HR Analytics with the help of big data is defined as the ability to provide the most accurate analytical-driven evidence-based HR related decisions until date [8, 9]. Another definition by Reddy and Lakshmikeerthi (2017) describes HRA as a communication device that paints a cohesive and actionable picture of the current situation and the future outcomes [10]. Thus, HRA is not the manipulation of HR data nor is it the communication of HR findings, but it is the unique mix of unlocking insights from data and the ability to tell a story with these findings to solve problems.

HR Analytics involves integrating different internal HR functional data and external data to the firm utilizing information technology for collecting, manipulating, and reporting data. Further, HR Analytics has been defined as "A HR practice enabled by information technology that uses descriptive, visual, and statistical analyses of data related to HR processes, human capital, organizational performance, and external economic benchmarks to establish business impact and enable data-driven decision-making" [11]. For the purpose of this paper, we adopted the latter definition as it focused on the impact of HR decisions on the business outcomes. Furthermore, the paper highlights the strategic role of HR processes and decisions and its impact on the overall organizational performance.

B. Evolution of the HR Analytics Concept

Heuvel and Bondarouk (2017) discuss the evolution of HR analytics throughout the years from basic automation to the digital age of big data and artificial intelligence [1]. Automation in HR started in the 1980's with the automation of a few processes and administrative tasks. These were the early stages of the adoption of HR Information Systems (HRIM) which started an entire movement on how HR can automate

more of it processes. At this stage, academics began taking interest in these technological enablers but reached limited results and the same was observed from HR professionals who attempt to implement these technologies.

By the 1990's more interest and development was observed by both academic researchers and business professionals who started to better understand the possibilities of implementing these technologies. More scholars took interest in investigating and studying HRISs but the environment was not ready and the acceptance was slow with many doubts from both scholars and professionals.

In the 2000s, along with the internet many technologies were available and accessible to businesses. This is when the term electronic HRM first appeared and took high notice from the scholars and the professionals on the landscape of it and its various applications such as administrative, performance management, compensation management, and talent acquisition. Further, the literature used e-HRM, HRA, HCA, HRIS and other terms to refer to very similar concept with many elements overlapping between the notions [12].

Today with the digital wave and big data, we are starting to perceive HR as less of a supporting function and more of strategic and decision enabler function [9, 12-14]. The technological advancements have broadened the scope for E-HRM applications and shifted it towards a more strategic use. Data-driven tools are helping to solve some major HR and business problems and make better and more informed decisions. In recent years, business have started using the term HR Analytics to describe this notion. The term is becoming more and more popular and increasingly considered as an indispensable HR tool with tremendous gain for the organization and HR as a function [14-16].

C. Process of HR Analytics

HR Analytics is the process of collecting, processing, transforming and managing HR related data to be then analyzed using analytical tools and models [17]. The process of analytics focuses on aligning HR to the strategic business plan [18]. Similarly, the process uses HR data to connect HR practices and policies to the business outcomes and ultimately to better understand the relationships between HRM and notions such as employee engagement, satisfaction, productivity and performance [10].

Sousa (2018) concludes that for analytics to fully support and benefits HRM, the organization needs to first reach a certain level of analytic maturity to enable it to achieve the desired HRM goals and overall strategy [19].

These process levels of descriptive, predictive, and prescriptive each has its own benefits and value but the more an organization moves from descriptive to prescriptive, the more significant the added value is to the business and its overall performance [10].

D. Antecedents of HR Analytics

Dahlbom et al., (2020) argue that there are three main factors that affect the adoption of HR Analytics; technology, organization, and people. Many advancements are being observed in the field of

analytics and HRA, however there remains considerable doubt and ambiguity on the impact of these tools and models due to the various factors that hinder the implementation of HRA [12].

Putting the three factors identified by Dahlbom *et al.*, (2020) into perspective, the factors represent the quality of the data and the IT infrastructure (technology), the understanding of the impact of analytics (organization), and the skills and capabilities (people). As stated by many researchers, these factors are still at a pre-mature stage resulting in more challenges than benefits [11, 12, 20].

First, there are many issues with the quality and accessibility of data as well as problems around the outdated IT infrastructure and systems [12, 21, 22]. The initial goal of e-HRM is to capture, store, and make accessible data for the organization to generate reports and dashboards, this is still not yet implemented in most organizations [11]. In addition, Dahlbom (2020) recognize a shift of this goal towards reorienting HR as a strategic function [12].

Second, organizations are still facing troubles fully comprehending the use of data and big data in the world of HR and its impact on the overall organizational outcomes. Until date, not many organizations are comfortable with the manipulation of data and do not fully understand its benefits and use which affects the adoption of HRA [12, 23, 24].

Lastly, the lack of data analytical skills within the HR department is another major challenge to the implementation of HRA and the most recurring factor among scholars [11, 12, 18, 25, 26]. This has been a high concern among HR professionals and businesses which raise the question of whether HR analytics should even be within the traditional HR function [11].

There are more nuances to these three factors and many other antecedents that play a role in the impact of HRA such as the size of the organization, the financial wealth and capabilities to invest in these technologies, the institutional mechanism, and the organizational structure [8]. It is also important to note that these factors can play an enabler part just like they can be an obstacle to the implementation of HR Analytics, and ultimately to the business outcomes.

E. Consequences /Outcomes of HR Analytics
HR Analytics is creating a more strategic role to HR as a function with evidence-based insights in the aim to help organizations reach their strategic goals and desired outcomes [1, 9, 10, 18, 20, 27, 28]. Additionally, Lakshmi and Pratap (2016) in their study on the strategic role of HR Analytics reveal that in order for HR to play a more strategic role and have a more significant impact on the business and ultimately its outcomes, HR professionals need to embrace analytics and to deep dive into its tools and techniques to unlock its full potential [29]. This will improve various desired organizational outcomes such as enhanced organizational performance, higher levels of employee engagement, and increased satisfaction.

Ingham (2011) states that HR professionals must focus on analytics by identifying the right measures and presenting them in a cohesive way to drive strategic business decisions. Similarly, Ben-Gal (2019) argues that the only way for organizations to adopt and invest more in HRA is to understand the ROI which will guide the way forward both academically and practically [27, 30]. Chattopadhyay *et al.,* (2017) reveal that the landscape of data analytics within HR has been revolutionized taking a more strategic role to drive business performance and build competitive advantages. HRA, when implemented correctly, has the capabilities of making HR more efficient and cost-effective which ultimately all falls into more desirable business outcomes [8].

Furthermore, Coolen and IJselstein (2015) maintain that "only those organizations that manage to create and maintain a balanced blend of different relevant capabilities will be successful in HR analytics" [31]. Today, data and big data have completely changed the way we perceive and do business. Organizations are aware that data and analytics are the way forward to achieve their business goals and objective more effectively [8]. Thus, organizations need to incorporate HRA into their businesses for more informed and evidence-based decision making to ensure organizational effectiveness.

Marler and Boudreau (2017) argue that HR Analytics is a practice that provides managers with the information needed to link HR processes to employees' behaviors and ultimately to the outcomes of the organization. In their study, they reveal that HRA has a positive relation with organizational effectiveness [11].

Ben-Gal (2019) also supports this statement in his ROI-based review on HR analytics and concludes that there is a correlation between the amount of investment and effort put into HR analytics and the organizational effectiveness [30]. Similarly, Naula (2015) states that HR analytics enhances the credibly of HR as it improves the effectiveness of its policies and practices which leads to a competitive advantage for the organization [18].

HR Analytics is certainly on the right track to making more impactful and strategic decisions which enhances its credibility within the organization and positions HR as a core function [18]. To further support this statement, scholars need to conduct return on investments-based reviews, cost benefit analysis, and impact analysis to measure the impact and benefits of HRA on employee and organizational performance and organizational effectiveness.

F. Factors Affecting Successful Implementation of HR Analytics
The digital era has allowed HR professionals to access large samples of data and analyze them in the aim to solve complex HR related challenges for better decision making (Dahlbom *et al.*, 2020). Their findings show that despite the high interest in data analytics and its benefits, many challenges surface when it comes to the use of HR data which hinders HR advancements [12].

In addition, many organizations are eager to tap into the world of predictive and prescriptive analytics but only a few stated that they have fully implemented HR Analytics within their organizations. In effect, HR has just begun its journey in analytics with most

organizations still in the process of increasing automation in HR reporting and applying basic analytics techniques to HR data. Therefore, the idea of using data and big data to answer workforce related questions, improve HR functions, and support strategic decision making is still perceived as futuristic.

Chattopadhyay *et al.,* (2017) report the adoption of HR analytics in an organization is slow as the uptake of data science itself is lagging. This is because using big data requires a shift in the processes used earlier, along with a shift in culture [8]. This appears to be difficult for organizations that are not ready to come out from their long-established norms. Implementing analytics require a strong visionary leader, with the right access to resources. Somehow, a change agent is required to a large extent, especially in the public sector, so that analytics can be used efficiently in the government sectors too.

To achieve HRA maturity and opt for successful implementation, HR professionals need to work on connecting the fragmented IT landscape and automate the data collection process as initial steps towards adopting and implementing HR analytics [1]. Marler and Boudreau (2017) argue that successfully adopting HR analytics requires analytically skilled personnel within the HR department as opposed to one common or a group of analysts common through all functions of the organizations [11]. Thus, HR teams need further develop both their business and analytical skills to translate findings into solutions for improved business performance [18].

Sousa (2018) concludes that for analytics to fully support and benefit HRM, the organization needs to first reach a certain level of analytic maturity to enable analytics to achieve the desired HRM goals and overall strategy [19]. Further, Marler and Boudreau (2017) contended that another factor for HR Analytics to be successful is politically based. For HR professionals to gain access to the cross functional data needed to perform their analyses, managers from other functions must be willing to provide access and to be involved in the process as resistance to change by managerial decision makers have a high impact on abandoning the results derived by such analysts [11].

G. Future of HR Analytics

HR Analytics is an evidence-based approach used to improve the decision-making process for HR related functions. Pursuing this data-driven analytical approach leads to added value to HR as a department. However, despite the high interest in HR Analytics, both in the world of research and business, there is still a long way to go before fully reaping the benefits of data and analytics.

Dahlbom *et al.*, (2020) conducted qualitative interviews with nine leading Finnish companies to explore the benefits of HRA and identify the factors that hinder its adoption [12]. In their study, they revealed that top management did not have much faith in the future of HRA and had many doubts concerning the benefits it holds to the employees and the organization. It is then extremely important for organizations to better understand the impact and benefits of HR Analytics to increase the chances of its adoption and advancement [30]. Consequently, measuring the current impact of analytics will determine the future of HR Analytics. Kremer (2018) argues that the development of HR Analytics will mainly depend on the moderation factors that promote or prevent its success [21].

Heuvel and Bondarouk (2017) converse how the application, value, structure, and systems support of HRA in 2025 might look like [1]. They argue that the main focus will be around fostering evidence-based decision making and developing an analytical mindset specifically around HR functions. They further stress on the importance of determining specific HR drivers that impact the business outcomes as previous studies have simply identified a positive relationship between HRA and business outcomes without identifying which exact outcomes are affected directly and indirectly and to what extent.

III. RESEARCH QUESTIONS

Our research identified peer-reviewed journals that were collected and then filtered out to capture high-quality research. Our review of these journals allowed us to lay down the following questions: (1) What are the antecedents affecting HR Analytics? (2) What are the key components to a successful implementation of HR Analytics? (3) What and how are organizational outcomes affected by HR Analytics, specifically, increase organizational effectiveness?

Despite thorough research and investigation of the impact of HR Analytics on Organizational Effectiveness, very few studies have explored the antecedents and success factors to the implementation of HRA. Thus, we urge for further empirical research and investigation on the practical implications to HR Analytics.

IV. RESEARCH METHODOLOGY

In the current study, we used secondary data collection and a systematic literature review to investigate the antecedents and consequences of HR Analytics, and specifically the success factors to its implementation. The methodological approach was to review and analyze previous academic research by following three main steps; collecting previous research, categorizing the captured publications, and then classifying them based on a quality assessment.

The first step was to collect scholarly research by identifying HR Analytics relevant journals. The search was done on the multidisciplinary online database EBSCO where we researched articles and journals which included "HR Analytics" and "Workforce Analytics".

The second step was the categorizing process, we selected articles and journals that were published between 2005 and 2020 with the search terms appearing in either the title or the abstract of exclusively peer-reviewed journals.

The third step was the classification process to assess the quality of the previous studies and to solely select those that fit the quality criteria. This also helped us with our recommendations and suggestions for future research.

V. PREMILINARY RESULTS AND DISCUSSION

A. Interpreting the Findings

Evidence linking HR analytics to performance is very scarce. We present possible rationalization for this puzzle and recommend opportunities for future research and practice. Our research shows that despite organizations having high interest in HRA, there is a clear gap between the goals and resources to become analytically mature.

We see a shift from an administrative function to a more strategically oriented function adding value and driving organizational decisions. Following our review, it must be noted that it is essential to have a robust IT infrastructure that can lead to better decision making. Organizations must be mindful of the need to improve HR analytics capabilities and of the fact that this will require further investment in HR technologies.

Further, our findings show that the more investment put into HRA, the higher the return will be on the HR department and ultimately the organizational outcomes.

B. Practical Implications

The skills required to conduct HR Analytics differ from those needed by HR professionals in the traditional setting. HRA stems from business and technology which is why it could be interesting and even beneficial for organizations to have a separate entity or team to deal with HR Analytics dedicated to data collection, processing, and transformation to support the rest of the HR functions in decision making but also add an input to overall business strategic decisions.

The HR department is completely being revolutionized with the introduction and adoption of HR Analytics. Therefore, it is important for organizations to work on the department as a whole to enable it to take on a more strategic role, and be more capable in achieving business goals and objectives. For that, HR professionals need to revisit HR practices and processes to implement HRA in each process for successful adoption. We recommend HR professionals to collaborate with the departments implementing the technology and analytical tools to maximize its use and benefits. We also would like to stress on the temporal factors surrounding workforce analytics when evaluating its value on HR and the business.

VI. CONCLUSION AND FUTURE SCOPE

The purpose of choosing a systematic review was to explore the current concepts and practices around workforce analytics and to investigate the current gaps and drawbacks of its implementation. In this study, we defined the concept of workforce analytics, drawing a clear framework to the study which led us to explore the evolution of HRA throughout the years and how it is reinventing our field by taking a more strategic stand and providing a greater contribution to the organization's decision-making. In addition, this study identified the three antecedents affecting workforce analytics; people, technology, and the organization - each holding a role as an essential pillar to the success of HRA implementation. This encouraged us to dive more into the factors that affect its integration where we determined a few drawbacks such as the lack of long-term vision, a non-alignment of the HRA strategy with the organization's strategy, and the lack of analytical maturity within the organization and, more specifically, the department. All these factors are currently hindering successful implementation of workforce analytics within organizations. We finally touched on the impact of HR analytics and determined the positive correlation between HRA and desirable employee behavior and consequently business outcomes.

Future research studying HR Analytics and variables affecting it could benefit from empirical investigation. We recommend longitudinal data collection from various industries in order to produce generalizable results. Additionally, studies investigating the impact of HR Analytics on specific organizational outcomes has been extremely limited and further research is needed to understand these correlations in depth and identify their significance towards specific HR processes such as talent acquisition, performance management, and compensation.

Conflict of Interest. There is no conflict of interest to be declared.

REFERENCES

[1]. Heuvel, S., & Bondarouk, T. (2017). The rise (and fall?) of HR analytics: A study into the future application, value, structure, and system support. *Journal of Organizational Effectiveness: People and Performance*, *4*(2), 127-148.

[2]. Davenport, T.H., Harris, J.G. and Morison, R. (2010). Analytics at Work: Smarter Decisions, Better Results, Harvard Business School Press, Boston, MA.

[3]. Boudreau, J. W., & Ramstad, P. M. (2005). Talentship, talent segmentation, and sustainability: a new HR decision science paradigm for a new strategy definition. *Human Resource Management, 44*(2), 129-136.

[4]. Jones, K. (2014). Conquering HR Analytics: Do you need a rocket scientist or a crystal ball? *Workforce Solutions Review*, *5*(1), 43–44.

[5]. Conboy, K., Dennehy, D., & O'Connor, M. (2020). 'Big time': An examination of temporal complexity and business value in analytics. *Information & Management, 57*(1), 1-13.

[6]. Dulebohn, J., & Johnson, R. (2013). Human resource metrics and decision support: A classification framework. *Human Resource Management Review, 23*(1), 71–83.

[7]. Hota, J. & Ghosh, D. (2013). Workforce Analytics Approach: An emerging Trend of Workforce Management. *AIMS International Journal of Management, 7*(3), 167-179.

[8]. Chattopadhyay, D., Biswas, B. D., & Mukherjee, S. (2017). A new look at HR analytics. *GMJ, 11*(1), 41-51.

[9]. Sousa, M. J. (2018). HR analytics models for effective decision making. *14th European Conference on Management, Leadership and Governance*, *ECMLG,* 256-263.

[10]. Reddy, P. R., & Lakshmikeerthi, P. (2017). HR Analytics' - An Effective Evidence Based HRM Tool. *International Journal of Business and Management Invention*, *6*(7), 23-34.

[11]. Marler, J. H. & Boudreau, J. W. (2017). An evidence-based review of HR Analytics. *International Journal of Human Resource Management, 28*(1), 3–26.

[12]. Dahlbom, P., Siikanen, N., Sajasalo, P., & Jarvenpää, M. (2020). Big data and HR analytics in the digital era. *Baltic Journal of Management, 15*(1), 120-138.

[13]. Simón, C., & Ferreiro, E. (2018). Workforce analytics: A case study of scholar–practitioner collaboration. *Human Resource Management, 8*(1), 781–793.

[14]. Meena, R., & Parimalarani, G. (2019). Human Capital Analytics: A Game Changer for HR Professionals. *International Journal of Recent Technology and Engineering, 8*(2S11), 3963-3965.

[15]. Boston Consulting Group (2014). Creating People Advantage. The Boston Consulting Group, Inc., Boston, MA.

[16]. Hamilton, R., & Sodeman, A. (2020). The questions we ask: Opportunities and challenges for using big data analytics to strategically manage human capital resources. *Business Horizons, 63*(1), 85-95.

[17]. Kapoor, B., and Sherif, J., (2012). Human resources in an enriched environment of business intelligence. *Kybernetes,* Vol. *41*(10): 1625-1637.

[18]. Naula, S. (2015). HR analytics: its use, techniques and impact. *International Journal of Research in Commerce & Management,* (8), 47-52.

[19]. Sousa, M., Pesqueira, A., Lemos, C., Sousa, M., & Rocha, Á. (2019). Decision-Making based on Big Data Analytics for People Management in Healthcare Organizations. *Journal of Medical Systems, 43*(9), 1-10.

[20]. Mohammed, A. Q. (2019). HR analytics: A modern tool in HR for predictive decision making. *Journal of Management, 6*(3), 51-63.

[21]. Kremer, K. (2018). HR analytics and its moderating factors. *Vezetéstudomány-Budapest Management Review, 49*(11), 62-68.

[22]. Harris, J. G., Craig, E., & Light, D. A., (2011). Talent and analytics: New approaches, higher ROI. *Journal of Business Strategy, 32*(1), 4–13.

[23]. Rasmussen, T., & Ulrich, D. (2015). Learning from practice: *How HR analytics avoids being a management fad. Organizational Dynamics, 44*(3), 236-242.

[24]. Fitz-enz, J. (2010). The new HR Analytics: Predicting the economic value of your Company's Human Capital Investments. New York: Amacom Books.

[25]. Bassi, L. (2011). Raging debates in HR Analytics. *People & Strategy, 34*(1), 14–18.

[26]. Sripathi, K., & Madhavaiah, C. (2018). Are HR professionals ready to adopt HR analytics? A study on analytical skills of HR professionals. *Journal of Advanced Research in Dynamical and Control Systems 10*(8), 303–308.

[27]. Ingham, J. (2011). Using a Human Capital Scorecard as a Framework for Analytical Discovery. *Strategic HR Review, 10*(2), 24-29.

[28]. Sharma, A., & Sharma, T. (2017). HR analytics and performance appraisal system: A conceptual framework for employee performance improvement. *Management Research Review,* Vol.*40*(6): 684-697.

[29]. Lakshmi, M., & Pratap, S., (2016). HR analytics - a strategic approach to hr effectiveness. *International Journal of Human Resource Management and Research, 6*(3), 21-28.

[30]. Ben-Gal, H. C. (2019). An ROI-based review of HR analytics: practical implementation tools. *Personnel Review, 48*(6), 1429-1448.

[31]. Coolen P., & IJselstein, A. (2015). A practitioner's view on HR analytics", (web log post) available at: www.linkedin.com/pulse/practitioners-view-hr-analytics-patrick-coolen?trk=prof-pos.