Evolution of HR Analytics in India - a Detailed Analysis

Rashmi Raj[1], Alka Lalhall[2] and **Shilpi Raj[3]**

[1]Research Scholar Department of Management Sciences, Mahatma Gandhi Central University,
[2]Assistant Professor Department of Management Sciences, Mahatma Gandhi Central University,
[3]Assistant Professor, Department of Management Sciences, Amity University,

Abstract

The technological domains and trends of artificial intelligence (AI), robotics, business intelligence, big data and analytics, edge computing, hyper automation, Block chain, Democratization, Human Augmentation, and Multi experience are enabling mankind to innovate and create superhuman capabilities. This leaves human resources (HR) to fight the battle of replacing people-literate technology with people-literate people. With the developing trends, the propensity for analytics and intricate algorithms created a breakthrough into a creative zone that extended a manageable workforce. The purpose of this study is to review the earlier studies conducted based on evolution and emergence of HR analytics. It tries to investigate through prior works done on business analytics, big data, business intelligence and on HR Analytics a swell as literature concerning innovation and adoption of various models, tools and techniques.

Keywords

HR Analytics, artificial intelligence, business intelligence, block chain, human augmentation

Introduction

Human Resources (HR) are important asset of the organization in any domain. In addition to information, it contributes ability and technical skills, which are critical for any company to succeed over the long term. Evaluating human capital its quality, position, and future prospects has never been easy for organizations. Historically, the HR assessment was completed by hand, which added a great deal of subjectivity. But as technology has advanced, the application of complex data mining analytics techniques to HR data has given analytics an entirely novel shape called as HR-analytics. These days, HR-analytics has emerged as a new frontier in enhancing and then utilizing HR for organizational benefits. Big Data is a transformed technology that offers a comprehensive method for deriving useful insights from vast amounts of real, authentic, high-velocity, and valuable data (ALMUTAIRI, 2020)((Ramstad, 2007).Due to the concept's increasing popularity, businesses are using everyday real-world information flows to boost performance standards and increase operational visibility (Hougton, 2015).The businesses endorsing big data indicated a shift in the direction of analytics to improve decision-making across a range of departments, including human resources (Staiger, 1997).

HR analytics are sometimes referred to as data matrices, statistical tools for data visualization, and decision-making tools (Ramstad, 2007). Subsequent studies have identified a synthesized

and systematic approach to HR analytics that goes beyond HR matrices (Boudreau, 2017) (Fink, 2017). This approach calls for a more focused approach to generate meaningful insights and be crucial to the execution of strategy (Fink, 2017), thereby redefining HR analytics from a new and wider angle (Rajesh, 2018). HR Analytics are now achievable for practically all organizations thanks to the increased accessibility of HR data through innovative methods of data gathering and analysis combined with new technical breakthroughs. With the study of workforce data, the growth curves rose sharply, improving the organization's HR operations in recruitment, career development, knowledge management, and task quality (Carson, 2011) (Hawkes, 2017) (Levenson, Harnessing the power of HR analytics, 2005) (Vorley, 2016).

The tech-ecosystem has made a significant contribution by turning the vast amounts of intricate and ubiquitous data created by blogs, tweets, data warehouses, and social networks into useful information that organizations can employ to reshape themselves and by establishing analytics as the cornerstone of transformational roles. Managers' expression of the need for fact-based understanding and a move beyond intuitive abilities laid the groundwork for the development of descriptive analytics and diagnostic analytics. The goal of combining organizational data with external data to analyses it broadens the scope of analytics, giving rise to the term "Big Data" and Analytics 2.0, which became well-known thanks to the "Open source community" strong support. This helped to pave the way for the emergence of positions in the data-forecasting industry such as Hadoop administrators, business intelligence developers, and big data engineers. Data Science is now a single discipline of research and experimentation with full attention to predictive analytics and prescriptive analytics, thanks to the large IT companies' time and energy put in the unification of statistics, machine learning, and data analysis. The advancements in chatbots, smart replies, and neural machine translations have heavily relied on data mining methods, business intelligence software, and intricate algorithms derived from machine learning.

The modern IT era brings with it new viewpoints on work and culture, associations with technology, frameworks for infrastructure, and workstation guidelines (Gupta M. S., 2021). All of these factors cause HR to transition from routine tasks to strategic business partners, paving the way for analytics. However, the new framework has presented HRs with new challenges, including the true value of employees, organizational guidance systems, virtual workplace technologies, and digital ethics (Muthusamy, 2017) (Rajasshrie Pillai, 2020). This study looked at the analytics tools and approaches that HR departments have recently adopted and how such tools and techniques affect their work and decision-making when it comes to supporting their organizations as strategic business partners.

The emergence of HR analytics

Early 1900s

Modern human resource management practices have their roots in the early development of personnel management. It signaled a change in labor management philosophy from the conventional, paternalistic approach to one that is more methodical, scientific, and people-centered (Fayol, 1916) (Mayo, 1933) (Taylor, 1911) (FOLLET, 1918). Organizations' HR strategies and policies are still shaped by the values and procedures developed during this time around. Parallel concept and innovation of various models were taking place to support the emergence of technological and analytical aspects. Administrative innovations, according to

(Daft L. R., 1978) are related to the organizational structure and involve acceptance from the bottom up. On the other hand, adoptions concerning HR and administrative procedures are generally implemented in a top-down manner.

Mid 1950-2000

"An idea, practice, or object that is perceived as new by an individual or other unit of adoption" is the definition of innovation (Rogers, 1995). The majority of breakthroughs studied in terms of dissemination, according to (QUINLAN, 1983) have been in the field of technology. Using the theory of reasoned action (TRA), (Davis F. D., 1989) created a model that examined perceived utility and perceived ease of use. This approach is commonly referred to as the technology acceptance model (TAM). Numerous theoretical models that have undergone empirical testing have been developed to predict an individual's degree of innovation adoption. The theories of planned behavior (TPB (Ajzen, 1991)), perceived characteristics of innovating (PCI; (Benbasat, 1991), diffusion of innovation (DOI) for individuals (QUINLAN, 1983), TAM (Davis F. D., 1989), TRA (Ajzen, 1985), and unified theory of acceptance and use of technology (UTAUT; (Davis V. V., User Acceptance of Information Technology: Toward a Unified View, 2003)).

Era of 2000-2010

According to Marquez (2007), HR executives often feel at ease when talking about forecasting and budgets, but they become uncomfortable when talking about correlations, predictive analytics, or any kind of analytical testing. The HR industry will advance and become a true strategic business partner with the use of HRA. Compared to only HR measurements, the application of HRA is thought to offer a more comprehensive and valuable perspective on data and can offer a study of the company as a whole (Levenson, Harnessing the power of HR analytics, 2005) (Fitz-enz, 2010). The strategic relevance of HR measurements in tying HR practices to business outcomes and boosting organizational performance was highlighted in research by (Brian E. Becker, 2001). Organizations can now manage and monitor HR indicators in real-time thanks to the introduction of HR information systems (HRIS) and enterprise resource planning (ERP) systems, which further eased the collecting and analysis of HR data. Research by (M Armstrong, 2005) and (C Koch, 2000) emphasize how technology is advancing HR analytics and metrics. For instance, these measures will improve HR's capacity to determine where it would be most advantageous to devote the resources required to either prevent or minimize turnover in addition to knowing the turnover rate (Neumann, 2008).

The period of development and acceptance of HR analytics 2010-till date.

When businesses realized they needed to measure and assess the efficiency of their HR procedures, HR metrics began to take shape in the middle of the 20th century. During this time, metrics and key performance indicators (KPIs) were developed to evaluate several aspects of the workforce, such as absenteeism, turnover rates, and employee productivity.

(Mohrman, 2013) is one of the foundational publications which emphasizes the significance of HR metrics in coordinating HR practices with organizational goals and enhancing decision-making. The increased awareness of HR as a strategic role and the necessity of data-driven approaches to HR management are highlighted by (Gale, 2014). The need for more advanced HR measures increased as businesses came under more pressure to prove the return on their HR investments and as competition among them increased. Studies conducted by (Bersin,

2013) and (CIPD, 2016) demonstrate the increasing significance of HR metrics in guiding strategic workforce choices and cultivating an analytics-driven culture in businesses.

The shift to HR analytics is a step towards evidence-based HR practices, in which data, not gut feeling or customary wisdom, guides decisions (Boudreau, 2017). Predictive analytics is being used by organizations more and more to predict labor trends in the future and spot areas for development (Davenport, 2006). Organizations can now gather, analyze, and visualize HR data more efficiently because to technological innovations like cloud computing and big data analytics (Carson, 2011) (Kabra, 2016). Strategic workforce planning has been made easier by HR analytics, which offer insights into talent gaps, succession planning, and staff optimization (Gupta A. D., HR - A STRATEGIC PARTNER: Evolution in the adoption of Human Capital Management systems, 2015). Organizations can enhance their hiring and selection procedures, which will enhance talent matching and lower attrition, by utilizing data analytics (Bersin, 2013).Through focused interventions, HR analytics has allowed organizations to monitor and enhance employee engagement and retention (Craig, 2019). HR analytics are being used by organizations more and more to monitor diversity and inclusion KPIs and pinpoint areas in need of development (CIPD, 2016). The implementation of agile HR strategies has been made easier by HR analytics, enabling businesses to quickly adjust to shifting market conditions and business requirements (Deloitte, 2020). The ethical aspects of HR analytics, such as data protection, openness, and justice, are receiving more attention (García-Izquierdo, 2022). Despite the enormous promise of HR analytics, organizations still struggle with issues of data quality, integration, and skills shortages (Bersin, 2013).

HR Information Systems (HRIS) and Integration of Machine Learning and AI in HR

HRIS which includes software and systems intended to centralize employee data and expedite HR procedures, has developed into a vital resource for contemporary HR administration. The transition towards Software-as-a-Service (SaaS) HRIS models is highlighted by research by (Brewster, 2016), which gives organizations access to scalable, reasonably priced HR technology solutions. HRIS functionality has been completely transformed by the integration of machine learning (ML) and artificial intelligence (AI) technology. Research by (Boudreau, 2017) highlight how AI-powered HRIS may improve decision-making through predictive analytics, automate repetitive HR operations, and improve employee experiences by providing individualized recommendations and insights. The increasing use of mobile HRIS solutions for self-service functions, like obtaining pay stubs, requesting time off, and updating personal information, is highlighted by research by O'Kane et al. (2019). Furthermore, improvements in HRIS compliance and data protection features have been fueled by the focus on data privacy and security. Research by (Yonggui Guo, 2019)and (Nyathani, 2023) emphasize how crucial data encryption techniques and GDPR compliance are to the development and application of HRIS.

Over the past fifteen years, the amalgamation of artificial intelligence (AI) and machine learning (ML) technologies has transformed human resource management (HR), enabling institutions to extract significant insights from their data and arrive at better educated judgements. HR procedures, including hiring and talent management as well as employee engagement and retention, have changed as a result of the confluence of automation and advanced analytics.

Predictive analytics (Dayarathna, 2021) models may now more accurately predict future employment trends because to the integration of ML and AI (Bersin, 2013).Recruitment

efficiency is increased and prejudice is decreased through the use of machine learning (ML) algorithms to automate the screening and selection of candidates (Davenport, 2006).In order to forecast future employee performance and pinpoint areas for development, machine learning algorithms can evaluate past performance data (Boudreau, 2017).Bots that Chat for HR Services: AI-driven chatbots are being used to automate repetitive HR processes, respond to employee inquiries, and offer 24/7 HR support (Panetta, 2019).Prediction of Employee Attrition: AI systems are able to identify attrition risk and apply focused retention efforts by analyzing trends in employee data (Nancy Cohen, 2019).

Evolution and advancement towards recent trends of HR Analytics Tools and Techniques: Driving Data-Driven HR Management

The HR landscape has changed over the past 15 years as a result of the development of HR analytics tools and methodologies, which allow businesses to use data-driven insights to improve workforce management strategies and foster organizational success. Driven by technical developments and an increasing emphasis on evidence-based HR decision-making, HR analytics has moved significantly from simple reporting and descriptive analytics to sophisticated predictive modelling and AI-driven solutions. Predictive analytics has emerged as a major trend in HR analytics, allowing businesses to anticipate labor trends and take proactive measures (Bersin, 2013). Thanks to the integration of ML and AI technologies, HR analytics applications now support sentiment analysis, natural language processing, and advanced predictive modelling (Boudreau, 2017).

With the advent of sophisticated data visualization technologies, HR professionals can now effectively communicate complicated insights and promote data-driven decision-making (Bersin, 2013).Employers can increase employee engagement and retention by using employee experience platforms, which

combine data from many HR systems to give a comprehensive picture of the employee lifecycle (Deloitte, 2020). Through the application of social network analysis methodologies to HR analytics, organizations have been able to promote collaboration, improve information sharing, and identify influential individuals (Rob Cross, 2002). Unstructured data, including employee feedback and social media posts, is analyzed by text mining and sentiment analysis methods to reveal employee sentiment and satisfaction levels (Maturi, 2018). The ethical aspects of HR analytics, such as data protection, openness, and justice, are receiving more attention (García-Izquierdo, 2022). Organizations can monitor their progress towards diversity targets and pinpoint areas for development by utilizing HR analytics solutions that now incorporate diversity and inclusion data (CIPD, 2016) (Firdose, 2022). In summary, the development of HR analytics tools and methodologies has revolutionized HR management practices, empowering businesses to use data-driven insights to maximize worker productivity, improve employee happiness, and propel business success in the digital era

Recent tools for analytics used by HR

HR underwent a smooth transition, moving from organizing papers to using HRIS, producing reports, and now providing dashboards and analyses for decision-making. According to statistics, Power BI is used more frequently than other tools. Other tools that need the usage of Excel or commercial software include R, Tableau, Python, Visier, and others. With the release of Gartner's Magic Quadrant for Business Intelligence (Panetta, 2019), Microsoft Power BI

became well-known. This tool makes it easy for HR professionals, who frequently struggle with technology, to access and perform aggregations and visualizations. HR professionals find it easy to use the user-friendly interface, which allows them to share data quickly and collaboratively. This can be used to map skills and capabilities or to understand the working culture of people with varying ages, experiences, and genders.

R software

R has grown in popularity as an open sources programming language that was originally written mostly in C. Fortran for statistical computing and has been widely used by statisticians and data miners for data analysis. HR departments across different companies are currently using R (I Setiawan, 2020) extensively to analyze employee data sets and generate both descriptive and predictive analyses using different packages. Recently, GG plot and R Churn analytics have been widely utilized to take forecasts and make judgements on employee turnover with ease through graphs. It is becoming more and more popular among HR professionals because it makes it easier for them to create interactive online applications, dashboards, reports, and statistical computations quickly (Global, 2019). This allows HR professionals to visualize data even if they are not computer scientists.

Tableau

The next most popular analytical tool is Tableau, which is comparable to Power BI but has more useful capabilities and can connect to a wide range of data sources, including SQL databases, SPSS files, and any data collection with any set of data that can be evaluated live on a platform. HR professionals all over the world found it easy to use and create interactive dashboards and stories from the data thanks to its user-interactive features and drag-and-drop interface, but because it is not free and requires good investment, questions about affordability are frequently raised. HR professionals acknowledged their fear of data (McBassi, 2011). Many have access to "One Organization and One Report," which enables them to find answers rather than becoming bogged down by the numbers (Schmidt, 2016). With Tableau, users can generate dynamic and interactive reports and dashboards for data visualization. Tableau is a tool that HR professionals can use to visualize performance indicators, workforce trends, and metrics.

Python

The next easiest to learn language is Python, which is frequently used in place of R. Python is a popular programming language for HR analytics and other data analysis applications. Python is most renowned for two products: Spyder (Scientific Python Development Editor), which aids HR in data exploration, in-depth engagement, and improved data visualization, and PyCharm, which helps HR manage everyday regular tasks and concentrate on bigger things. Overall, HR professionals worldwide report feeling at ease with its interactive console, fantastic libraries, and supportive community (Sommer, 2016). Python (Mohammed, 2019) is a popular programming language for HR analytics. For applications involving data processing, analysis, and machine learning, it provides libraries like Pandas, NumPy, and Scikit-learn. (Global, 2019)

Visier

The usage of Visier (Sommer, 2016)as a user-interactive platform for data aggregations that addresses a variety of workforce challenges, such as talent management and making decisions on employee retention, and integrates readily to other HR systems, making it one HR BI tool. Although it is quite comparable to Tableau, its value as workforce analytics that can be put to use is greater. Its productivity forecasts and performance analysis are its strongest points. With the help of the cloud-based HR analytics platform Visier (AlMobark, 2023) (Mohammed, 2019), businesses can examine employee data, find patterns, and make informed decisions. Workforce planning, benchmarking, and predictive analytics are some of the functions it provides.

Techniques best adapted by HRs

Whether small, medium, or huge in size, organizations are fully aware of the power of people data. It has been noted and acknowledged that stakeholder and HR communication is increasingly crucial and covers real-time reporting with impact, correlations, charts, and diagrams. HR professionals must use the latest analytics approaches in order to offer solutions and fulfil the position of Strategic Business Partner. Which worker is up for a challenge or fresh learning based on historical performance data? How might employee turnover and business ability generated from the data sets affect retention in the upcoming quarter? How can the greatest talent be chosen using resume analysis? (Yamin, 2019). These kinds of inquiries are common for HR professionals, and they even put them to the test as potential strategic business partners. In these cases, regression analysis, association analysis, sentiment analysis, decision tree, machine learning allows for the ability to learn from data without explicitly requiring programming knowledge and makes decisions depending on the training data. It has been most useful recently for determining the likelihood of an event, comprehending trends (Yadav, 2020), engagement opportunities, and, most recently, helping HR professionals identify between spam and non-spam emails that aid in HR professionals finding the appropriate information.

Analysis of Regression

Regression analysis (Leo Breiman, 2017) (Friedman, 2009) describes how the independent variable varies over the dependent i.e. modelling the relationship between one or more independent variables (predictors) and a dependent variable (outcome) is done statistically using regression analysis. It is frequently applied to forecasting and prediction activities. Regression analysis (Leo Breiman, 2017)is still a useful tool for HR professionals to use when making even minor decisions because it may have a significant impact on workforce management, employee trust, and cost sheets (Carson, 2011). HR professionals became interested in this because it reduces aggravation and produces workable, high-quality solutions, such as assigning staff to projects without increasing costs, managing talent and then keeping them on board, or involving staff members through "artificial creative" activities like puns and jokes (Gong, 2006).

Association Study

By restricting the algorithm and developing patterns, it assists HRs in establishing associations among massive amounts of data and mitigating noise in the data. By applying association rules in mining, such as those found in Wecka and its Apriori Algorithm, practitioners are able to

identify intriguing relationships between the different variables in the data (Elragal, 2016). HR may find it useful to discover that while training costs more, performance rises in situations where employees are valued as assets rather than liabilities, transformation is a planned process even in the actual world, and other such situations.

Machine Learning

A branch of artificial intelligence known as "machine learning" (Bishop, 2006) (Williams, 2006) is concerned with creating algorithms that let computers analyze, interpret, and make decisions based on data. Creating models that can generalize patterns from observed data and apply them to new, unseen data is the main objective of machine learning (Murphy, 2012). Supervised learning, unsupervised learning, semi-supervised learning, and reinforcement learning are the four main categories into which machine learning approaches can be divided.

Sentiment Analysis

Sentiment analysis (Lee, 2008) (Maturi, 2018) is a natural language processing (NLP) approach that is used to examine and evaluate the sentiment or emotion portrayed in textual data. It is often referred to as opinion mining. Determining whether a text conveys a favorable, negative, or neutral sentiment towards a specific issue or topic is the aim of sentiment analysis. Artificial Intelligence and Machine Learning contributed significantly to the analysis of opinion (Yamin, IT applications in healthcare management: a survey, 2018).
It somewhat aids HR in ascertaining the opinions of workers regarding projects, change, innovation, policies, working conditions, direct managers, tasks allocated, or any other work-related matter. HR professionals frequently utilize RapidMiner to gauge employee sentiment whether favorable or negative and make the case for the best course of action. The whole set of data is categorized into positive, neutral, and negative sentiments or opinions, and is then modelled unlabeled to encompass the full range of emotions and assist users in making decisions (Punamkumar Hinge Harshal Salunkhe, 2023).

Decision tree

A sort of classification analysis called a **decision tree** is utilized to construct the tree model in order to calculate the gain ratio. Basically, it requires just data sets with correctly identified variables to indicate the decision-making aspects that may be discounted without increasing costs (Elragal, 2016). Networking skills address a wide range of issues, including finding training associations, assessing the effectiveness of different software programs, and finding talent to pitch for a firm (Rizvi, 2017) (Rahul, 2017). HR benefits from analytics since it can lower hiring costs, connect costs, keep up with global trends, and maintain its position as a powerful strategist (Eric, 2021).

Table 1 Timeline for HR analytics

S.N.	Timeline	Author and year	Adoption Theory or Innovation of Model	Tools and techniques used or introduced
1.	Early 1900-1950			

Cont.

2	1950-2000	(QUINLAN, 1983) (Ajzen, 1985) (Daft, 1978) (Fornell, 1981) (Davis F. D., 1989) (Morris, 1996)	Theory of Reasoned Action (TRA) Diffusion of Innovation (DOI) Theory of Planned Behavior (TPB) Perceived Characteristics of Innovating (PCI) Technology Acceptance Model (TAM) Unified Theory of Acceptance and Use of Technology (UTAUT)	
3	2000-2010	(Fitz-Enz, 2010) (Wilson, 2001) (Schillewaert, 2002) (Levenson, Harnessing the power of HR analytics, 2005) (Friedman, 2009) (Gong, 2006) (Bishop, 2006) (Williams, 2006) (Lee, 2008)		Regression Analysis Machine Learning Sentiment Analysis
4	2010-2020	(Gale, 2014) (Giuffrida, 2013) (Schönberger, 2013) (Talukder, 2012) (Panetta, 2019) (Global, 2019) (I Setiawan, 2020) (Schmidt, 2016) (McBassi, 2011) (Mohammed, 2019) (Sommer, 2016) (Carson, 2011) (Leo Breiman, 2017) (Elragal, 2016) (Murphy, 2012) (Maturi, 2018) (Rizvi, 2017) (Rahul, 2017) (Deloitte, 2020)		R Power BI Tableau Python Visier Regression Analysis Association Study Machine Learning Sentiment Analysis Decision Tree Analysis
5	2020-2024	(Punamkumar Hinge Harshal Salunkhe, 2023) (Eric, 2021)		Sentiment Analysis Decision Tree Analysis

Impact of HR analytics on HR practices

The efforts of HR professionals are praiseworthy, and their willingness to adapt to changing technological landscapes is revolutionizing the way analytics findings are produced. Several companies, including Google, Accenture, Shell, Nestle, Deloitte, IBM, and SwedBank, have effectively implemented HR analytics and achieved substantial financial gains. If businesses put more effort into training HR staff to incorporate new technology, increase their career growth scale, and help them understand their new jobs, these effects might have a greater multiplicity. HR professionals face several fundamental challenges (HR analytics conceptualization and adoption:key issues), including the need for clarification on how to connect their structured data with big data (Craig, 2019), the implementation of HR analytics

physically challenging (Rao, 2013) lack of a change management strategy, an insufficient support staff, and the requirement for an AI-enabled system to support analytics for them.

Table 2 Impact of HR analytics on HR practices in tabular form.

Sr.no	HR functions	Tool or software	Impact of HR analytics
1	**Recruitment**	Social networking analysis, IBM'S Watson HireVue—AI driven tool	Most of HRs accepted that HR Analytics has changed the working of HR towards the recruitment process in terms of posting jobs, looking for talented candidate and approaching them IBM'S Watson Facebook, Tweeter, Instagram and other Social media sites will be used to post a job and hire a talented person HireVue—AI driven tool Video interviewing software which will analyze candidate language, personality and expressions (Hawkes, 2017) (Shapiro, 2010)
2.	**Training and learning**	Python, R, Tableau e-Learning—social sites, mobile devices, machine learning	The training modules are well organized as per the need. Outdated stuff is replaced with new techniques with new methods. Direct conversation with mentor made a heart out interaction. This contributed towards clarity and much better Performances e-Learning—social sites, mobile devices, machine learning Helps in comparing the learner's performance, understand diverse learning styles and preferences. Giving utilization of predictive analysis and multi-source knowledge mapping which will recommend and provide feedback with intervention of mentor based on employee performance. (SGuha, 2017)
3.	**Employee engagement**	Machine learning	Communicating even with non-desk employee effectively, support and train when needed and track the individual employee participation with insights. (SEN, 2020) (Bishop, 2006)
4.	**Career development**	Python, machine learning, sensitivity analysis, social media	HRs accepted that they are able to plan jobs in much better way after clear analysis on projects, needs, growth prospects, opportunities and threats. Analytics is making a way out. Leaders with proactive insight can foster talent for new opportunities and train and support career growth (Kabra, 2016)
5.	**Employee retention**	Tableau Sage people, Sage HR	HRs reported that the retention rate showed a positive trend as they are able to work better on their policies, procedures, and employee safety and satisfaction Analytics highlights the critical factors, expectations and skills which helps the managers to positively allocate duties (Craig, 2019)
6.	**Employee performance**	R, Python, Tableau, Visier	Give insight in trends, predictions and low time. It is helping managers and employee themselves to track their performances and compare with the standards. It improves the reliability and no scope of biasness. Most HRs has accepted that through analytics a steep rise in performance is marked as they are able to make performances reasonable than intuitive.

Analytics implication on role of HR and decision making

The battle over HR analytics raged, encompassing dashboards, HRISs, excel sheets, and software (McBassi, 2011). Not only was the What, Why, When, and Where of analytics difficult for HR professionals, but employee engagement also needs careful thought (McMurrer, 2010). HR professionals are now more inclined to enter the analytics field and experience the data-to-insight journey because to the analytics community's support, awareness, and acceptance (garg, 2015). HR professionals found comfort in descriptive analytics while using Excel, but predictive analytics caused a stir and allowed HR professionals to discover and engage with themselves (Kabra, 2016).

The most widely publicized success occurred during the hiring process when analytics took a sharp turn and established a path towards becoming a business partner (Hawkes, 2017). Through the creation of a strong emotional connection, network, and ROI, big data and analytics transformed the way that HR approached Performance, Capability, Capacity, and Retention (Rainer Strack, 2014). An increase in operational performance is made possible by network analysis, which was especially contributed to and argued for by the talent community with functional clarity and role description (maurer, 2019). Sentiment analysis circulating from networks to workers aided in improved decision-making during transition, the launch of new initiatives, and worker commitment (Deloitte, 2020). Analytics has demonstrated its value during the COVID-19 crisis, when the globe is experiencing crises in the areas of health, the economy, and education. The new revolution in human resources (Khalil M Dirani Mehrangiz Abadi Bhagyashree Barhate Amin Alizadeh Rosemary Capuchino Garza, 2020) has been set off by the global crisis and is gravitating towards greater technical developments and virtual systems. Employee performance and turnover are significantly impacted by technical development (Froese, 2016). Numerous analyses demonstrate that despite this, workers and organizations who are receptive to technological advancement are well-positioned to survive and thrive. More people are accepting Flock and Pukka Team as virtual workspaces; gamification, artificial intelligence, and machine learning are utilized for data visualization, employee engagement, and the mental and physical wellness of employees; R and Python are in demand due to their user-friendly interfaces and strong community support.

Conclusion

Companies are incorporating big data into everyday operations and encouraging innovative methods to support improved decision-making. Sentiment analysis, network analysis, and machine learning have significantly improved business and staff management. For HR, having access to such a vast dataset and the ability to derive insights was a dream come true because they thought it required technical expertise to report and present. HR professionals must take the time to learn how analytics operate and organize (Gnanzou, 2015) the way they record their daily data. The team must become more transparent, establish a connection with the analytics community, and keep up with emerging knowledge. Spending time understanding technologies such as analytics enables them to make better decisions than just institutions. The management of personnel via virtual platforms has replaced traditional hierarchies in HR positions over time. With the right big data approach HR operations are poised to grow exponentially and make a greater contribution to the organization as a whole. However, for HR analytics to have the greatest possible impact, some elements must be correctly executed. These include determining the appropriate goal and timing of interventions, implementing suitable analytics

techniques, collaborating on interventions, and expanding HR as a point of intervention. As was previously said, HR professionals are using analytics to not only describe or diagnose problems, but also forecast, prescribe, and mitigate certain major setbacks. This is enabling them to adopt a new vision of a technologically savvy workforce that can even operate remotely, as evidenced by COVID-19. Ultimately, the growing utilization of analytics by HR is impacting organizations by improving decision-making and exceeding expectations. Software developers can also help by creating tools that automatically propose data when it is supplied or by creating straightforward analytics software with a drag-and-drop capability for many non-tech users.

References

Addo, S. N. (2014). Using the UTAUT model to analyze students' ICT adoption. *International Journal of Education and Development using Information and Communication Technology*, 75-86.

Ajzen, I. (1985). *From intentions to actions: A theory of planned behavior*. SSSP Springer Series in Social Psychology.

Ajzen, I. (1991).

AlMobark, B. A. (2023). A Quantitative Approach for Data Visualization in Human Resource Management. *International Journal of Computer Science and Network Security*, 133-139.

ALMUTAIRI, M. (2020). Role of Big Data in education in KSA. *International Journal of Information Technology*.

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

Bersin, J. (2013). Predictions for 2014: Building a strong talent pipeline for the global economic recovery. *Deloitte*.

Bishop, C. M. (2006). *Pattern Recognition and Machine Learning.* Springer New York, NY: Springer New York.

Boudreau, J. H. (2017). An evidence-based review of HR Analytics. *The International Journal of Human Resource Management*, 3-26.

Brewster, T. B. (2016). Conceptualising the future of HRM and technology research. *The International Journal of Human Resource Management* , 1-20.

Brian E. Becker, M. A. (2001). *The HR Scorecard: Linking People, Strategy, and Performance.* Harvard Business School Press.

C Koch, C. S. (2000). HRIS Selection: A Case Study. *Management Decision*.

Carson, S. M. (2011). Maximizing the Impact and Effectiveness of HR Analytics to Drive Business Outcomes. *Strategic Management Decisions*, 20-27.

CIPD. (2016). HR Analytics: Driving Return on Human Capital Investment. *CIPD* .

Craig, K. (2019). Predictive Analytics and How BI can help HR improve employee retention. *datapine blog*.

Daft, L. R. (1978). A dual-core model of organizational innovation. *Academy of Management Journal*.

Daft, R. L. (1978). A Dual-Core Model of Organizational Innovation. *Academy of Management Journal*, 193-210.

Davenport, T. H. (2006). Competing on Analytics. *Harvard Business Review*, 98-107.

Davis, F. D. (1989). Perceived Usefulness, Perceived Ease of Use, and User Acceptance of Information Technology. *MIS-QUARTERLY*, 313-339.

Davis, V. V. (2003). User Acceptance of Information Technology: Toward a Unified View. *MIS Quarterly*,

Dayarathna, R. N. (2021). Predictive HR analytics and talent management: a conceptual framework. *Journal of Management Analytics*, 195-221.

Deloitte. (2020). Organizational network analysis: gain insight, drive smart. *Deloitte*.

Edward E. Lawler III Alec Levenson John W, B. (2004). hr metrics and analytics: use and impact. 27-35.

Elragal, N. E. (2016). Big Data Analytics in Support of the Decision Making Process. *Procedia Computer Science*, 1071-1084.

Eric, R. E. (2021). PREDICTING EMPLOYEE ATTRITION USING DECISION TREE ALGORITHM. *International Journal of Scientific and Engineering Research*, 1305-1318.

Fayol, H. (1916). *General and Industrial Management.* Paris: PITMAN PUBLISHING CORPORATION.

Fink, A. L. (2017). Human capital analytics: too much data and analysis, not enough models and business insights. *Journal of Organizational Effectiveness People and Performance*, 145-156.

Firdose, D. W. (2022). HUMAN RESOURCES ANALYTICS: RACES AND FORECASTS OF INDIAN IT SECTOR . *International Journal of Multidisciplinary Educational Research*, 81-86.

Fitz-Enz, J. (2010). *HR ANALYTICS Predicting The Economic Value of Your Company's Human Capital Investments.* Amarican Management Association.

FOLLET, M. P. (1918). *The New State: Group Organization and the Solution of Popular Governement.* New York: David McKay Co.

Fornell, F. D. (1981). Evaluating structural equation models with unobservable variables and measurement error. *Journal of Marketing Research*, 39-50.

Friedman, T. H. (2009). *The Elements of Statistical Learning.* New York: Springer New York, NY.

Gale, F. S. (2014). HR tech: The year ahead. *Talent Management Magazine*.

García-Izquierdo, F. J.-G. (2022). Human Resources Analytics: A systematic Review from a Sustainable Management Approach. *Journal of Work and Organizational Pyschology*, 129-147.

Giuffrida, M. (2013). HR can't ignore big data. *Talent Management Magazine*, 16-19.

Global, T. (2019). Why Python is good for data analysis.

Gnanzou, S. F. (2015). How 'Big Data' can make big impact: findings from a systematic review and a longitudinal case study. *international journal of production economics*, 234–246.

Gong, Y.-S. S.-C. (2006). The application of genetic algorithm in the development of preventive maintenance analytic model. *The International Journal of Advanced Manufacturing Technology* , 169–183.

Gupta, A. D. (2015). HR - A STRATEGIC PARTNER: Evolution in the adoption of Human Capital Management systems.

Gupta, A. D. (2020). *HR - A STRATEGIC PARTNER: Evolution in the adoption of Human Capital Management systems.* Routledge.

Gupta, M. S. (2021). Fearless path for human resource personnel's through analytics:a study of recent tools and techniques of human resource analytics and its implication. *International Journal of Information Technology*,, 1649-1657.

Hawkes, S. L. (2017). From analytics to action: how Shell digitized recruitment. *Strategic HR Review* , 76-80.

Higginbottom, K. (2014). Is HR Failing To Capitalize On Big Data?.

Hougton, E. (2015). Evolution of HR analytics: a middle east perspective. 185-189.

R analytics conceptualization and adoption:key issues. (n.d.). *Vicence Fernandez, Eva Gallardo Gallardo*.

I Setiawan, S. S. (2020). HR analytics: Employee attrition analysis using logistic regression. *IOP*

Kabra, B. K. (2016). Current and Future Trends in Human Resources Analytics Adoption. *Journal of Cases on Information Technology*, 50-59.

Khodashahri, R. S. (2020). Strategic Human Resource Management Practices and Employee Retention: A Study of the Moderating Role of Job Engagement. *Interdicsiplinary Journal of Management Sciences*.

(2015). *Leading in the new world of work.* Deloitte University Press.

Lee, B. P. (2008). Opinion Mining and Sentiment Analysis. *Information Retrieval,*, 1-135.

Leo Breiman, J. F. (2017). *Classification and Regression Trees.* New York: Chapman and Hall/CRC.

Levenson, A. (2005). Harnessing the power of HR analytics. *Strategic Human Resource Review*, 28-31.

Levenson, A. (2011). Using Targeted Analytics to Improve Talent Decisions. *Center for Effective Organizations*, 1-7.
Luo, M. J. (2010). The Analytics Movement: Implications for Operations Research . *Informs*, 313-324.

Mattox, J. F.-e. (2014). *Predictive analytics for human resources.* . John Wiley & Sons.

Maturi, M. P. (2018). Sentiment Analysis on Interview Transcripts: An application of NLP for Quantitative Analysis. *International Conference on Advances in Computing, Communications and Informatics*.
maurer, r. (2019). Employee Sentiment Analysis Shows HR All the Feels.

Mayo, E. (1933). *The Human Problems of an Industrial Civilization.* New York: Macmillan Co., New York, 1933.

McBassi, L. B. (2011). Raging debates in HR analytics: the evolution of people strategy. *journal of the Human Resource Planning Society*, 14-18.
McMurrer, L. B. (2010). HR Analytics Handbook Hardcover. *Reed Business*.

Misra, A. S. (2017). *HR Analytics: The Next Frontier.* livemint.

Mohammed, Q. A. (2019). HR ANALYTICS: A MODERN TOOL IN HR FOR PREDICTIVE DECISION MAKING. *Journal of Management*, 51-63.
More, M. D. (2022). HR PEOPLE DATA ANALYTICS USING POWER BI DATA. *International Journal of Research Publication and Reviews*, 60-64.
Morris, A. D. (1996). User Acceptance of Information Technology: Theories and Models. *Annual Review of Information Science and Technology*.
Murphy, K. P. (2012). *Machine Learning A Probabilistic Perspective.* The MIT Press.

NASSCOM. (2016). *Big data analytics to reach $16 billion industry by 2025: Nasscom.* Indiatimes.

Nyathani, R. (2023). AI-Driven HR Analytics: Unleashing the Power of HR Data Management. *Journal of Technology and Systems*, 15-26.
Osman, B. C.-F.-L. (2010). International Journal of Business and Management. *An Exploratory Study on Turnover Intension Among Private Sector Employee*, 57-64.
Panetta, K. (2019). Gartner top 10 strategic technology trends for 2020. *Gartner*.

Pauli Dahlbom, N. S. (2020). Big data and HR analytics in the digital era. *Baltic Journal of Management*, 120-138.
Punamkumar Hinge Harshal Salunkhe, M. B. (2023). Artificial Intelligence (AI) in Hrm (Human Resources Management): A Sentiment Analysis Approach. *Atlantis Press*.
Rahmani, B. J. (2019). HR analytics a roadmap for decision making: case study. *Indonesian Journal of Electrical Engineering and Computer Science*, 979-989.
Rahul, S. S. (2017). Analysis of employee attrition and implementing a decision support system providing personalized feedback and observations. *Journal of critical review*, 2372-2380.
Rainer Strack, J.-M. C. (2014). Creating People Advantage 2014- 2015: How to Set Up Great HR Functions.

Rajesh, S. S. (2018). Redefining HR using people analytics: the case of Google. *Human Resource Management International Digest*, 3-6.
Ramstad, J. W. (2007). *Beyond HR: The New Science of Human Capital.* boston: Harvard Business School Press.

Rao, N. V. (2013). Analytics as a Predictor for Strategic and Sustainable Human Resource Function: An Integrative Literature Review. 1-13.
Rizvi, I. K. (2017). An efficient framework for real-time tweet classification. *International Journal ofInformation Technology*, 215-221.
Rob Cross, S. B. (2002). Making Invisible Work Visible: Using Social Network Analysis to Support Strategic Collaboration. *California Management Review*.
Sateesh V Seth, T. P. (2021). Examining the determinants of successful adoption of data analytics in HRM. *JOURNAL OF BUSINESS RESEARCH*.
Schillewaert, R. F. (2002). Organizational innovation adoption: A multilevel framework of determinants and opportunities for future research. *Journal of Business Research*, 163-176.
Schmidt, T. Z. (2016). Data-driven HR - R\'esum\'e Analysis Based on Natural Language Processing and Machine Learning.

Schönberger, V. M. (2013). *Big Data: A Revolution That Will Transform How We Live, Work, and Think.* United State of America: Houghton Mifflin Harcourt Publishing Company.
SEN, S. (2020). Employee engagement analytics: how to do it and add value.

Setyadi, N. P. (2019). An Application of the UTAUT Model for Analysis of Adoption of Integrated License Service Information System. *science direct*, 57-65.
SGuha. (2017). How data analytics improves your corporate training experience.

Shapiro, T. H. (2010). Competing on Talent Analytics. *harvard business review*, 52-58.

Sharma, A. S. (2017). HR analytics and performance appraisal system A conceptual framework for employee performance improvement. *Management Research Review*, 684-697.
Sharma, A. S. (2017). HR analytics and performance appraisal system A conceptual framework for employee performance improvement. *Management research review*, 684-697.
Sharma, S., Dashora, J., & Saxena, K. (n.d.). APPLICATION OF BUSINESS INTELLIGENCE SOLUTIONS FOR HUMAN RESOURCE.
Singh, N. (2016). *India companies use analytics tools to spot talent and troubl.* Times of India.

Sommer, B. (2016). Visier – taking HR analytics into talent acquisition. *Diginomica*.

Staiger, J. (1997). competing on analytics. *film crit*, 5-20.

Susmita EKKA, P. S. (2022). Predicting HR Professionals' Adoption of HR Analytics: An Extension of UTAUT model. 77-93.
Tanya Nagpal, M. S. (2016). Analyzing Human Resource Practices For Decision Making in Banking Sector using HR analytics.
Taylor, F. W. (1911). *The principles of scientific management.* New York: Harper & Brothers, New York, 1911.

Times, E. (2015). *Talent Analytics are the future of HR in India finds TimesJobs.* Economics Times CIO.

Timming, R. H. (2021). Can HRM predict mental health crises? Using HR analytics to unpack the link between employment and suicidal thoughts and behaviors.
TJ, G. L. (2016). A study on the acceptance of HR analytics in organisations. *International Journal of Innovative Research and Development*, 357-360.
Vorley, Z. K. (2016). Big Data Text Analytics an enabler of Knowledge Management. *Journal of Knowledge Management* , 18-34.
Williams, C. E. (2006). Gaussian Processes for Machine Learning. *the MIT Press*.

Wilson, M. F. (2001). Effective HR measurement techniques .

Yadav, R. S. (2020). Data analysis of COVID-2019 epidemic using machine learning methods: a case study of India. *International Journal of Information Technology*, 1321–1330.
Yanartas, A. A. (2020). An analysis on the unified theory of acceptance and use of technology theory (UTAUT): Acceptance of electronic document management system (EDMS). *compters in huma behavior reports*, 1-7.