Role of Big Data Analytics & Artificial Intelligence (AI) For Effective People Management

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The role of Artificial Intelligence (AI) and Big Data Analytics for effective decision-making in organizations has grown by leaps and bounds in today's organizations. The need for the same has been escalated by the increasing uncertainties in today's business environment and to streamline effective and meticulous business decision-making in the organizations. This paper explores the application of Big Data Analytics and AI in the domain of People Management practices in organizations and how the same is constantly helping managers and HR leaders to align HR deliverables with the strategic needs of their organizations. The paper discusses pertinent case studies to explore the application of Data Analytics for robust HR decision-making.

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Introduction

In building a successful business, arguably the most valuable asset is its people. Human resource management departments are increasingly turning to data analytics for critical personnel decisions. With advancements in artificial intelligence and machine learning, HR professionals now have even more data at their disposal to guide these decisions. Data analytics in people management involves leveraging data and analytical techniques to enhance HR processes and decision-making. By analyzing various types of HR data, organizations can gain insights that help in the improvement of recruitment, employee retention, performance management, and overall workforce planning. Big data analytics in HR involves extracting significant insights from extensive HR big data sets (Baki et. al, 2023). This encompasses the collection, arrangement, and examination of HR data to reveal patterns, trends, and correlations. In the context of measuring employee performance, data analytics

can yield a more precise and unbiased assessment, empowering organizations to make informed decisions and enhance performance effectively. The HRM field has drastically changed over the last 20 years, adopting data-driven methodologies and cross-functionality (Bresciani et. al, 2021; Zhang, 2021). But the rise of artificial intelligence (AI) has changed the HRM paradigm and further transformed the HRM function specialists in businesses. AI technologies have started to pervade many aspects of organizational functioning, including human resource management, due to their ability to improve system efficiency, improved data analysis, and innovation prospects (Guenole, N., & Feinzig, 2018; Rathi et.al, 2018). Similar to the Internet and the World Wide Web, which brought about the rise of e-commerce, consumerism, the sharing economy, and the gig economy, artificial intelligence has had a profound impact on businesses and society (Lawler & Mohrman, 2003; Malik, Srikanth, & Budhwar, 2020). AI-based systems in business organizations will drastically change the nature and significance of jobs, the employer-employee relationship, the relationship between people and technology, customer experience, and competitive advantage in a dynamic market environment (Wilson, Daugherty, & Bianzino, 2017). According to a survey of 8,370 workers, managers, and HR directors in ten nations, published in Oracle and Future Workplace (2019), 50% of the workforce used artificial intelligence (AI) in some capacity in 2019; compared to 32% in 2018; 76 percent of workers (and 81 percent of HR leaders) find it challenging to keep up with the pace of technological changes in the workplace; 64% of people will trust a robot more than their manager. Workers want a simplified experience with AI at work, asking for a better user interface (34 percent), best practice training (30 percent), and an experience that is personalized to their behavior (30 percent). Although artificial intelligence (AI) has been an explosive issue for several decades, there is not yet a single definition that is widely recognized in the literature, which poses a fundamental challenge to a cohesive understanding of AI (Mikalef & Gupta, 2021).

Review of Literature

Managing people continues to be a top priority for organizations. The rise of big data has introduced new methods for organizing employees fostering evidence-based meticulous decision-making for managers (Gravili, et. al, 2023). Big Data in Human Resource Management refers to information assets characterized by high volume, high velocity, and high variety, requiring cost-effective and innovative information processing methods (Gandomi & Haider 2015) to improve insight and decision-making in HR functions. In the digital HRM phase, humanizing the workplace necessitates a focus on leveraging technology to improve human values and potential and make the business more human-centric, which occasionally runs counter to productivity and efficiency targets. Business partner HRM is undergoing a major evolutionary shift with the arrival of AI. Concerns about AI ethics, compliance, and culture to establish a human-centric workplace

are raised by the majority of enterprises' ambiguity about how to use AI technology to meet their people-management and value development goals (Budhwar et.al, 2023). The use of Human Resource Analytics (HRA) and the evolving role of the HR function appear to be closely linked (Dahlbom et.al, 2019), with each transformation potentially reinforcing the other. In this regard, human resource analytics has emerged as a significant new trend and challenge in business, highlighting the strategic importance of human resource management (HRM) to senior executives (Bahuguna, Srivastava, & Tiwari, 2024). People or HR Analytics (HRA) encompasses the processes used to understand, quantify, manage, and enhance the role of talent in executing strategy and creating value. It involves focusing on developing HR metrics (e.g., identifying & using measurable indices about an organization's workforce) and analytics (e.g., how can the organization manage and improve the metrics that are critical for its business success?). For achieving insights on such metrics and evidence-based HR decision-making, HRA involves using statistical methods to connect HR practices with organizational performance. Google's HR data analytics team has created an evidence-based method to improve the company's recruiting and selection process (Patil & Priya, 2024). By identifying several high-performance variables that predict a candidate's potential success, they achieved this using advanced HR technology to gather and analyze candidate and employee data. Researchers discovered in the Human Resources Professional Association survey that, despite their best efforts to be inclusive, companies may unconsciously favor applicants who most closely like them. This phenomenon is known as "unconscious bias." The Implicit Association Test (IAT), a psychological test that reveals people's subconscious word connections to indicate bias, has also identified another type of bias: linguistic bias. These prejudices are incorporated into resume selection processes as well as job descriptions (Cai et.al 2023). AI has made it possible for algorithms to be created that will assist companies in recognizing and eliminating these bias patterns from the language they use when hiring new employees and extending a warm welcome to diverse candidates, according to HRPA experts. Additionally, AI might show managers applicants rejected because of human propensity.

Businesses have been gathering consumer data for years to acquire insights and forecast future behavior. It is imperative for HR teams to make significant progress in utilizing people analytics. AI will be able to participate more fully in HR if it can be determined what data to monitor, evaluate, handle, and safeguard. "Companies will search for creative methods to draw in top talent in the never-ending talent battle. Companies can set themselves apart from one another with the use of technologies that improve the candidate experience and live up to the expectations of the modern applicant. According to a LinkedIn study, video interviews are expected to gain popularity, but they will need to be conducted with a minor modification in their pattern of capture. Instead of prere-

corded questions, the interview will be conducted in real time, with the candidate simply needing to sit in front of the camera and respond; they won't need to manually record their responses or go to the next question. They are trying to overcome the challenges of filming an impartial interview, as candidates will not have much time to prepare or fabricate responses" (Fenwick, Molnar, & Frangos, 2024).

The technique used in the video interviews is predicated on: 15 Natural Language Processing + Facial Expressions and the parameters that are used to derive the results are non-verbal communication, word choice, interview transcript, and tone. Researchers also point out that HR has access to a wide range of additional technology that it can employ to manage its resources. In HR domains, one needs to ascertain its purposes. Examples like FreeHAL-SOAR, Google as a personal assistant, Cyc—which the Cedars-Leaveland Clinic is presently using to create a natural language query interface for biomedical information—and Open Mind Common Sense are a few examples. So there is a research gap on a framework suitable for implementing AI in HRM. There are a lot of studies presently surveyed on color psychology and workplace design and its implantation through artificial intelligence. The skill of intentionally using color in interior design to affect feelings, perceptions, and behavior is known as office color psychology. When designing workspaces, this is a crucial factor to take into account and necessitates a thorough analysis of how color influences productivity and elevates staff emotions. There are a lot more things to be uncovered like color psychology or the use of color in different workplace designs through artificial intelligence. Businesses that deal with artificial intelligence must have logos that use distinctive symbols, elegant, contemporary fonts, and a future, scientific aesthetic. They must also exude a strong feeling of reliability, authority, and trust. This explains why blue is a common color used by Artificial Intelligence companies. Artificial Intelligence is widely used in the human resources department of modern businesses. Workers typically find it challenging to adopt and employ AI tools and abilities in developing technologies (Udin, 2023). AI would have a significant impact on the sector since it drastically alters people's perceptions. The HR division will need to make sure the correct candidate is hired who has experience with AI systems. Another limitation of HR is that it would lose its authority as an expert witness and its ability to make important judgments. AI has demonstrated the potential to improve psychological recovery. This study explores the use of Generative Artificial Intelligence (GAI) and Human-Computer Interaction (HCI) for precise mental health assessments and customized treatment plans. Sentiment Analysis and Healing Digital Journeys are examples of emotional technologies that identify subtle mood changes, accurately identify user de-

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mands, and provide a mental healing experience for users. AI supports psychotherapy by facilitating customized treatments, co-creating plans, and recommending future possibilities for rehabilitation, all while the design industry focuses on psychological healing.

AI For People Management: Theoretical Background

AI is revolutionizing Human Resources (HR) by gathering large amounts of data and performing predictive analysis in seconds. The advent of AI shall reduce the manual, redundant functions and foster innovation since the focus shifts to the strategic and mission-centric aspects of business AI tools are revolutionizing recruitment by reducing time spent on candidate screening and allowing recruiters to focus on assessment and engagement (Watson et. al, 2019). AI-driven vendor software can recommend learning programs based on job roles, experience, and peer activities. AI-enabled screening software can identify suitable candidates based on skills, experience, and cultural fit (Murgai, 2018). AI-powered interviewing systems streamline the process by identifying the right candidates and engaging them efficiently.

AI can also assess high-performing leaders by collecting employee feedback, sourcing candidates online, and handling HR queries and scheduling meetings. Sharma (2013) found a positive relationship between AI usage and better HR performance in the IT industry in Delhi/NCR. However, AI also had a significant impact on innovativeness and ease of use. This highlights the potential of AI in Industry 4.0, a new revolution in the IT landscape (Fernandez, 2000). The research provides insights into AI's impact on HR operations. In the context of services industry IT and AI have vast implications. The advancement of AI, mobile tech, NLP, and speech recognition has made smart travel assistants feasible. These apps understand user preferences and offer tailored suggestions, even coordinating various services at destinations within budget constraints. However, a key challenge is determining whether these assistants serve the user or the developer, leading to the emergence of a new marketing approach focused on targeting travel assistants rather than tourists**.** Another example was from the Orissa Tourism Website which was revamped to highlight the state's tourism offerings in collaboration with the National Informatics Centre (NIC). Electronic tourism distribution channels prioritize ease of transaction over product differentiation. Systems like CRS (Computerized Reservation System) play a pivotal role, enabling storage, retrieval, and transaction processing related to air travel, including schedules, fares, and passenger data.

GIS plays a crucial role in tourism planning and management by providing visual representations and advanced analyses of digital geospatial data related to tourist destinations. GIS, as part of GIT, serves as an information system that enhances flexibility in providing information on travel, accommodation, dining, and trip management (Jovanoviæ, 2016). In-

Table 1 AI-based People Management Software At a Glance

Sl. No	Name of AI software	Features
1	Workable	Streamlines recruitment, decision-making, and talent acquisition, offering capabilities beyond hiring, including onboarding and talent management.
2	Manatal	Democratizes recruitment by enabling HR departments to source, engage, and hire top talent across 135 countries, enhancing team collaboration.
3	Fetcher	Streamlines sourcing and repetitive tasks, allowing businesses to focus on building candidate relationships and improving hiring experiences with over 1,000 organizations.
4	Paradox	Streamlines high-volume hiring across industries, powered by Olivia, a conversational recruiting assistant, automating administrative tasks like applicant screening and onboarding.
5	Skillate	Streamlines the hiring process, optimizes it with applicant tracking systems, and drives candidate engagement throughout the process.
6	Textio	analyze job descriptions and recruitment messaging to minimize bias, suggesting alternative wording for more inclusive content, allowing recruiters, talent acquisition professionals.
7	Eightfold	Enhances organizations' hiring, retention, and growth of diverse workforces across 20 verticals, 155 countries, and 24 languages

Source: Authors' own compilation

Table 2 Software Used In CRS

Majorsystems	Created by	Users
Amadeus	Air France, Iberia , Lufthansa, SAS	Online travel agencies including ebookers, Expedia, Opodo Flights
Sabre	American Airlines, All Nippon Airways, Cathay Pacific Airways,	Expedia, TravelocityKayak
Galileo	Aer Lingus, Air Canada, Alitalia Swissair, TAP, United Airlines	Cheap Tickets, ebookers, Ixeo
World span	Delta, Northwest	Orbitz, Hotwire, Priceline

Source: Ray et.al (2011)

formation technology extends beyond operational realms, influencing tactical and strategic management within the tourism industry. By fostering direct and efficient communication among stakeholders, including travelers and suppliers, IT offers competitive advantages and software components, such as CRS (Computerized Reservation System), play a pivotal role in enabling storage, retrieval, and transaction processing related to air travel (Jakkilinki, Georgievski, & Sharda,2007; Cho, & Fesenmaier 2001).

Travel agencies optimize operations using back-office software for accounting, commission tracking, and customer management, enhancing service quality. Group Decision Support Systems (GDSS) aid in efficient decision-making

through real-time discussions and idea generation, improving collaboration. Geographical Information Systems (GIS) within Information and Communication Technology (ICT) revolutionize tourism by enabling data management, analysis, and problem-solving. Robots have begun to give people a broader look at the future of many businesses and industries, including but not limited to the hotel industry (Ray et. al 2011) AI in the hospitality industry has the most dramatic use has been in the hotel sector. The hotel industry has been incorporating AI to the industry in the pandemic at many national and international associations, However, the idea of AI in the hotel industry has been met with much skepticism. Industry leaders, owners, managers and academics agreed the industry needed a solution and AI was the resolution. Also, mobile and Wi-Fi technologies provide unparalleled convenience for travelers, facilitating access to tour-related information via GSM, WAP, and GPRS networks, empowering travelers to seamlessly book accommodations, transportation, and other travel necessities.

HR Metrics Used For Big Data Analytics

When integrating big data analytics to assess the effectiveness of the HR function, organizations can use a diverse array of essential HR metrices and indicators. These measures can be classi-

Table 3 Software Used in Hotel Industries

ASI FrontDesk Freeware 6.0	With features including reservation administration, check-ins, billing, and reporting, ASI FrontDesk Freeware 6.0 is a free hotel management programme designed for small hotels and guesthouses. Its goal is to increase efficiency through front-office automation without requiring a large capital outlay.
eZee Front Desk Hotel Software 5.2	eZee FrontDesk Hotel Software 5.2 is a comprehensive hotel property management system that includes front-office operations, reservations, guest management, invoicing, and housekeeping. It may also include reporting, analytics, and integration with POS and online booking channels, all with the goal of increasing productivity and guest satisfaction for hotels of all sizes and types.
SIMSOFT Hotel pro 2006	all-in-one software for hotels that simplifies tasks like booking reservations, managing the front desk, coordinating housekeeping, handling bills and invoices, and generating reports
Room Master 2000 Hotel Reservation Software 12	Manage advance reservations and deposits. Email And printing confirmation for Group blocks, Revenue management,
EXSS Facility Manager 5.2	EXSS Facility Manager is intended primarily for small hotels, universities, fitness centres, SPAs, sports stadiums, gymnasiums, rent-a-cars, service areas, sanatoriums, pensions, rental facilities, and so on.

Source: Ray et.al (2011)

fied broadly into quantitative and qualitative dimensions, offering a comprehensive perspective on employee performance. Human resources (HR) have the potential to become a highly valuable component of businesses and play a major role in creating and implementing corporate strategy due to the growing significance of HR in determining organizational effectiveness (Lawler, 2003). HR can play a significant role in the formulation and application of strategies. However, HR lacks the kind of database-driven and analytical decision-making skills required to shape corporate strategy. This could be due in part to the absence of appropriate measures and analytical frameworks. One of the four traits that make HR a strategic partner is the use of metrics, which offer superior reasoning and analytics for decision-making about human contribution (Lawler & Mohrman, 2003). HR metrics for Big Data Analytics can be incredibly insightful for organizations looking to optimize their human resources management. Some of these metrics are as in Table 4.

HR metrics for Big Data Analytics can be incredibly insightful for organizations looking to optimize their human resources management.

Table 4 HR Metrics

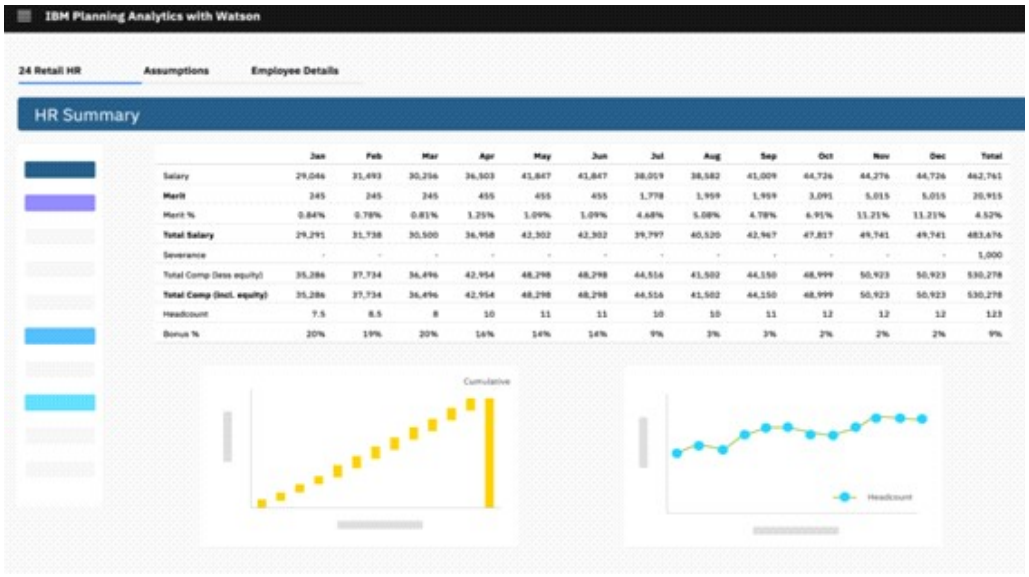
Sl No.	HR Metrics	Hallmarks
1	Defining KPIs	Clearly defining performance objectives and outcomes that are aligned with the organization's strategic goals is crucial. This in volves identifying key metrics and indicators to measure success
2	Incorporate HR Big Data Sources	Combine diverse HR big data sources to form a centralized Big HR data repository. This could involve utilizing HR data integration tools or devising bespoke solutions to link disparate systems and databases.
3	Quantitative Metrics	Concentrate on quantifiable KPIs and KRAs, such as sales revenue, customer satisfaction ratings, productivity outcome metrics etc. These offer objective data points that can be readily monitored and compared across timeframes.
4	Qualitative Metrics	Qualitative metrics encompass more subjective indices of employee performance, like those of teamwork, communication effectiveness, problem-solving capabilities, and leadership acumen.
5	Predictive HR Analytics	Predictive HR analytics utilizes past HR data and statistical models to anticipate future employee performance and recognize talents with high performance potential. By examining historical HR performance data and its correlation with other factors, HR decision-makers can forecast future employee achievements and make informed choices regarding promotions, succession planning, and talent cultivation.
6	Employee Interaction Analytics	This entails the examination of employees' digital footprints and interactions to evaluate their future behaviors, performance and predict their behavioral outcomes like intention to quit or pose conflicts.

Source: Authors' own compilation

Case Study: IBM Planning Analytics

IBM Planning Analytics leverages AI and analytics to automate workforce management and forecast employee attrition. It utilizes AI to enhance decision-making and effectively implement new workforce planning strategies aligned with business needs. It creates precise AI-driven workforce plans and gap analyses, considering factors such as employee development, location, return to work, compensation, retention, turnover rates, and strategic goals. IBM Planning Analytics is capable of inferring employee skills and proficiency levels based on their digital footprint within the company. This information is then used to offer personalized learning recommendations, encouraging employees to enhance their skills in key areas. The AI augmented analytics application also deploys a cognitive career coach to assist employees in exploring job opportunities, learning, and career paths. This initiative is complemented by a robust career conversations campaign, resulting in 80% of IBM employees reporting meaningful career discussions with their managers.

Fig. 1 Illustration of IBM Planning Analytics with Watson



Courtesy: https://www.ibm.com/products/planning-analytics/workforce-planning

To further integrate skills as a form of currency, the application implemented a machine-learning model to inform HR managers regarding salary decisions, reinforcing the skill-based people strategy for both managers and employees. To add to this, utilizing IBM's Watson machine learning capabilities, the workforce analytics team developed an algorithm incorporating various data sources such as recruitment, tenure, promotion history, performance, role, salary, location, and job position, among others. Additionally, the com-

pany included employee sentiment data, measured through their Social Pulse. The hypothesis was that engagement with social media might decrease when employees are considering leaving (Connelly et.al, 2023). IBM planning analytics provides complete visibility into the current workforce, job market trends, staffing metrics, and talent gaps. This enables HR managers to easily determine the most efficient action plans and cost-effective methods for recruiting, employee up-skilling, and managing training & development programs (Moore and Bokelberg, 2023; Sharma, Sharma & Bansal 2023; Yawalkar, 2019).

AI, by leveraging advanced capabilities such as machine learning, natural language processing, and predictive analytics, has sparked a revolutionary transformation in the field of manpower analytics. AI-driven predictive analytics offers HR professionals the capability to foresee future talent requirements and identify skill gaps. Through meticulous data analysis, AI facilitates organizational planning for future talent needs, encompassing upskilling, reskilling, succession

Table 5 Salient Hallmarks of IBM Planning Analytics

Sl. No.	Items	Hallmarks
1	Forecasting Talent skill availability	IBM Planning Analytics utilizes advanced analytics, AI, and machine learning to predict and assess skill supply in organizations. The result is a dependable baseline to track employee skill status over time, offering essential insights for targeted workforce planning.
2	Managing employee skill gaps	IBM Planning Analytics learning approach fosters ongoing development and is bolstered by cognitive solutions, including internal mobility-promoting job alerts, peer-to-peer coaching, and an AI-driven feedback application
3	Smart Tracking and Engagement of Job Applicants	IBM Planning Analytics utilizes a cognitive advisor which gathers information about the job seeker and answers questions as a recruiter would, significantly enhancing the candidate experience and the quality of applicants for various roles.
4	Evidence-based HR predictions (Predictive Analytics)	AI systems sift through immense datasets to formulate predictions, ranging from scrutinizing industry trends to analyzing an organization's growth patterns, providing a comprehensive outlook on the future talent requirements
5	Optimizing Talent Utilization	Through the analysis of the business's current requirements, upcoming projects, and individual employee profiles, AI can recommend optimal placements for talent, maximizing effectiveness.
6	Prescriptive Analytics & Scenario Planning	Through simulating diverse business scenarios, AI module in IBM Planning Analytics helps HR decision-makers comprehend how different situations, such as market downturns, expansions, or product launches, could influence staffing requirements.

Source: https://www.ibm.com/products/planning-analytics

planning, and beyond. This proactive strategy guarantees the timely availability of suitable talent, reducing disruptions and enhancing resource utilization.

Case Study: Intelogos

Intelogos is an AI enabled HR analytics software that specializes in people analytics and performance management, fostering growth for both managers and employees. The application analyzes organizational as well as departmental productivity trends and patterns linked to employee effort and performance-driven outcomes. These insights are gleaned from a variety of big data sources, encompassing computer-based tasks and feedback from external tools. By leveraging big data analytics and AI, HR managers as well as employees can gain awareness of their strengths and weaknesses, while managers are equipped to offer actionable feedback based on performance deliverables. Intelogos utilizes live data to produce recommendations aimed at fostering business growth through the optimization of performance management procedures.

Table 6 Salient Hallmarks of Intelogos

Sl. No.	Items	Hallmarks
1	Personal metrics	Primary indicators of individual performance updated daily.
2	Employee Insights	Examination of metrics to offer observations and recommendations for the next steps.
3	Team dashboard	Comprehensive overview displaying team performance metrics, time off statuses, leader boards, etc
4	Employee engagement mapping	Evaluation of employee engagement levels and satisfaction metrics.

Source: *https://www.intelogos.com/*

Conclusion

The convergence of artificial intelligence (AI) and big data analytics has revolutionized the landscape of people management in organizations, offering unprecedented opportunities for informed decision-making and strategic alignment. The adoption of data-driven methodologies in human resource management (HRM) has become imperative in navigating the complexities of today's business environment. The significance of leveraging data analytics in people management cannot be overstated. By harnessing the power of AI and machine learning algorithms, HR professionals gain access to a wealth of insights derived from vast HR datasets. These insights enable organizations to optimize various HR processes, ranging from recruitment and employee retention to performance management and workforce planning. Furthermore, data-driven performance evaluations facilitate more precise and unbiased assessments, thereby fostering fairness and consistency across the organization.

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