



HR ANALYTICS: SERBIAN PERSPECTIVE

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Abstract:

The explosion of new business models is not the only consequence of the accelerated development of information and communication technologies, but also of global crises. Disruptions such as the COVID-19 pandemic have accelerated managers' awareness that change is not only necessary, but has already taken place.

Traditional Human Resources (HR) models were not ready to respond to the challenge of digital transformation. The „new normal“ implies a new set of necessary skills, capabilities and a different working environment. Companies face the challenge to innovate HR function by developing new career paths and creating more flexible models and relationships with different stakeholders.

Most business leaders have become aware that it is impossible to carry out a business transformation without quantifying HR function. HR analytics are on the business agenda and it is the fastest-growing area of HR Management today, driven significantly by global crises, and it will be more crucial when organizations must decide how to proceed in the “next normal”.

The paper defines HR 5.0 as the future of HR, in the framework of Industry 5.0, with attempts to study the state-of-the-art HR in order to explore the current status and perspectives of HR analytics in Serbia, point out the approach that radically transforms the use of human data by policy makers and defines one set of conceptual recommendations for successful HR implementation.

Keywords: HR analytics, Industry 5.0, HR 5.0, digital transformation, artificial intelligence

1. Introduction

Digital transformation is no longer a buzzword. The explosion of new business models that emerged during the COVID-19 pandemic is not an exclusive consequence of global crises, but disruptions such as COVID-19 and the war in Ukraine have only accelerated managers' awareness that change is not only necessary but has already taken place. The „next normal“ quickly replaced „new normal“.

Agility has become the mantra of digital transformation. Agility starts with knowing the company's talent ecosystem. However, traditional HR models are not ready to respond to the challenge of digital transformation. This confirms the finding that only one-third of the research companies collected information on the individual skills of their employees in 2021 (a global study of 10,910 participants, of which: 930 C-Suite executives, 1,736 HR Leaders, 8,244 Employees, 16 Geographies and 13 Industries) [1].

The good news is that most respondents have become aware that it is impossible to carry out a transformation without quantifying the skills. The “next normal” means business models shift, with a new set of necessary skills and capabilities. Ahead of companies is the challenge to innovate in finding new talent and keeping what they already have by developing new career paths and creating more flexible models and relationships with different stakeholders [2]. That

includes forming partnerships, joint ventures, strategic vendor relationships and alliances, and even collaboration with competitors.

HR analytics (HRa) are on the business agenda and it is the fastest-growing area of Human Resources Management today, driven significantly by the COVID-19 pandemic, and it will be more crucial when organizations have to decide how to proceed in the “next normal” [3].

The paper discusses HR analytics (HRa), the situation and perspectives, with an emphasis on implementation in Serbia, primarily in the field of small and medium enterprises (SMEs).

The initial hypotheses were set from the macro and micro aspects of HRa:

H1: Advanced HRa (HR 5.0) should be considered within Industry 5.0, as HR 5.0

H2: HRa should be considered in the function of the enterprise transformation.

This paper tries to study the macro aspect - the state of HRa in the world in order to explore the perspectives of HRa in Serbia and defines a set of conceptual recommendations for successful HRa implementation.

2. HR analytics

In the „new normal“ conditions, which the world introduced in the „next normal“ where „black swan“ [4] is the rule rather than the exception, there is a clear transition to new business models working from home and using platforms and digital skills that most did not even know existed. Also, changes in lifestyle models caused by erasing the boundaries between private and business, home and office are evident. This has caused a lot of anxiety because of the rapid transition to new skills and changing life and shopping habits.

The evaluation of the HR function indicates that a revolution or at least an evolution of the HR profession is needed. In the context of the future of work, it is necessary for HR to focus on creating an agile workforce. It is not surprising then, that this time the practice was faster than the theory, looking for solutions for problems for which science does not have an established methodology.

Findings from a 2017 study by van den Heuvel and Bondarouk suggest that, by 2025, HRa will have become an established discipline [5]. The impact of HR on business outcomes, as well as strong influence in strategic and operational decision making, will most likely be proven before that. The development of HRa is determined by integration with data and information communication technology (ICT) infrastructure. Moreover, the HRa function may be subsumed in a central analytics function - transcending individual disciplines such as marketing and finance, which is not the case now.

Many definitions related to HRa can be found in white papers and scientific journals. Different scholars have defined HR analytics in numerous ways. For the purposes of this paper, we will use one of the simplest:

„HR analytics is the application of analytical logic for the HRM function“ [6].

2.1 HR x.0

Starting from the cited definition, that HRa is the application of analytical logic for the HRM function, and the set hypotheses H2 we defined the taxonomy of HR x.0 based on Gartner analytical maturity model [7] as function of analytics.

HR x.0	Type of analytics	Desrcipton	Ind. x.0	Data sources
HR 0.0	No analytics	Past tense	Ind. 1.0	No data
HR 1.0	Descriptive Analytics	Focus on the past: Analysis of raw numbers to figure out WHAT happened.	Ind. 2.0	Primary data sources Secondary data sources
HR 2.0	Diagnostic Analytics	Focus on the past: Advanced analysis to figure out WHY this happened.	Ind. 3.0	Consulting firms' data, Macro-industry data
HR 3.0	Predictive Analytics	Focus on the present in relation to the future: What WILL happen	Ind. 4.0	Big data Open data
HR 4.0	Prescriptive Analytics	Focus on the future: HOW we can make it happen	Ind.5.0 evolution	Micro (personal) data
HR 5.0	Cognitive Analytics	Future tense: follow Industry 5.0	Ind. 5.0	All data

Table 1. Development / taxonomy of HR analytics

Descriptive analytics tools may include: descriptive statistics including graphs and plots, benchmarking tools, KPIs-based methods (scorecards), business intelligence (BI) dashboards and advanced survey analytics.

Predictive analytics tools may include: regression and correlation time series analysis, classification methods (decision trees, logistic regression, discriminant analysis,), clustering (K-nearest neighbors, K-means), anomaly detection, profiling, association rules, link-analysis, causality modeling (Bayesian networks), text analysis and NLP and Attrition modeling. Predictive analytics are based on lagging metrics as outputs of events and focusing on what has already happened. They are useful for understanding if intended results have been achieved yet but are often of limited use for predicting future trends [8].

Prescriptive analytics uses almost the same tools as predictive analytics, but its focus has shifted to real-time solutions: HOW we can make it happen. Prescriptive analytics are based on leading metrics as a measure of an input that has a direct influence on an outcome. These metrics show the status of things now and can help course correct in real time to meet business objectives. They include things like employee engagement and satisfaction. Employers could monitor employees' emotional and cognitive states giving nudges, mandating breaks, or even making promotion and termination decisions based on collected data [9].

Cognitive Analytics are based on artificial intelligence (AI) tools such as neural networks, deep learning, blockchain, etc. In the near future, AI will be one of the most influential human resource technology trends. Already now AI supports routine and repetitive activities and monitoring operations, leaving managers with more time to plan, strategize, learn, and work on personal development. AI is also gaining ground in the actual screening process where companies can potentially gain a massive efficiency boost by using AI recruiting tools able to reduce a pool of several hundred applicants down to a shortlist of 5-6 with the highest potential [10].

Beyond hiring (talent acquisition), AI is increasingly used to track and assess workers on the job in the following areas: Onboarding, Learning and Training, Cognitive- Supporting Decision-Making, Leadership Coaching, and Automating Administrative Tasks [9].

Table 1 is named Development / taxonomy of HR analytics. This refers to the inheritance of previous concepts. In particular, HR 2.0 Diagnostic Analytics did not exclude the previous HR 1.0 Descriptive Analytics, but has only improved it. The same applies to the following stages in the development of HRa (HR 3.0 vs HR 2.0; HR 4.0 vs HR 3.0; HR 4.0 vs HR 5.0). The same is true for data sources, the use of data from the previous HR x-1 phase is inherited specifically, in HR 2.0 except Consulting firms' data and Macro-industry data sources, the analysis is based on a primary and secondary data source.

HR 5.0 is the HRa umbrella and brings together all HR analytics tools from HR 1.0,

(Descriptive Analytics) to HR 4.0 (Prescriptive Analytics). So, since HR 5.0 relies on Industry 5.0 concepts, it will be more closely defined through this concept.

3. HRa framework

Building an HR analytics framework is the first step to apply and use HRa. A prerequisite is to know that useful HR analytics use a process that helps the organization to define and align on goals and then collect meaningful data that can be acted upon. Many businesses achieve this through the well-known LAMP framework: Logic (articulate the connections between talent and strategic success, and conditions that predict individual and organizational behavior), Analytics (how data can provide answers), Measures (the numbers and indices calculated from data systems) and Process (communication and knowledge transfer mechanisms through which the information becomes accepted and acted upon by key organization decision makers [11])

HR 4.0 is a framework to bring about changes in the people strategies of organizations changing the way work is experienced [12] and shaping people's strategies in Industry 4.0, as an initial response to the changing role of organizations in the context of this challenge [13]:

- HR 4.0 explores why Industry 4.0 creates the impetus for transformation in people strategies and HR practices;
- HR 4.0 outlines what business leaders — including Chief People Officers, Chief Human Resource Officers, CEOs, and other C-suite leaders — can do to respond; and
- HR 4.0 describes how organizations are already responding to the need for change, with examples of emerging roles, technologies, and critical skills for the future of HR.

Industry 4.0 is based on data: how it is collected, analyzed, synthesized, interpreted, and applied, to make the right decisions, predict outcomes and improve performance, has become a competitive factor [14]. HR 4.0 approach integrates HR and data science perspectives. The holy grail of HR 4.0 is prescriptive analytics located in the Industry 4.0 framework. "In simple terms it's the action plan based on the data." [15].

Generally, Industry 4.0 has brought a new future of work (new normal) disrupted by technological advancements. Successful organizations, or those who want to be, are ready for change: 53 percent of companies are introducing next-generation ERP systems, intelligent ERP, which includes artificial intelligence, machine learning, blockchain technology and Big Data, with a focus on user experience, cloud computing and intelligent Internet. At the same time, 33 percent of companies are already in the process, while only 4 percent have implemented such a solution [16].

3. Step forward to Industry 5.0 and HR 5.0

By analogy, if HR 4.0 follows Industry 4.0, the HR 5.0 follows Industry 5.0. Numerous technologies and applications are expected to help Industry 5.0 such as supercomputing, edge computing, digital twins, collaborative robots, Internet of Things, blockchain, augmented reality, 6G, etc. Industry 5.0 is the next industrial evolution (not revolution) and its objective is to leverage the creativity of human experts in collaboration with efficient, intelligent, and accurate machines, in order to obtain resource-efficient and user-preferred manufacturing solutions compared to Industry 4.0 [17]. These three categories (experts' knowledge, user experience and customization) are added value compared to Industry 4.0. So, Industry 5.0 brings people back into focus - human experts, which proves the need for a redefined HRa function within HR 5.0.

Survey data from 2021, conducted by software company Sage, with 500 HR and business leaders, across the UK, US, Canada, and Australia (respondents were from midsize global companies, in traditionally high-growth, high-skill sectors such as technology, business services and not-for-profit) found that more than 80% of the C-suite leaders said they would not have been able to operate effectively during the pandemic without HR technology. The same percentage of HR leaders said HR technology enabled them to be more flexible and responsive to changing priorities while helping their businesses become more resilient. Also, they had to scale HR technology to manage and operate effectively during the pandemic as

remote working became pervasive across organizations [18].

HR analytics is different from the analysis of sales figures or logistics efficiency [19]. It is about people who work together in complex organizations and even more complex living and working conditions. The development of HR 5.0 is characterized by integration, with data and ICT infrastructure integrated across disciplines and even across organizational boundaries. HR 5.0 is expected to be very well subsumed in a central analytics function - transcending individual disciplines such as marketing, finance, and HRM [5].

On the other hand, Deloitte's research (completed by more than 3,600 executives in 96 countries, the report included responses from more than 1,200 C-suite executives and board members) shows that executives are gradually abandoning the idea of optimization solely through automation, as well as focusing more on integrating people and technology to ensure their complementarity and organizational advancement. This is in line with Industry 5.0. We believe that the reason for returning people to the center of decision-making lies in this result: Almost three-quarters (72%) of executives identified "the ability of their people to adapt, reskill and assume new roles" as a priority for navigating future disruptions [20].

Wellness management is one of the trends in HR 5.0 function. Its main goal is the management of employees' mental and physical wellness to improve the health and wellbeing of employees, and setting realistic expectations in terms of performance and increases the chances of achieving business success. Long working hours led to 745,000 deaths from stroke and ischemic heart disease in 2016, a 29 percent increase since 2000, according to the latest estimates by the World Health Organization and the International Labor Organization [21].

4. CS: Serbia

Considering that for Serbia, at this moment, based on the author's secondary research, we do not have representative data on the use of HR, we have used these proxy variables from existing research. The first source is the official statistical data from the publication entitled: "Usage of information and communication technologies in the Republic of Serbia, 2021 Households / Individuals Enterprises", published and printed by the Statistical Office of the Republic of Serbia [22].

The survey for enterprises in Serbia was carried out in March 2021. Telephone interview with 1,573 enterprises (representative stratified sample size) was used. The response rate was 82.6%,

The key findings:

- 100% of enterprises have a fixed broadband Internet connection in Serbia.
- 96.6% of large enterprises have a website;
- 94.1% of medium enterprises have a website;
- 81.6% of small enterprises have a website.

The use of the company's website in the function of HR is not statistically significant. Website of enterprise mainly provides description of goods or services and pricelists (85.3%), Links or references to the enterprise's social media profiles (41.3%) and online ordering or reservation or booking of goods/services (19.2%). To assess the level of use of a web business analytics tool, we used the proxy variable: Tracking or status of orders placed (10.1%).

- 22.3% enterprises use ERP software in Serbia. Small (10-49 employees): 17.6%; Medium (10-49 employees): 35.2% and Large (more than 250 employees).

In 2017, Deloitte researchers, as part of a global study involving 10,000 business and HR leaders from 140 countries, found that 72% of companies in Serbia said that Digital HR and employee analytics are very important for their business.

At the same time, 17% stated that they largely use to measure, manage, and improve the strategic role of the HR department, and 8% that they have useful data that they use in HR. evaluating the strategy of attracting talent in the direction of cognitive recruitment considering the options of social networks (32%), the use of analytics for forecasting (11%) and the use of games and simulations to attract and evaluate potential candidates (14%) [23].

Serbia 2021: According to the RSO study, the answer to the question: “Does your enterprise use any of the following Artificial Intelligence?” is shown in Table 2. The following usage options are offered: Technologies performing analysis of written language (text mining), Technologies converting spoken language into machine-readable format (speech recognition), Technologies generating written or spoken language (natural language generation), Technologies identifying objects or persons based on images (image recognition, image processing), Machine learning for data analysis, Technologies automating different workflows or assisting in decision-making (AI-based software) and Technologies enabling physical movement of machines via autonomous decisions based on observation or surroundings (autonomous robots, self-driving vehicles, autonomous drones).

Technologies	Small (10-49)	Medium (10-49:	Large (more than 250 employees)	% of enterprises in Serbia
Text mining	-	0.7	1.9	0.2
Speech recognition	0.0	0.6	2.6	0.2
Natural language generation	0.1	0.4	2.3	0.2
Image recognition, image processing	0.1	0.7	0.4	0.2
Machine learning (deep learning)	0.1	1.5	1.4	0.4
AI - based software	0.1	1.9	1.0	0.5
Autonomous robots, self-driving vehicles, autonomous drones	0.0	0.7	0.6	0.2

Table 2. Used AI technologies in companies in Serbia [22]

For human resources management or recruiting, e.g. candidates' pre-selection screening, automation of recruiting based on machine learning, employee profiling or performance analysis based on machine learning, chatbots based on natural language processing for recruiting or supporting human resources management, etc. used by 8.0% of enterprises (Figure 1). Note: Only for enterprises that answered “Yes” in previous question “Does your enterprise use any of the following Artificial Intelligence?”

Enterprises		Size class			Region				Total
		Small (10–49)	Medium (50–249)	Large (250+)	Beogradski	Vojvodne	Šumadije i Zapadne Srbije	Južne i istočne Srbije	
For human resources management or recruiting									
Activity	Manufacturing	-	-	-	-	-	-	-	-
	Electricity, gas, steam and air conditioning supply; Water supply and sewerage	-	-	-	-	-	-	-	-
	Construction	-	-	-	-	-	-	-	-
	Wholesale and retail trade	-	-	-	-	-	-	-	-
	Transportation and storage	-	-	59.4	50.0	-	100.0	-	27.5
	Accommodation and food service activities	-	100.0	-	100.0	-	-	-	100.0
	Information and communications	-	5.9	-	-	-	-	20.0	2.2
	Real estate activities; Professional, scientific and technical activities	-	-	-	-	-	-	-	-
	Administrative and support service activities; Repair of computers	100.0	-	-	55.8	-	-	-	55.8
Total		14.2	3.8	15.9	14.2	-	4.1	9.8	8.0

Fig 1. Does your enterprise use any of the following Artificial Intelligence?" For human resources management or recruiting (only for enterprises that answered "Yes" in question "Does your enterprise use any of the following Artificial Intelligence?" [22]

The obtained results indicate that the use of AI technologies in companies in Serbia is at the level of statistical error, and HRa is even below this level.

4. Conclusions and recommendations

Based on the presented analysis, we can conclude that the next generation of HR, which exists in the Industry 5.0 environment, is actually HR 5.0. At the moment, HR 5.0 is in its infancy in terms of the ways it is being used by HR. It is indicative that the HR function transcends the boundaries of an organization. Mega trends indicate that Industry 5.0 is characterized by the human factor and this indicates the need for serious consideration and socio-political support. H1: "Advanced HR analytics should be viewed in Industry 5.0 as HR 5.0" should be considered correct.

Proving the hypothesis H2: "HR analytics should be considered in the function of the overall digitalization of the company", remains to be proven through future works and, above all, future practice. At this point, it is certain that HR development is determined by data. Using data science to build business analytics models, on IT infrastructure, contributes to improving business results and supporting operational and strategic decision making. It is indicative that the HR function should be integrated into other business functions, with the prospect of taking a central place in the function of business analytics. From the point of view of science and profession, HR goes beyond the framework of an individual discipline, such as HR, economics, marketing, finance, e-business, etc. in the first place, which makes it a serious candidate for multidisciplinary discipline.

4.1. Recommendations for action

It is unlikely that an independent HRa that is (if it exists) will function well in a vacuum. That is, the development of HR in companies with a low degree of digitalization, which

characterizes the SME sector in Serbia, cannot be expected. Large companies generally have implemented HR functions.

According to the findings of the presented research, HR 5.0 is still at the level of statistical error in Serbia. At this moment, it is more certain that SMEs will skip the HR 3.0 link and make preparations for HR 4.0, in order to reduce the backlog. We found support for this recommendation (among others) in the conclusions of the 2020 survey that Human Resource Analytics has been successfully implemented by only a few organizations due to poor data management, dearth of analytical skills and lack of organizational adaptability [12].

For the development of HR in SMEs in Serbia, a number of support measures are needed:

Government level:

1. Establishment of legislative - strategic frameworks by government
2. Further support for the digitization process: training, software, establishment of start-ups
3. Creating public-private-academic partnerships
4. Open data initiative
5. Modernization of curricula

SME level:

1. Digital transformation of the company (in progress)
2. Implementation and integration of HR 4.0

Serbia has high-quality ICT specialists with competitive wages that are attractive for foreign companies looking to outsource. Serbia's tech sector is expected to continue to grow by more than 20 percent a year, but expansion is hampered by a lack of skilled people - with foreign firms hiring as quickly as the educational system can produce them. Universities are churning out engineers, but it is estimated that the country needs at least 15,000 more to meet the rising demand [24].

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