

Artificial Intelligence in Transforming Human Resource Management in Public Hospital

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Abstract

This paper discusses the role of artificial intelligence and its impact on human resource management outside of business in health service provider such as a public hospital. The aim is to investigate the results of the operation of artificial intelligence in the health sector and its use in human resource management in a public hospital, through applications that are already used in the business world. In the first phase in AI's before and after the implementation of an online human resource service platform in a public hospital and a second bibliographic research was chosen to present and analyze specific scenarios of the application of AI's by the business world, as good practices. The comparative evaluation resulted in an increase in use of 18.66%, a reduction in errors of 3600%, a reduction in service time of 271%, increased user satisfaction of 144% and a reduction in staff employed of 20%. The use of AI's applications in human resource management is perhaps the critical element for the effective and efficient operation of a hospital in human resource management and the satisfaction of employees and patients although the research is limited to a single hospital and the existence of additional AI applications in Human Resource Management is a limitation.

Keywords: *AI Applications in Hospital Human Resource Management, Artificial Intelligence in Health Services, Digital Transformation, Human Resource Management.*

Introduction

Today's business environment is characterized by intense competition, rapid change and a trend towards globalization. Businesses are forced to anticipate the ever increasing demands and needs of their customers before they appear in changing markets. This forces businesses to develop the ability to maneuver, adapt and involve in order to survive and remain active. To achieve their goals, business have been using tools based on new technological developments over time, incorporating most of them.

Artificial intelligence is the most important example and factor new technology (although it

has existed since 1950), which is used in the world of business of all kinds, changing the way they operate and adapting business to new data: the use of automated tools in production, product development, marketing, logistics, the operation of the business itself and its human resources, through its management. In particular, the use of Artificial intelligence in human resources has created a number of positive changes in the operations and process used in human resource management.

Despite comprehensive research on the general impacts of artificial intelligence on business operations and innovation, there is a significant gap in the scientific discourse that specifically examines the mechanisms through

which AI is integrated into both exploratory and exploitive efforts in the management of a hospital organization. While a significant portion of the existing literature has focused on the role of AI in enhancing business decision making [35], there remains a gap in research addressing how human resource management effectively reconciles AI driven innovation optimization of operational process followed in a hospital organization [35].

To date, no previous research study in Greece has focused on the relationship between AI and HRM in a public healthcare provider. Therefore, following this lack of literature on the relationship, this paper conducts a double research: a) a literature review for the development of AI application scenarios in HRM areas in a public hospital provider and b) a comparative analysis and evaluation of result, after the implementation of an online staff self - service platform in a hospital. The following research questions guide the study of the paper:

- In which sub-areas of human resources management, could applications using Artificial Intelligence be used by a healthcare provider in the context of optimal management of its human resources?
- What are the results from the use of a self-service platform for the staff requests in a hospital provider?
- Is the development and use of similar applications using artificial intelligence in hospital providers justified?

The Comprehensive Theoretical Basis

Today, artificial intelligence is the most important example and factor of new technology (although it has existed since 1950), used in the world business. Artificial intelligence is a part of computers that, by studying and designing 'intelligent' agents to understand their environment so that by taking initiatives and activities they can maximize their success [1]. Artificial intelligence is a more general term that includes machine

learning, deep learning, neural networks, and the ability to process natural language, the ability to process speech, the operation of robotic systems (robotic) and the creation of images (vision) [2]. The goals of artificial intelligence [3-5] are to develop a system with similar thinking to that of humans, to create a system that thinks rationally, system that act like humans and the development of systems that react logically. It takes the form of [6] limited of weak artificial intelligence: which involves daily tasks and repetitive tasks without creativity. General or strong artificial intelligence: when it simulates human level thinking, shares ideas, innovates and Highly Intelligent AI: with intelligence greater than the level of the smartest people. Its tools are [7]: logical programming, automated reasoning and search algorithms. Machine learning [8] is a subset of AI with the ability to solve problems by creating learning (supervised, unsupervised and reinforcement [3]) from data, with correlations and predictions using algorithms. Another subset of AI is deep learning [9] that uses big data, artificial neural networks, Deep Neural Networks. There is also natural language processing [10] as a subset for understanding and creating texts.

Human resource management, defined by Nankervis [11] '*as a combination of three factors: people, resources and management*' or '*a set of actions, strategies and functions that are necessary to be carried out so that the company can acquire, retain and utilize capable employees who will work productively and effectively*' [12, 13]. Theories have been developed for Human Resource Management such as human capital [14]. Comparative advantage [15] and the psychological contract [16]. The function of Human Resource Management [17] are recruitment and staffing, (continuous) training and development of human resources skills, rewards and benefits and ensuring employment relations. They are developed both within the internal and external environment of the organization [18].

Necessary elements are the existence of human resources capabilities, i.e. the personal characteristics that enable (human resources) to respond to their roles and duties and achieve high performance [20]. Of course, in today's intensely digital era, it is accepted that capabilities ' *cannot be observed directly, but can only be measured by action aimed at achieving specific goals* [21]. Necessary are the functional capabilities of human resources i.e. the provision of human resources management functions, personal reliability and the use of technologies for human resource management [22]. There vital roles for HR leaders have also been developed [23]: a) social integrators act as a link between organization and HR, b) talent intelligence advocates who contact analysis to drive candidate sourcing, c) Strategic Partners who develop their skills in digital communication and outreach with a focus on results. The existence of interpersonal skills – skills and characteristics that define and influence an individual's ability to interact with others [24], teamwork, the development of harmonious cooperation with other employees to achieve a common goal [25], flexibility and adaptability affect the efficiency and effectiveness of [26], as well as emotional intelligence [27] which includes self-awareness, motivation, self-regulation, mindfulness, and social skills [28].

Can Artificial Intelligence contribute to Hospital Management?

It is given that Artificial Intelligence in all sectors and by extension in health services, is constantly increasing its contribution. Some of its contribution may be [29]:

1. Ability to create automated administrative process, healthcare, medical records and data management, as well as addressing and identifying any errors in workflows or possible billing errors. The transformation and use of automated processes will save time for medical and non-medical personnel to perform other tasks.
2. Analysis of human resource management data in health services regarding staff workload, staff needs, their evaluation, training needs, etc.
3. Offering assistance to health professionals in patient diagnoses and treatments for example tumor diagnosis in oncology patients. Especially through decision systems integrating artificial intelligence, there is the possibility of learning from large databases, such as patient history, medical test results, genetic profile of patients, etc.
4. Assistance in the processing of imaging examinations images, as there is the possibility of selecting, checking, detecting specific types of cancer, e.g. lung, breast, skin, but also stroke or fractures, etc. The consequence is the reduction of workload of radiologists and laboratories, avoidance of exhaustion of medical staff, reduction of any errors in diagnoses, increase in the percentage of valid diagnoses.
5. Ability to predict patient flow, admissions – discharges, by calculating the availability of beds in each hospital or health unit.
6. Data analysis from various sources, such as clinical trials, patient records.

The introduction of artificial intelligence applications in hospital administration is a challenge that requires the coordination of systems, technologies, the existence of an ethical framework and the existence of skills and experience of public administration executives in artificial intelligence. The transition of governance (the exercise of political power) towards the era of artificial intelligence creates requirements [30, 31]:

1. Integrating its applications into public policies, to exploit the possibilities and limit risks or errors [32].
2. Necessary commitments and respect for rights, e.g. protection of sensitive personal data.
3. Creating trust between the individuals involved and parties, who are affected by

artificial intelligence applications that make decisions.

Methodology

There is a need to use automated tools that offer solutions in human resource management in organizations that manage a large number of personnel. So the research questions and sub questions are the existence or not of:

RQ1: Applications that can improve Human Resource Management in a hospital (health care provider)?

And if implemented, will there be:

SubRQ1: Is there differentiation in service time?

SubRQ2: Is there differentiation of errors during operation of the department?

SubRQ3: Is there differentiation in the workload per employee?

SubRQ4: Is there differentiation of employees with specific items and reduction of the department's operating costs?

SubRQ5: Is there differentiation in satisfaction of the platform's customer, i.e. hospital staff?

SubRQ6: Are there more immediate and valid information about the category and type of requests and their completion?

To answer the above questions, a study was designed based on:

1. For the research part of good practices that could be applied in a public hospital, a bibliographic search was conducted and good examples were transferred from business world so that they could be applied in the hospital,
2. For the research part from its implementation to a comparative analysis of quantitative and qualitative data collected from historical data :
 - Before the implementation of the system: January – June 2024
 - After the implementation of the system “: January – June 2025

The comparative analysis concerned request from 350 employees from different sector of a

hospital (medical, nursing, administrative staff, etc.) at the Giannitsa (Greece) Public Hospital. The system allowed for the electronic submission, approval and monitoring of request for leave days, schedule changes and days off.

Key evaluation points included:

1. The number of request processed
2. The average handing time per request
3. The user satisfaction (via a query on the platform)
4. Frequency of administrative errors.

Results and Discussion

Case studies of AI Applications in Human Resource Management transferred from Business to Hospital settings

Management of Medical staff Mobility through artificial Neural Networks

Medical staff can be selected as it's a critical factor for the operation of a hospital organization. The stay in the hospital organization of low-performing staff and the departure of efficient and effective staff creates reduced performance in the organization, increased operating costs, reputation problems, etc [32].

Artificial Neural Networks can support decision making processes by analyzing two categories of data:

- Personnel related information, like gender, marital status, education, age, specialization, year of service, compensation, etc.
- Historical organizational data, including staff replacement and mobility records.

By using the sensitivity analysis artificial neural networks can identify the influential variables that affect staff mobility and replacements trends, proving insights into key parameters shaping workforce stability [32]. This approach enable more effective workforce planning and strengthens HRM decision making by incorporating quantitative

evaluation methods and predictive analytics [32, 33].

Candidate Search through Knowledge based Search Engines

Given the existing shortages in the Greek labor market – especially in specialties such as internal pathology, radiology, and anesthesiology- many health care organizations are forced to search for professionals on the internet or in Greek professional associations. This recruitment of external medical personnel (as collaborators) can be implemented through knowledge based search engines [32]. The knowledge based search engines help by matching the skills of candidates with the requirements of the job, performing automated or segmented searches and providing rankings of potential candidates. This approach leads to faster and more accurate identification of suitable professionals, while reducing manual effort. Such systems are already widely used in the corporate sector through human resource

Management with improved Artificial Intelligence [33].

Evaluation of impact of an AI-Based self-service Platform: The Case of Giannitsa Public General Hospital

The HRM departments in Greek Hospitals manage a large daily volume of requests for various types of leaves i.e. regular, sick, educational etc, days off and changes to work schedules. Traditional management methods (like handwritten applications or requests made via phone or email) lead to significant delays, increased administrative work load and reduced transparency.

The hospital implemented a Human Resource management application, specifically an AI –base request management system. Through a comparative evaluation between the manual system and the AI-based application over a similar period, the following results emerged (table 1).

Table 1. Results from Implementation of the Platform at Giannitsa Public Hospital

Indicator	Before Implementation	After Implementation	(%) Change
Average number of requests per month	750	890	(+)18,66%
Average processing time (hours)	26	7	(-)271%
Frequency of administrative errors	12/month	2(Total)	(-)3600%
Employee satisfaction [scale 1 (less) to 5 (high)]	1,8	4,4	(+)144%

More analysis from the submitted requests shows the following:

1. **Request distribution:** Before the application’s launch, there were 615 requests for leave and days off, 110 requests for work schedule changes, and 25 requests for sick leave longer than 3 days. After application’s launch, there were 732 requests for leave and days off, 105 schedule change requests, and 53 requests for sick leave over 3 days.

2. **Gender distribution:** Before implementation, 503 requests were from women (67%) and 247 from men (33%). After implementation, 622 were from women (70%) and 268 from men (30%). No significant change was observed between male and female usage, likely due to similar needs during the same period.

3. **Increase in total requests:** There was an 18.66% increase in staff requests submitted to the hospital. A more detailed comparison

showed that during the first two months, requests through the platform were 10% fewer than manual requests (possibly due to initial skepticism). However, as usage increased, the overall six-month period showed the reported growth.

4. **Processing time:** The average processing time per request decreased by 271%, from 26 hours to 7 hours. The reduction was even greater (350%) in cases involving sick leave requests, which require more complex administrative actions.
5. **Administrative errors:** Under the manual system, there were about 12 errors per month — a total of 72 errors from January to June 2024. After implementing the AI platform, errors nearly dropped to zero (a 3600% decrease), with only two (2) recorded in total during the same period.
6. **User satisfaction:** Feedback collected during request completion showed a 144% increase in user satisfaction compared to the manual system. Interestingly, satisfaction increased more among female users (about 160%) than male users (110%), though no obvious reason for this difference was identified.

Additionally, analysis of the platform's operation revealed some secondary conclusions:

1. Due to the reduction in request processing time, fewer administrative staff may be needed in the HR department.
2. The hospital's operating costs could be reduced because of the lower administrative workload.
3. Further cost reductions could result from eliminating the use of paper, printing ink, etc.
4. The hospital's environmental footprint improves due to the elimination of printed forms.

The integration of a remote self-service tool [34] facilitates direct and autonomous access of employees to Human Resources (HR) services. The ability to electronically submit and track

requests not only reduces the need for human mediation but also enables:

1. **Optimization of Business Processes:**

Through the creation of repeatable procedural routines, weaknesses are identified, and opportunities for improvement are established. This allows organizational processes to adapt to changes in the environment or market. Potential errors are detected and prevented, enabling leadership to implement improvements that enhance competitiveness and efficiency [19].

2. **Human Resource Development and Performance Management:**

In a work environment where employees develop their skills and competencies, there is the potential to establish a system of analysis, evaluation, and rewards to increase efficiency and engagement with organizational goals. Moreover, identifying weaknesses in employee performance can lead to targeted training programs, empowerment initiatives, and even strategies to prevent resignations from the organization [19].

3. **Risk Prediction:** Through big data analysis — including data from social networks and other sources — risks such as fraud detection, unforeseen events, system failures, or potential security threats can be identified. This enable the implementation of preventive measures for risk mitigation as well as the automated management of response actions for any potential threat [19].

Limitations and Recommendations

The findings of this study indicate a positive association in the use of AI in HRM in a hospital. However, it should be noted that there are some limitations. First, the study was conducted in a specific context with a relatively small and specific sample, including characteristics. To enhance the reliability and

generalizability of these results, future studies should include larger groups of participants from other hospitals or other applications within the same hospital. Second, while the present study mainly examined the implementation of one platform, it did not evaluate the overall quality and outcome of all AI-based applications that can be used in HRM.

Possible new fields that would use artificial intelligence applications in a hospital entity and can be integrated into human resource management practices could be:

- Artificial neural networks for searching and planning in case of replacement of medical personnel,
- Genetic algorithms for planning the necessary personnel for the operation of the hospital entity,
- The use of interactive response applications for citizen self-service on issues, clinic appointments, information, etc.

Conclusions

Today, the corporate landscape is shaped and influenced by globalization, technological advancements, the introduction of new ideas, economic and political instability in many countries, and environmental concerns. Human resource policies are resorting to the use of new technologies and strategies in the face of these changing conditions. Nevertheless, the human factor remains a crucial determinant of success in HR management. Even the most advanced AI solutions rely on human input, decision-making, and oversight. Undoubtedly, this study provides a preliminary theoretical framework that could serve as a foundation for future research and practical application.

This research adds to the body of literature by offering valuable perspectives on the potential benefits and key parameters related to the integration of AI applications in the human resource management of a hospital.

The findings of this study indicate a positive correlation in the use of AI in the Human Resource Management of a hospital. The main advantages of using AI in the case of the Giannitsa General Hospital are the saving of the necessary working time for the human resources management department itself, the improvement of efficiency by reducing errors in satisfying requests, the improvement of efficiency by increasing the number of requests served and clearly the improvement of the satisfaction of the employees themselves. The following AI technologies could be meaningfully integrated into hospital HRM practices: Artificial Neural Networks (ANNs) for medical staff replacement, Genetic Algorithms for HR working scheduling, considering constraints such as working hours, leave, and rest days, ensuring operational continuity and safety. Undoubtedly, the specific research that was carried out can constitute an initial approach that can serve as a basis for additional study and further research and application in practice, in order to assess the results that will arise.

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Conflict of Interest

There is no conflict of interest in the data collection, literature review, writing of the script, and its publication by the Journal.

Consent for Publication

The authors hereby gives both their consent for publication.

Data Availability

Derived data supporting the findings of this study are available from the corresponding author on request.

Author Contributions Statement

Name of Author	C	M	So	Va	Fo	I	R	D	O	E	Vi	Su	P	Fu
Tzouros Theodoros	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓		✓	✓
Tsagaris Apostolos		✓		✓				✓	✓	✓	✓	✓	✓	
C : Conceptualization			I : Investigation						Vi : Visualization					
M : Methodology			R : Resources						Su : Supervision					
So : Software			D : Data Curation						P : Project					
Va : Validation			O : Writing - Original Draft						administration					
Fo : Formal analysis			E : Writing - Review & Editing						Fu : Funding acquisition					

Declaration of Interests

The authors declare no potential conflicts of interest concerning the research, authorship, and/or publication of this article.

Ethical Approval

Our institution does not require ethics approval for reporting individual cases, case series or comparable data.

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