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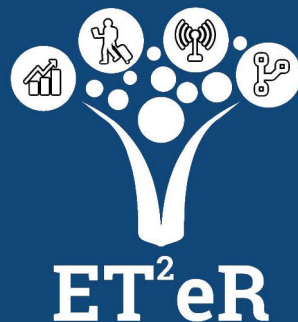


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Poseban broj časopisa „ET²eR – ekonomija, turizam, telekomunikacije i računarstvo” obuhvaća radove prezentirane na **4. međunarodnoj znanstveno-stručnoj konferenciji ReECON - RENEWABLE ECONOMICS**.

Konferencija je održana u Biogradu na Moru, 1. - 2. listopada 2024. godine u organizaciji Veleučilišta Baltazar Zaprešić i Veleučilišta u Virovitici. Na konferenciji je sudjelovalo 90-tak znanstvenika i stručnjaka iz raznih područja poslovne ekonomije, ruralnog i regionalnog razvoja, informacijskih tehnologija i turizma.

Cilj konferencije je bio zadržati proaktivni pristup u primjeni teorijskih i empirijskih dostignuća kojima će se utjecati na poboljšanje poslovnih procesa, promicanje održivog poslovanja u dinamičnom okruženju, stvaranje ozračja etičnog ponašanja, transparentnosti i odgovornosti te jačanje otpornosti gospodarstva u cjelini uz pružanje dugoročnih održivih smjernica za realni sektor.

U ovom posebnom broju ET²eR-a objavljeno je 7 znanstvenih i 15 stručnih radova. Teme radova su iz područja poslovnog upravljanja, turizma i hotelijerstva, ruralnog i regionalnog razvoja, digitalne tehnologije, javne politike i održivog gospodarskog razvoja.

Časopis „ET²eR“ namijenjen je svima koji žele dati doprinos poticanju i razvijanju primijenjene stručne djelatnosti. Svrha časopisa je upoznavanje šire javnosti s novostima iz navedenih područja i popularizacija struke. Stoga ohrabrujem sve potencijalne autore da prijave svoje radove za objavljivanje.

Časopis je uvršten u bazu Hrčak te ERIH PLUS (European Reference Index for the Humanities and Social Sciences) bazu, čime je postao časopis koji se kategorizira u znanstvene radove druge skupine (a2).

Zahvaljujem se svim sudionicima konferencije, autorima, recenzentima, uredništvu časopisa, lektorima te tehničkom i izvršnom uredniku na trudu i znanju uloženom na kreiranje ovog posebnog broja časopisa „ET²eR – ekonomija, turizam, telekomunikacije i računarstvo”.

”

Glavni urednik

doc.dr.sc. Dejan Tubić, prof. struč. stud.

Foreword

”

The Special Issue of the journal 'ET²eR – Economics, Tourism, Telecommunications and Computer Science' comprises papers presented at the **4 International Conference on Renewable Economics - ReECON**.

The conference was held on 1. - 2. November 2024 in Biograd na Moru, Croatia, and was organised by the University of Applied Sciences Baltazar Zuprešić and Virovitica University of Applied Sciences. The conference was attended by more than 90 scientists and experts from different areas of business economics, rural and regional development, information technology and tourism.

The goal of the conference was to maintain a proactive approach to the application of theoretical and empirical achievements which can influence improvement of business processes, promote sustainable business activities in a dynamic environment, create a climate of ethical behaviour, transparency, and responsibility, and strengthen the resilience of economy on the whole while providing sustainable long-term guidelines for the real sector.

Seven scientific and fifteen professional papers are published in this Special Issue of ET²eR. Paper topics are related to areas of business management, tourism and hospitality, rural and regional development, digital technology, public policy, and sustainable business development.

The journal "ET²eR" is aimed at authors who would like to contribute to the promotion and development of applied professional activity. The purpose of the journal is to familiarize the general public with news from the aforementioned fields and to popularize the profession. Therefore, I would like to invite all potential authors to submit their papers for publication.

The journal is included in the Hrčak database and the ERIH PLUS database (European Reference Index for the Humanities and Social Sciences), making it a journal categorized in the second group (a2).

I would like to use this opportunity to thank all the participants in the conference; authors, reviewers, the editorial board of the journal, proofreaders, and the executive and technical editors for their effort and knowledge invested in creating this Special Issue of the journal 'ET²eR – Economics, Tourism, Telecommunications and Computer Science'.

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Application of artificial intelligence in project management: analysis of potentials and challenges

Primjena umjetne inteligencije u upravljanju projektima: analiza potencijala i izazovi

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Sažetak

Ovaj rad istražuje integraciju umjetne inteligencije (UI) u upravljanje projektima, s posebnim fokusom na njen utjecaj na digitalnu transformaciju i optimizaciju procesa. Donošenje odluka je značajno poboljšano zahvaljujući UI u suvremenom poslovnom okruženju, a ključno je za uspješno upravljanje organizacijama i projektima. Sposobnosti UI-a u analizi podataka, predviđanju ishoda i optimizaciji procesa donošenja odluka predstavljaju veliki potencijal za organizacije da poboljšaju prilagodljivost, povećaju proaktivnost i učinkovitije planiraju buduće poslovne korake. Uloga UI-a u planiranju projekata i upravljanju rizicima istražena je kroz prizmu prediktivne analitike i razvoja prediktivnih modela. Praktične primjene ovih tehnika u upravljanju rizicima ističu sposobnost UI-a da upravlja i ublažava rizike na učinkovitiji način. Analiza podataka, kao ključna komponenta donošenja odluka, ima izuzetne koristi od UI-a. Organizacije mogu obraditi ogromne količine podataka iz različitih izvora, poput internih sustava i društvenih mreža, s velikom brzinom i preciznošću. Ova sposobnost omogućava identificiranje obrazaca, trendova i skrivenih poveznica koje bi inače mogle ostati neotkrivene. Posljedično, znanost o podacima postala je ključni alat za voditelje projekata, omogućujući brže i relevantnije prikupljanje i obradu podataka. Integracija znanosti o podacima s tehnologijama UI-a u upravljanju projektima predstavlja značajan napredak u modernom vodstvu i praksi upravljanja. Praktična primjena UI-a u velikim organizacijama poput SAP-a, Siemens AG-a, Rimac Automobila i Infobip-a pruža konkretne primjere njenog potencijala za poboljšanje učinkovitosti projekata. Ove studije slučaja ilustriraju kako UI može pružiti konkurentsku prednost menadžerima i njihovim organizacijama u suvremenom poslovnom okruženju. Primjena UI-a u upravljanju projektima je transformativna, nudeći značajna poboljšanja u efikasnosti, prilagodljivosti i strateškom planiranju. Dokazi iz studija slučaja naglašavaju vrijednost UI-a u postizanju superiornih rezultata projekata i održavanju konkurentске prednosti u današnjem dinamičnom poslovnom kontekstu.

Ključne riječi

Analiza podataka, Projektni menadžment, Umjetna inteligencija (UI)

Abstract

This paper explores the integration of Artificial Intelligence (AI) in project management, focusing on its impact on digital transformation and process optimization. Decision-making, a critical element for the successful management of organizations and projects, is significantly enhanced by AI in the contemporary business environment. AI's capabilities in data analysis, outcome prediction, and decision-making optimization present substantial potential for organizations to improve adaptability, increase proactivity, and plan future business steps more effectively. AI's role in project planning and risk management is examined through the lens of predictive analytics and the development of predictive models. The practical applications of these techniques in risk management are highlighted, showcasing AI's ability to manage

and mitigate risks more efficiently. Data analysis, an essential component of decision-making, benefits greatly from AI. Organizations can process vast amounts of data from various sources, such as internal systems and social media, with speed and accuracy. This capability allows for the identification of patterns, trends, and hidden connections that might otherwise go unnoticed. Consequently, data science has become a crucial tool for project managers, enabling faster and more relevant data collection and processing. The integration of data science with AI technologies in project management marks a significant advancement in modern leadership and management practices. The practical application of AI in large organizations such as SAP, Siemens AG, Rimac Automobili, and Infobip provides concrete examples of its potential to enhance project efficiency. These case studies illustrate how AI can provide a competitive advantage to managers and their organizations in the contemporary business environment. The deployment of AI in project management is transformative, offering substantial improvements in efficiency, adaptability, and strategic planning. The evidence from case studies underscores the value of AI in achieving superior project outcomes and maintaining a competitive edge in today's dynamic business context.

Keywords

Artificial Intelligence (AI), Data Analysis, Project Management

Introduction

The current technological paradigm, characterized by artificial intelligence (AI) and related technologies, is profoundly transforming contemporary society. AI's ability to analyze vast amounts of data, perform complex tasks, and learn from its experiences opens up a wide range of potential applications. In the context of this paper, one of the key areas where AI promises revolutionary changes in the near future is in the field of economic sciences, particularly in project management. This study will therefore examine the fundamental concepts of artificial intelligence and its role in economic sciences. We will explore the use and application of AI with the aim of enhancing project management processes, offering a deeper and broader understanding of its implications in the modern business world.

Artificial intelligence (AI) is fundamentally a branch of computer science that aims to create computational systems and algorithms capable of performing tasks that require human-like intelligence. This intelligence can be simulated through advanced computational models, including machine learning and deep learning, which enable project managers to manage project processes more efficiently based on data-driven insights.

This paper will also discuss key AI technologies and demonstrate their potential applications in project management. Machine learning, a subfield of AI, allows computational systems to learn and improve their performance in executing specific tasks without explicit programming. Instead, these systems learn from data, recognizing patterns and making decisions based on data analysis. The main machine learning techniques include supervised learning (where the system is trained on labeled data), unsupervised learning (where the system identifies patterns in unlabeled data), and reinforcement learning (where the system learns through feedback on the success of its actions) (Mitchell, T. M., 1997).

Deep learning, a subset of machine learning, employs artificial neural networks with multiple layers (deep networks) to analyze and learn from large volumes of data. These layers enable the system to learn at different levels of abstraction, recognizing complex patterns in data such as images, sound, or text (Goodfellow, I., Bengio, Y., & Courville, A., 2016).

Globally, and particularly within the European Union, various levels of government are increasingly

engaging in discussions and the formulation of regulations and laws focused on artificial intelligence (AI). Members of the European Parliament assert that AI has the potential to significantly enhance contemporary networked societies by *„...improving Healthcare (AI could enable more precise diagnoses and better disease prevention), increasing agricultural efficiency (by optimizing farming practices through data-driven insights), mitigating climate change and adapting to its effects (through advanced modeling and predictive analytics), enhancing production systems (through predictive maintenance, leading to increased efficiency), boosting security (by contributing to the safety of European citizens).“* (European Parliament, 2020).

Such advancements in these areas are anticipated to positively impact the quality of life for citizens, enhance public administration efficiency, improve safety, and foster the competitiveness and sustainability of organizations.

The question arises regarding the advantages of integrating such technologies into the managerial component of project management. Project management, as defined by Tobis I. and M. (2020), involves the organization of multiple individuals and their skills to achieve goals within deadlines and adhere to financial constraints. Given that the primary role of a project manager is to allocate resources effectively to achieve objectives within specified timelines and budget limits, it is pertinent to identify which areas, within the context of project management, could be enhanced and improved through the application of artificial intelligence (AI).

The application of artificial intelligence (AI) in economic sciences, particularly in project management, is becoming increasingly relevant in the contemporary digital and interconnected society for several reasons:

- **Process Optimization:** AI's ability to automatically analyze project data facilitates the identification of optimal trajectories, resource allocation, and scheduling of project activities. This capability leads to cost reduction and increased efficiency.

- **Predictive Analytics**¹: Advanced data processing enables project managers to forecast future events and risks based on historical data analysis. This foresight aids in timely decision-making to mitigate potential issues.
- **Task Automation**: Routine tasks in project management, such as generating financial or operational reports and managing communication processes, can be automated using AI systems. This automation allows managers to allocate more time to strategic planning and decision-making.

These are just some examples of how the aforementioned technologies can yield positive results and enhance the work of managers and all those involved in organizational operations. We can anticipate that the future of AI application in project management, when used in an appropriate and secure manner, promises further innovations and changes. This paper will, through the previously outlined chapters, explore in greater detail the specific applications of AI in project management, analyze its advantages and challenges, and provide insights into real-world case studies from business practice.

In addition to case studies used in the paper, literature review and thematic analysis are employed to examine existing scholarly and industry research on AI's impact in the domains of process optimization, predictive analytics, and task automation. This includes analyzing peer-reviewed articles, government publications, and AI reports to establish a comprehensive understanding of current trends, technological advancements, and potential future developments in AI for project management.

Lastly, data analysis is applied to interpret findings from case studies and identify patterns and commonalities across different organizations and industries. This method allows for the cross-examination of data points to validate trends and assess the broader implications of AI integration in project management. Through these methodologies, the paper aims to provide a balanced, data-driven perspective on AI's transformative role in modern project management.

1. Application of AI in Projects

In the 21st century, artificial intelligence (AI) technologies have emerged as a significant force that transforms industries and revolutionizes business operations and processes. According to research by Rajes D. S. and Jafar M. A. (2023), project management is among the areas where AI technologies are finding their application. The integration of AI and project management holds substantial potential for optimizing project processes and enhancing organizational success. It is hypothesized that success in this interdisciplinary field lies in the ability to adapt human expertise and facilitate quality decision-making. As technologies and tools continue to expand in significance, their role in project management is expected to grow, potentially leading to even higher rates of successful application in the future.

According to PMI Croatia, the primary tasks of project managers include task planning and scheduling, resource management, communication with stakeholders, and managing the project team. AI can be applied in the early stages of task planning and scheduling. Algorithms, which take into account all relevant data and information, can propose several optimal solutions for initiating a project, allowing project managers to make more informed decisions. When it comes to task allocation, AI can analyze the skills and qualifications of project team members and efficiently allocate tasks, ensuring that each member undertakes tasks for which they possess the highest level of expertise and skills. In the domain of resource allocation, AI can significantly contribute to project success. It is well known that many projects fail due to inadequate and incomplete resource allocation, leading to delays, extended deadlines, and increased costs. AI can optimize resource allocation, thereby minimizing the risk of such and related issues. PMI Hrvatska, available at: <https://www.pmi-croatia.hr/> [August 10, 2024.]

Experts Jesus G. R., Javier M. T., and Ruben G. C. (2023) identify specific categories within project management where the application of artificial intelligence (AI) holds potential for achieving significant outcomes. These categories include human resources, information technologies, logistics

¹ **Predictive analytics** is viewed as an advancement of business analytics within the field of economic sciences. "By applying these statistical and mathematical methods to structured and unstructured data, we gain insights into patterns and relationships among the data, and can assess the probability of certain events occurring or not

occurring in the future." (Megatrend Business Solutions, Online Edition), <https://www.megatrend.com/prediktivna-analitika/>.

and distribution, business operations, and design. They argue that the potential for AI is particularly realizable in the context of project proposal preparation, which encompasses project planning, cost estimation, and the assessment of project scope. Effective execution of these tasks is essential to enhancing the likelihood of project success. Expertise and knowledge of project managers remain fundamental for utilizing tools in these areas, as does their capacity for decision-making.

2. Case Studies on the Use of Artificial Intelligence: Siemens and SAP

In this study, Siemens AG serves as an example of an organization that has successfully implemented and utilizes artificial intelligence (AI) in its projects. The model employed for project management and optimization of resource allocation is Artificial Intelligence as a Service (AIaaS). Siemens applies machine learning in its research and development to process significant amounts of data generated by its project teams. According to Siemens, this approach provides a unique selling point (USP) and a scalable return on investment (ROI) for all organizations that utilize their AI services. Available at: [Unlocking the Power of Generative AI: Siemens Industrial Copilot - Siemens Global](#) [August 10, 2024.]

Conversely, there are notable challenges associated with the application of such technologies in project management. One of the principal challenges is the necessity for a high level of expertise in the application of artificial intelligence (AI) and related technologies, as well as the ongoing need for complex maintenance and updating of these systems.

Dr. Ulli Waltinger, head and founder of the Machine Intelligence research group and head of the AI development department at Siemens, underscores the need for enhanced data security in the modern business environment. He asserts that the next challenge is *„connecting the real world with the increasingly expansive virtual realm, which is continually growing due to the vast amounts of data we feed it daily.“* This perspective on innovations in this field demonstrates that sometimes advancements move faster than human knowledge and intelligence itself. Available at:

<https://lidermedia.hr/preporuceno/waltinger-iz-siemensa-umjetna-inteligencija-nije-terminator-nego-pomoc-u-radu-27204> [August 10, 2024.]

The potential benefits of such systems, aligned with the digital and green transitions, include: reduction of CO₂ emissions through production optimization, prediction of developmental issues in manufacturing processes, utilization of operator experience for future adjustments, Documentation of countermeasures to prevent the impact of anomalies on project processes.

For instance, Siemens exemplifies the need for "advanced" systems and tools to manage increasingly complex processes in the industrial and manufacturing sectors. This need has led to the development of the industrial application "AI Anomaly Assistant," which leverages artificial intelligence for anomaly detection in the manufacturing industry. This application holds significant relevance in project management contexts as it simplifies monitoring and control processes within production environments. The application focuses on analyzing events in the production process that impact specific parameters such as productivity and quality. By identifying anomalies, it assesses their business significance, effectively automating evaluations that previously relied solely on the knowledge and practical experience of project or production managers. Stephanie Leonida (2021), Siemens New Industrial App Utilizes AI to Detect Anomalies in the Process Industry, Control.com, Available at: <https://control.com/news/siemens-new-industrial-app-utilizes-ai-to-detect-anomalies-in-the-process-industry/> [August 12, 2024.]

The next company included in the case study is SAP (Systems, Applications, and Products in Data Processing), a leading firm in Germany and globally, specializing in software development aimed at enhancing business processes, financial planning, and ERP systems².

Recently, SAP has been advancing and expanding its operations through the integration of artificial intelligence tools. In May 2023, SAP introduced its initiative under the slogan "SAP AI Built for Business," which incorporates AI into 15 different areas of business. One example is the innovative tool "SAP S/4HANA," primarily designed for intelligent information collection in accounting and finance.

² ERP (Enterprise Resource Planning) refers to "business software that supports the execution of various operational processes within a company across business areas such as procurement,

warehousing, production, sales, quality, maintenance, finance, accounting, and controlling." NavalT, online edition, source: <https://nava.hr/sto-je-erp-i-kako-ga-koristiti/>.

This tool is utilized to predict risks associated with late payments and prioritize customers with increased collection risks. This significantly enhances the services provided to users, reduces costs, and improves efficiency.

These case studies illustrate how organizations can leverage modern innovative tools and the technical, conceptual, and other knowledge possessed by project managers. The use of these tools enhances the organization, planning, and oversight of all project elements and phases, aligning with project planning and the core essence of project management. Therefore, it is assumed that the increased application of AI tools across a broad spectrum of business areas will improve the success of various activities and increase the achievement rate of objectives.

3. Potential Advantages and Risks

The introduction and implementation of artificial intelligence (AI) within the realm of economic science, specifically project management, bring numerous advantages and challenges, highlighting the increasing need for continuous innovation and development. The role of project managers in contemporary organizations is expanding, necessitating that the information upon which they base their informed and expert decisions is as accurate and precise as possible.

According to a Gartner study³, approximately one-third of all organizations are implementing AI-based tools in their operations, and 80% of directors and senior managers believe that "*automation can be applied to every business decision.*" This study illustrates the opinions and attitudes of companies and their leaders regarding AI and its application in business. It can be anticipated that project managers will play a significant role in the development and implementation of such technologies in the near future. This is crucial, as the adopters of AI in business must be those who lead and are involved in all project activities.

The success rate of projects varies according to domain, size, duration, and complexity. In this context, it is estimated that only about 35% of projects are successful, a relatively low percentage that represents a significant opportunity for

improvement in increasing the success rate (Nieto-Rodriguez & Ricardo Viana Vargas, 2023). They predict that the implementation of AI and other technological innovations in project management could improve project success rates by 25%⁴. If these predictions hold true, they could potentially save significant resources, time, and money currently lost to unrealized and unsuccessful projects.

Today, the application of AI is not confined to the ICT industry but has expanded to nearly all industries and sectors. Processes that were previously reserved exclusively for human labor and intelligence are now being automated and optimized to such an extent that human intervention is almost entirely absent.

Key advantages of applying such technologies and tools in management include increased efficiency, faster decision-making, more accurate risk prediction, and cost reduction. Improvements in these project elements enhance time and cost efficiency, as well as overall outcomes. This aligns with the current green and digital transition policies. Besides facilitating decision-making processes, AI provides deeper insights that human capacities sometimes cannot adequately achieve. For example, deep data analysis identifies patterns that often elude human reasoning. Decisions made without sufficient information can lead to further loss of resources, time, and increased project costs. A subsequent challenge is the security and quality of data associated with AI use; expected results will not be achieved if the data is not accurate and correct (Ethics Guidelines for Trustworthy AI, High-Level Expert Group on Artificial Intelligence, April 2019). Available at:

https://www.europarl.europa.eu/meetdocs/2014_2019/plmrep/COMMITTEES/JURI/DV/2019/11-06/Ethics-guidelines-AI_HR.pdf [August 14, 2024.]

According to the European Commission (2020), the challenges associated with the practical applications of AI are found within the context of legal and ethical considerations that the introduction of such technologies into traditional business processes. The complexity of implementing artificial intelligence in project management represents a process that may sometimes require significant changes in technological infrastructure, employee training, and broader adjustments to

³ Gartner.com, mrežno izdanje, studija koja predviđa kako će 80% zadataka projektnih menadžera biti eliminirano i zamijenjeno sa umjetnom inteligencijom do 2030. Izvor: <https://www.gartner.com/en/newsroom/press-releases/2019-03-20-gartner-says-80-percent-of-today-s-project-management>.

⁴ hbr.org, How AI Will Transform Project Management Izvor: <https://hbr.org/2023/02/how-ai-will-transform-project-management>

business processes. A lack of experience with such and related tools will consequently complicate the entire process and lead to a slowdown in existing activities and processes. Therefore, it is evident that certain risks concerning fundamental human rights, privacy protection, and personal data may arise, and these must be addressed when developing frameworks and rules for the secure broad implementation of such technologies.

4. Conclusion

Project management, including the oversight and management of projects, can gain significant benefits from the use of innovative tools and technologies. Through a comprehensive analysis of the previously discussed chapters, key aspects of AI application in project activities have been defined, including the advantages and challenges of practical application and the necessity of establishing stringent legal and ethical frameworks to ensure appropriate responsibility in their broader use.

The greatest potential of AI application lies in increasing the efficiency of project teams, reducing costs and resource consumption, and enhancing overall project success. Decisions that managers need to make can be made with a higher degree of informativeness, rendering their decisions more optimal and precise.

The implementation of AI technologies presents numerous challenges and requires many adjustments to ethical and legal frameworks within which they will be used. In a modern society where data security has become critical, states and governments are demanding increasingly robust measures to ensure the integrity of information and personal data. This necessity can extend to the field of project management, where the conditions under which managers will operate in the future are becoming more advanced and complex, necessitating continuous adaptation for all involved in these activities.

The introduction of new technologies can consequently help organizations enhance their competitive edge. New methods for risk analysis, tools for making more informed decisions, resource optimization, and automated control and supervision are just some of the potential areas where organizations can gain significant advantages.

Therefore, it is imperative for project professionals and experts to be prepared for the new era of AI tools in advancing project management and economic sciences. Project specialists and managers must be ready for the potential adaptation to the

accelerated digital transformation of society and organizations. Increased agility and readiness for changes in the current contemporary environment are essential to maintaining the success of the organizations in which they operate. This will further enhance their skills and, consequently, contribute to economic and technical sciences in this interdisciplinary field.

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