Research article

ADOPTION OF AI IN RACE AND MARATHON EVENT MANAGEMENT: A CASE STUDY IN SERBIA

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Abstract. *This study investigates the adoption of artificial intelligence (AI) among marathon and race organizers, evaluating their familiarity with this technology and its potential benefits in event management. A survey was conducted among 25 marathon and race organizations across Serbia, with responses received from 14 organizations. The results showed varying levels of familiarity with AI, alongside diverse perspectives on its effectiveness in event management. While some organizers believe AI improves efficiency in organizing and managing events, others remain skeptical due to limited exposure. The findings suggest that AI integration into marathons and races in Serbia is in its early stages, though there is a growing interest and recognition of AI's potential. Key metrics, such as the competency and readiness levels for AI adoption, averaged 3.4 and 5.6 (on a scale of 1-10), respectively. The study concludes that AI's full potential remains largely unexplored by most organizers.*

Key words: *artificial intelligence, AI, marathons, races, event industry*

1. INTRODUCTION

The event industry officially began in the mid-1970's, with the exact date and event varying widely depending on the source (Schmader et al., 1997; Fletcher et al., 2009). The numbers and types of events increase daily, ranging from sports and recreation events to professional meetings, conventions, fairs, festivals, expositions, fundraising, corporate, community, marketing, and entertainment events. As the industry has diversified, so too have the professionals who organize these events, often learning and adapting through hands-on experience (Fletcher et al., 2009).

Sports events, particularly marathons and races, have gained prominence as one of the most popular event types globally. Additionally, those events contribute to the prestige and positive image of a location, providing an opportunity to present positive changes in a place (Lubowiecki & Basińska, 2011; Piekarz et al., 2015; Łuczak, 2021). Running, as a form of physical activity, has seen increasing participation rates, making it one of the most practiced exercise activities worldwide (Scheerder et al., 2015; Running USA, 2014; Janssen et al., 2020). Marathons and races attract a diverse group of participants, ranging from casual runners to professional athletes, which introduces multiple risks associated with this diversity; therefore, careful planning is essential to ensure safety, comfort, and satisfaction for all participants (Janssen et al., 2006; Lubowieck & Basińska, 2011; Piekarz et al., 2015; Scheerder et al., 2015; Cook et al., 2016; Janssen et al., 2017; Łuczak, 2021; Janssen et al., 2020). Marathon organization involves collaboration among organizers, healthcare officers, safety officers, support teams, and marathoners (Hall et al., 2019; Phua et al., 2024). The industry is currently experiencing social and technological transformations, driven by the fourth industrial revolution and AI advancements, offering new management capabilities and emphasizing the importance of understanding human behavior and preferences for successful event planning (Ekici & Toksoz, 2021).

The COVID-19 pandemic acted as a catalyst, revolutionizing marathon events and improving runner engagement (Phua et al., 2024). Users became familiar with tools on Internet of Things, leading businesses to explore AI and big data to improve customer experience (Almeida et al. 2020; Yuksel et al. 2021; González-Serrano et al. 2023; Phua et al., 2024). For instance, AI influences different aspects of sports event management, including marketing automation and optimizing operational processes. Additionally, virtual assistants and facial recognition technology streamline event logistics, enhancing participant experiences and security. (Neuhofer et al., 2021; Ogle & Lamb, 2019; https://time.ly/blog/clever-ways-to-use-artificial-intelligence-ai-in-events/; https://www.glueup.com/blog/ai-events/;https://www.eventible.com/learning/ai-in-events/)

Findings from previous research highlight the importance of further investigating the adoption of AI among marathon and race organizations, assessing their familiarity with AI and the ways it can facilitate marathon or race organization. Since the correlation between AI and the organization of marathons and races remains unclear, this study aimed to examine the impact of AI on the process of organizing marathons and races in Serbia.

2. METHOD

In order to understand the extent of AI familiarity among marathon and race organizations in Serbia, a quantitative approach was chosen as the most suitable methodology.

2.1. Sample of participants in the research

Marathons and races in Serbia were identified on the website (https://www.trcanje.rs /kalendar/?_rstr_nocache=rstr452660fb3349409a), where all the details about upcoming races and marathons in Serbia were found, including basic information about the location, date, distance, and organizer of each event. After identifying marathon and race organizations in Serbia, to gather more details about the organizations, their website, email, phone number, and social media profiles such as Facebook and Instagram, a Google search was conducted. This data led us to discover that 25 organizations in Serbia host sport events like marathons, half marathons, and races.

Table 1 Characteristics of the organizations

N	M	HM	OR	P
14	5	1	26	30-13000

Descriptive statistics found in Table 1 include the number of organizations that responded to the survey (N); the total number of marathons organized by these organizations in one year (M), which may vary depending on the existence of their organization; the total number of half marathons organized by these organizations in one year (HM), which may vary depending on the existence of their organization; the total number of other races organized by these organizations in one year (OR), which may vary depending on the existence of their organization; the range of participants in the marathons, half marathons, and other races (P), varying depending on the organization and event.

2.2. Measures

The questionnaire was based on a scholarly investigation delving into the roles and practical uses of robotic technology, AI, and service automation in event management, emphasizing their potential to enhance safety protocols, marketing strategies, operational efficiency, and overall participant experience (Ogle & Lamb, 2019). Additionally, examples from blogs describing clever ways to use AI in event planning, promotion, execution, and analytics to enhance processes and maximize the potential of events were utilized and adapted in the context of marathons and races in the questionnaire (https://time.ly/blog/clever-ways-to-use-artificial-intelligence-ai-in-events/; https://www. glueup.com/blog/ai-events). The first part of the questionnaire is focused on basic demographic data and other information about the organization of marathons and races, using open-ended questions. The second part addresses technology and AI, combining open-ended questions with yes/no/unsure responses, and a scale from 1 to 10 to evaluate their readiness to use AI technologies, development among employees, as well as the effectiveness and efficiency of AI; with 0 indicating no use. This section also includes questions where respondents expressed their views on AI through statements rated on a Likert scale, where 1 = Strongly Disagree, 2 = Disagree, 3 = Unsure, 4 = Mostly Agree, 5 = Agree, and 6 = Strongly Agree.

2.3. Procedures

The survey questionnaires were prepared in digital format using Google Forms and depending on the contact information found, the questionnaires were disseminated in February 2024. For data processing, methods of descriptive statistics were used. Google Forms was used as a tool to disseminate the questionnaires, and textual responses were coded and analyzed in Excel (Pivot). The survey was sent to 25 organizations of marathons and races, and responses were received from 14 organizations. Thanks to the response section in Google Forms, it was possible to quickly and clearly see the results, as the sample size was not large.

3. RESULTS

After disseminating the questionnaires to 25 organizers of marathons and races, responses were received from 14 organizers, while 11 organizers did not respond.

Table 2 shows that technologies are widely used in managing events, with 79% of the respondents confirming their use. However, the adoption of AI in planning is significantly lower, with only 14% using it. Additionally, 50% of the respondents are unsure about their intention to adopt AI in the future, indicating uncertainty about its future application.

Table 2 Use of technologies, AI and intention of using AI

Response Type	Use of technologies in managing	Use of AI in planning	Intention to implement AI
Affirmative	79%	14%	21%
Negative	21%	86%	29%
Unsure	/	/	50%

Table 3 demonstrates that social media (44%) and registration systems (25%) are the most commonly used technologies, while other tools like interactive maps, marketing tools, and specific software are used by a smaller percentage of the respondents.

Table 3 Specific technologies used in marathons and races

Technology	% of usage
Social media	44%
Application with interactive maps and notifications	6%
Marketing tools (unspecified)	6%
Notion, Witisi Software, Photography App, etc.	6%
Registration systems	25%
Website for promotion	6%
Runtrace portal	6%

The data in table 4 show a low level of competency in using AI, while their readiness to adopt AI (5.6) shows moderate potential for future integration.

Table 4 Evaluation of the competencies and readiness of the organizations to use AI

Evaluation competencies and readiness to use AI	Mean result (scale 1-10)
Competency level of the organisation in using AI	3.4
Readiness level of the organisation to use AI	5.6

Table 5 shows general agreement on AI's potential to improve aspects like marathon safety and logistics. However, the respondents are unsure about AI's effectiveness in areas like crisis management and predictive analytics for crowd dynamics.

Table 5 Views on AI enhancing in marathons and races

Statement	Agreement Level
AI enhances marathon safety with facial recognition.	Mostly agree
AI predictive analytics manage crowd dynamics effectively.	Unsure
AI provides real-time updates on race details.	Mostly agree
AI personalizes engagement based on participant data.	Mostly agree
AI handles large data for better event logistics.	Mostly agree
AI and AR offer immersive marathon experiences.	Mostly agree
AI enables virtual participation for remote users.	Mostly agree
AI aids logistics with trend insights and resource forecasting.	Mostly agree
AI gives tailored training recommendations based on performance.	Unsure
AI supports crisis management with real-time insights.	Unsure

Table 6 reveals that there is resistance to using AI for generating emails and marketing materials, while there is a relatively higher acceptance (36%) for using AI in preparing programs.

Table 6 Usage of chatbots

Response Type	Preparing programs	Generating emails	Creating marketing materials	Generating planning templates
Affirmative	36%	14%	29%	7%
Negative	64%	86%	71%	86%
Unsure	0%	0%	0%	7%

The evaluation of chatbots in table 7 reveals that chatbots are efficient in creating programs and marketing content, with higher effectiveness in email generation.

Table 7 Evaluation of used chatbots

Evaluation of used chatbots	Mean result (scale 1-10)
Efficiency of chatbots in creating programs	5.7
Chatbots' contribution to marketing content	5.4
Time-effectiveness of chatbots for generating emails	6.5

4. DISCUSSION

The findings address the research questions regarding AI familiarity and application among marathon and race organizers. Based on the feedback, it is recommended that sports event organizers in Serbia could start exploring AI technologies by implementing tools such as chatbots for customer support or personalized marketing, gradually expanding towards predictive analytics and automated logistics to improve efficiency. The study showed that even though there is interest in AI, the marathon and race organizations do not use it often or at all, since they are uncertain or unprepared to adopt AI technologies. This supports Neuhofer et al.'s (2021) claims that AI is beneficial for some areas such as. targeted marketing and dynamic pricing, but requires qualified staff and careful data handling to avoid bias and misuse. Similarly, the results align with previous studies (Ogle & Lamb, 2019; Fletcher et al., 2009) that identified the potential of AI to improve safety protocols, marketing strategies, and operational efficiency, but noted that implementation is still limited.

Furthermore, policy makers could support the adoption of AI by providing subsidies and education initiatives aimed at training event organizers. For instance, there is a growing interest in AI within the travel and tourism industry, but the existing research is mostly conceptual (Buhalis et al., 2019; Ivanov and Webster, 2019; Murphy et al., 2017; Samara et al., 2020; Tung and Au, 2018; Tung and Law, 2017; Tussyadiah, 2020; Filieri et al., 2021). Marathon and race organizations in Serbia recognize AI's benefits but face challenges in its implementation. A practical recommendation for marathon organizers is to adopt simple AI tools to streamline participant registration, optimize schedules, predict attendance, and improve sponsor communication.

The low use of AI might be because of a lack of resources, technical knowledge, or skepticism about new technologies. This underscores the need for further education about AI potential in events like marathons and races. Lommatzsch (2018) and Bhaskar and Sharma (2022) also indicate that, although chatbots and robots can replace human workers, clients still rely on the human factor for complex tasks, which aligns with our findings. Additionally, the findings support the theory that adopting new technologies like AI requires not only technical resources and education but also a change in mindset and approach among organizations. Consequently, this study shows how important it is to learn and change business models to make AI work well.

Previous studies (Schmader et al., 1997; Fletcher et al., 2009) also emphasize the events industry's evolution and the need for continuous learning and adaptation. Based on the findings of this study, marathon and race organizations should invest in training and developing skills related to AI. They should also create networks to share knowledge and resources to help each other with AI use.

The main limitation of the study is that only 14 organizations participated in the survey, and most lacked experience with artificial intelligence, limiting their ability to assess its effectiveness or contribute insights. It is also necessary to draw attention to the fact that the findings of this study are tied to the Serbian context and may not be relevant to countries. For future studies, it is important to consider the perspectives of marathon and race participants, as their satisfaction is a priority. Future research should additionally explore AI adoption across different sports and examine how it can improve the experience for athletes and audiences. Therefore, exploring their attitudes toward the integration of AI in events like marathons and races would be valuable.

5. CONCLUSION

Our findings indicate that AI is still in its early stages of adoption within the events industry, particularly in sports events such as marathons and races in Serbia. However, this study has shown that organizations in Serbia possess certain perceptions and awareness regarding its potential. Authors believe that completing the questionnaire sparked curiosity among those with limited AI experience and encouraged them to explore how their organizations could use AI to simplify various event organization processes.

REFERENCES

Almeida, F., Duarte Santos, J., & Monteiro, J. A. (2020). The challenges and opportunities in the digitalization of companies in a post-COVID-19 world. IEEE Engineering Management Review, 48(3), 97–103. https://doi.org/10.1109/EMR.2020.2991547

Bhaskar, P., & Sharma, K. D. (2022). A critical insight into the role of artificial intelligence (AI) in tourism and hospitality industries. *A Refereed Monthly International Journal of Management*, 15(3), 76-85.

Buhalis, D., & Sinarta, Y. (2019). Real-time co-creation and nowness service: Lessons from tourism and hospitality. *Journal of Travel and Tourism Marketing*, 36(5), 563-582.

Cook, S., Shaw, J., & Simpson, P. (2016). Jography: Exploring meanings, experiences and spatialities of recreational road-running. *Mobilities*, 11, 744–769.

Ekici, R., & Toksoz, D. (2021). New trends in event marketing. In *Impact of ICTs on event management and marketing* (pp. 21). doi:10.4018/978-1-7998-4954-4.ch010

Filieri, R., D'Amico, E., Destefanis, A., & Paolucci, E. (2021). Artificial intelligence (AI) for tourism: An European-based study on successful AI tourism start-ups. *International Journal of Contemporary Hospitality Management*, 33(11), 4099-4125. DOI: 10.1108/IJCHM-02-2021-0220.

Fletcher, D., Dunn, J., & Prince, R. (2009). Entry level skills for the event management profession: Implications for curriculum development. Vol. 4, Iss: 1, pp. 52-57.

González-Serrano, M. H., Alonso Dos Santos, M., Sendra-Garcia, J., & Calabuig, F. (2023). Sports entrepreneurship during COVID-19: Technology as an ally to maintain the competitiveness of small businesses. Technological Forecasting and Social Change, 187, Article 122256. https://doi.org/10.1016/j.techfore.2022.122256

Hall, S. A., Manning, R. D., Keiper, M., Jenny, S. E., & Allen, B. (2019). Stakeholders' perception of critical risks and challenges hosting marathon events: An exploratory study. Journal of Contemporary Athletics, 13(1), 11–22.

Ivanov, S., & Webster, C. (2019). Economic fundamentals of the use of robots, artificial intelligence, and service automation in travel, tourism, and hospitality. In S. Ivanov & C. R. Webster (Eds.), *Robots, artificial intelligence and service automation in travel, tourism and hospitality* (pp. 39-55). Emerald Publishing, Bingley.

Janssen, M., Scheerder, J., Thibaut, E., Brombacher, A., & Vos, S. (2017). Who uses running apps and sports watches? Determinants and consumer profiles of event runners' usage of running-related smartphone applications and sports watches. *PLOS ONE*, 12(7). DOI: 10.1371/journal.pone.0181167.

Janssen, M., Walravens, R., Thibaut, E., Scheerder, J., Brombacher, A., & Vos, S. (2020). Understanding different types of recreational runners and how they use running-related technology. *International Journal of Environmental Research and Public Health*, 17(7), 2276. DOI: 10.3390/ijerph17072276.

Jones, M. L. (2017). *Sustainable event management: A practical guide* (3rd ed.). Abington, UK: Routledge.

Lommatzsch, A. (2018). A next-generation chatbot-framework for the public administration. In *International Conference on Innovations for Community Services* (pp. 127-141). Springer, Cham.

Lubowiecki-Vikuk, A. P., Basińska-Zych, A. (2011). Sport and Tourism as elements of place branding. A case study on Poland. Journal of Tourism Challenges and Trends,4(2), 33–52.

Łuczak, J. (2021). Organisation of running events – reducing exclusions and improving the quality of life. Nierówności Społeczne a Wzrost Gospodarczy, 67(3). https://doi.org/10.15584/nsawg.2021.3.8

Murphy, J., Hofacker, C., & Gretzel, U. (2017). Dawning of the age of robots in hospitality and tourism: Challenges for teaching and research. *European Journal of Tourism Research*, 15, 104-111.

Neuhofer, B., Magnus, B., & Celuch, K. (2021). The impact of artificial intelligence on event experiences: A scenario technique approach. *Electronic Markets*, 31, 601–617. https://doi.org/10.1007/s12525-020-00433-4

Ogle, A., & Lamb, D. J. (2019). The role of robots, artificial intelligence, and service automation in events. In S. Ivanov & C. R. Webster (Eds.), *Robots, artificial intelligence, and service automation in travel, tourism and hospitality* (pp. 255-269). DOI: 10.1108/978-1-78756-687-320191012

Piekarz, M., Jenkins, I., Mills, P. (2015). Risk and Safety Management in the Leisure. Events, Tourism and Sports Industries. United Kingdom: QLM Ltd, CABI.

Phua, S., Borriraklert, A., & Mayakul, T. (2024). Integrating digital technology into marathon race with a technology-driven service design approach to enhance marathoner experiences. Human Behavior and Emerging Technologies, 2024, Article ID 7488352. https://doi.org/10.1155/2024/7488352

Running USA. (2014). State of the sport—Part II: Running industry report. Running USA: Los Angeles, CA, USA.

Samara, D., Magnisalis, I., & Peristeras, V. (2020). Artificial intelligence and big data in tourism: A systematic literature review. *Journal of Hospitality and Tourism Technology*, 11(2), 343-367.

Scheerder, J., Breedveld, K., & Borgers, J. (2015). Who is doing a run with the running boom? The growth and governance of one of Europe's most popular sport activities. In J. Scheerder, K. Breedveld, & J. Borgers (Eds.), *Running across Europe: The rise and size of one of the largest sport markets* (pp. 1–12). Basingstoke, UK: Palgrave Macmillan.

Schmader, S. W., & Jackson, R. (1997). *Special events: Inside and out* (2nd ed.). Sagamore Publishing: Champaign, Illinois.

Tung, V. W. S., & Au, N. (2018). Exploring customer experiences with robotics in hospitality. *International Journal of Contemporary Hospitality Management*, 30(7), 2680–2697. https://doi.org/10.1108/ijchm-06-2017-0322.

Tung, V. W. S., & Law, R. (2017). The potential for tourism and hospitality experience research in human-robot interactions. *International Journal of Contemporary Hospitality Management*, 29(10), 2498-2513.

Tussyadiah, I. P., Jung, T. H., & tom Dieck, M. C. (2018). Embodied of wearable augmented reality technology in tourism experiences. *Journal of Travel Research*, 57(5), 597–611. https://doi.org/10.1177/0047287517709090.

Van Bottenburg, M. (2006). De tweede loopgolf. *Over groei en omvang van de loopsportmarkt en hoe de KNAU haar marktaandeel verder kan vergroten*. Utrecht, The Netherlands: Utrecht University.

Yuksel, M., Smith, A. N., & Milne, G. R. (2021). Fantasy sports and beyond: Complementary digital experiences (CDXs) as innovations for enhancing fan experience. Journal of Business Research, 134, 143–155. https://doi.org/10.1016/j.jbusres.2021.06.046

https://time.ly/blog/clever-ways-to-use-artificial-intelligence-ai-in-events/
https://www.glueup.com/blog/ai-events;
https://www.eventible.com/learning/ai-in-events/
https://www.trcanje.rs/kalendar/?_rstr_nocache=rstr452660fb3349409a

USVAJANJE VEŠTAČKE INTELIGENCIJE U UPRAVLJANJU DOGAĐAJA POPUT TRKA I MARATONA: STUDIJA SLUČAJA U SRBIJI

Ova studija istražuje usvajanje veštačke inteligencije (VI) među organizatorima maratona i trka, ocenjajući njihovu upoznatost s ovom tehnologijom i njenim potencijalnim prednostima u upravljanju događajima. Istraživanje je sprovedeno među 25 organizacija za maratone i trke širom Srbije, a odgovore je dalo 14 organizacija. Rezultati su pokazali različite nivoe upoznatosti sa VI, kao i različite perspektive o njenoj efikasnosti u upravljanju događajima. Dok neki organizatori veruju da VI poboljšava efikasnost u organizaciji i upravljanju događajima, drugi ostaju skeptični zbog ograničenog poznavanja. Rezultati istraživanja ukazuju da je integracija VI u maratone i trke u Srbiji još uvek u ranim fazama, iako raste interesovanje i prepoznavanje potencijala VI. Ključne metrike, poput nivoa kompetencije i spremnosti za usvajanje VI, u proseku su iznosile 3,4 i 5,6 (na skali od 1 do 10). Studija zaključuje da je pun potencijal VI većine organizatora još uvek u velikoj meri neistražen.

Ključne reči: *veštačka inteligencija, VI, maratoni, trke, industrija događaja*