



(REVIEW ARTICLE)



The role of technology in sustainable project management

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World Journal of Advanced Research and Reviews, 2024, 23(03), 1728–1732

Publication history: Received on 07 August 2024; revised on 14 September 2024; accepted on 16 September 2024

Article DOI: <https://doi.org/10.30574/wjarr.2024.23.3.2836>

Abstract

Technology is increasingly being integrated within project management, which in turn is redefining approaches to sustainable practices. Resource effectiveness, along with increased stakeholder engagement and project process are being enhanced through technology which is really enabling the sustainability agenda to be taken on board. In this article, the focus is on how technology has been contributing towards sustainable project management and degree of focus on environmental, social and economic. The research provided useful insights in the advantages and obstacles related to implementing technology, as well as an outlook on future trends that allow a more precise analysis of how technology can be used to further sustainability goals in project management.

Keywords: Technology; Sustainability; Project Management; Resource Utilization; Stakeholder Engagement; Process Optimization

1. Introduction

Globalization and technological integration are now unavoidable factors that, when combined with sustainability, play a never-ending role in project implementation¹. A prevalent concern among project managers is the deficiency of efficacious methodologies for tackling environmental, social, and economic aspects in their vocation². It is evident that project managers are better equipped to adopt effective sustainability practices for the management of sustainable projects when technology and sustainability are integrated.

The use of advanced technology, with a variety of tools and methodological methods that aim to promote project sustainability, has made it easier to lead project management, since there is ample evidence to support this claim. Technology can be used to manage projects, provide eco-friendly solutions, and organize and enhance processes through a variety of tools, including resource management, accounting software, and project management software. Technology is advancing and project undertaking and delivery are being upgraded due to the twofold interplay between sustainability and technology¹¹.

In simple terms, it is clear that using technology in sustainable project management offers some advantages, but it also comes with some dangers and disadvantages. Although using technology in organizations can simplify operations, decision-making, and productivity, it also requires investment, change management, and training. Thus, if the goal is to fully employ technology to achieve sustainability in project management, these obstacles must be overcome⁴.

Initiatives in project technology indicate even more promise for project sustainability as we move to the future. Artificial Intelligence, the Internet of Things, and Blockchain are examples of disruptive technologies that could increase

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productivity while also focusing on sustainability and transparency³. In light of this, project managers can progress sustainable efforts by working within the blips of emerging technologies.

Using technology effectively is clearly essential to managing sustainable projects, as demonstrated by the findings of this study. The management of resources, stakeholder participation, and project workflow design are all improved by technology, which is helpful to project managers. For the appropriate application of project management techniques to create a sustainable future, it is still possible to keep the use of technology and sustainability separate.

2. Technological Tools and Sustainable Project Management

Project management software is an important tool for improving the sustainability of projects because it is largely instrumental in facilitating the processes, encouraging mass participation, and managing resources. There is software which have made project management more efficient, for instance, Microsoft project and Asana which help the project managers to plan projects and track their progress⁵. Project management software is a primary tool in today's project management processes which acts as an online tool for projects' planning and scheduling as well as for task management and collaboration. Tools like Microsoft project provide a complex of features for creating project schedules, resource assigning and tracking, and managing project schedules in general. Likewise, Asana has a clean and user-friendly design that enables teams to better coordinate their efforts through teamwork, file sharing and two-way communication⁷.

Project management software changes the dynamics of project efficiency in ways that are considerable. In this set of tools, several project processes are automated, allowing for the completion of tasks with little human intervention, time-saving, and error reduction. Project managers can create detailed project plans, set deadlines, assign tasks, and monitor progress in real-time, leading to improved project outcomes and timely deliverables⁶.

In addition, project management software also helps in minimizing wastes within the project since they offer different interfaces for mapping out task relations, resource usage, and project phases. Features such as the Gantt charts or the Kanban boards help the project manager to locate potential problems, allocate resources efficiently as well as solve or prevent problems before they actually occur. This proactive approach minimizes project delays, enhances workflow efficiency, and reduces unnecessary resource consumption, promoting sustainable project practices⁹.

The management of resources in ways that can sustain the project in the long run is one of the success factors in project management, and the use of management software is crucial when it comes to resource management. With the help of PM tools, project managers can properly distribute resources depending on the project's importance, employees' availability, and capabilities for project work at the project phases. This strategic resource allocation minimizes resource wastage, improves team productivity, and enhances project performance⁶.

Project management software, which offers several advantages in terms of project efficiency, waste reduction, and resource optimization, is, in summary, a fundamental component of sustainable project management practices. Project managers may work more efficiently together, make data-driven decisions that lead to project success, and improve project workflows with the help of platforms like Microsoft Project and Asana. Organizations can effectively accomplish project goals, improve sustainability efforts, and provide value to stakeholders by utilizing project management software.

3. Enhancing Resource Utilization and Process Optimization through Automation

In project management, automation technology is another bearer of factors that influence the improvement of resource effectiveness and effectiveness of processes, creating the foundation of the sustainability of projects. Management of resources has also been improved by tactical setups, these being Resource management systems, Automation systems for projects including RPA and AI which have enhanced the project workflow through better tracking and optimisation of resources while on the other hand, introduced efficiencies in repetitive tasks. This article reveals how these technologies affect or enhance sustainability in project management in terms of efficiency, the quantity of wastage or use of resources, and the general sustainability of projects.

SAP systems for resource management are tools of a high level that are used with the purpose of the optimal distribution and usage of resources – materials, energy, and people not to harm waste. Such systems are critical in the boosting of sustainability through optimization of various operations to ensure least impacts on the environment. By effectively managing and allocating resources, organizations can minimize resource wastage, optimize resource utilization, and

promote sustainability within their projects. According to some literature, this type of investment can be categorized under institutional fixed investment⁵.

Automation is integral to software development and covers components like RPA and AI, which significantly improve the sustainability of project management practices. In particular, RPA is suited for complex, routine, and linear work that is driven by specific rules (also known as 'tire kicks'). Notably, RPA eradicates human intervention by performing routine tasks and thus eliminates errors, and gives consistency and efficiency to the process. This automation contributes to the overall sustainability of projects by optimizing resource allocation and minimizing operational inefficiencies. However, some have criticized heavily bundled packages stating that they hide a whole lot of unpleasantness and restricting them can actually increase customer sophistication^{8,6}.

Another crucial automation technology is Artificial Intelligence (AI) which enhances the project execution by making use of algorithms to make analytical decisions and perform new operations. AI improves project efficiency in terms of precision, presentation, and repeatability due to the great volume of data it can process, forecast, and advise based on the result. By utilizing AI-driven tools in project management, organizations can achieve greater operational efficiency, reduce project timelines, and enhance overall project sustainability⁸.

The effect of resource management systems and automation technologies when integrated for sustainable project management cannot be overemphasized. While these technologies are supportive, they complement each other to improve resource consumption, processes, and successful project delivery. By implementing resource management systems, organizations can identify resource needs, allocate resources effectively, and reduce waste, thus contributing to environmental sustainability⁷.

In addition, RPA and artificial intelligence are other automation technologies that help to drive processes, minimize the level of interaction with the human factor, and improve decision-making processes. This way, repetitive work is replaced by automatization, which gives more time, higher quality and increased working efficiency. These advancements not only benefit project efficiency but also promote sustainability by minimizing resource consumption, reducing costs, and increasing project output-2.

Therefore, the implementation of resource management systems as well as automation in project management is transformative in sustaining the environment. Use of appropriate resources as well as improving the ways of processing the information and decision making allows increasing overall organizational efficiency, decrease the negative impacts on the environment and provide efficient and sustainable results in project management.

4. Future Trends in Technology and Sustainable Project Management

Emerging technologies such as blockchain, Internet of Things (IoT), and advanced analytics are driving a paradigm shift in sustainable project management practices. These technologies offer innovative solutions that enhance transparency, real-time data tracking, and data-driven decision-making in project management. This article delves into the impact of emerging technologies on sustainable project management, highlighting the opportunities they present for improving sustainability and efficiency in project execution.

Blockchain technology, known for its secure and transparent transactions, is revolutionizing project management by ensuring traceability, immutability, and transparency in transactions. By leveraging blockchain for project management, organizations can enhance accountability, reduce fraud, and streamline payment processes. The decentralized nature of blockchain fosters trust among project stakeholders, leading to improved collaboration and integrity in project operations. Furthermore, blockchain enables the creation of smart contracts that automate project workflows, enhancing efficiency and minimizing disputes¹¹.

The Internet of Things (IoT) is another game-changing technology that empowers sustainable project management through real-time data tracking and monitoring. IoT devices collect and transmit data from various project elements, enabling project managers to have real-time insights into project performance, resource utilization, and environmental impact. By utilizing IoT sensors, organizations can optimize energy consumption, track equipment usage, and monitor environmental conditions. This data-driven approach facilitates proactive decision-making, resource optimization, and waste reduction, ultimately enhancing project sustainability⁷.

Advanced analytics represents a powerful tool for extracting valuable insights from project data to drive informed decision-making and strategic planning. By applying predictive analytics, organizations can forecast project outcomes, identify potential risks, and optimize resource allocation. Advanced analytics tools enable project managers to analyze

large datasets, detect patterns, and make data-driven decisions that lead to enhanced project performance. Through data visualization and predictive modeling, advanced analytics empower organizations to proactively address challenges, optimize processes, and improve overall project efficiency¹¹.

The integration of emerging technologies into sustainable project management practices offers numerous opportunities for enhancing sustainability and efficiency. Blockchain, IoT, and advanced analytics enable organizations to achieve greater transparency, optimize resource allocation, and make data-driven decisions that drive project success. By adopting these technologies, organizations can improve project outcomes, reduce environmental impact, and foster a culture of innovation and sustainability.

The future trends in technology suggest a continued evolution towards more sophisticated and integrated solutions for sustainable project management. As blockchain matures, its applications in project management are expected to expand, offering greater transparency, security, and automation capabilities. IoT devices will become more prevalent, providing real-time insights and driving predictive maintenance practices in project environments. Advanced analytics will continue to evolve, incorporating machine learning and artificial intelligence algorithms to extract deep insights and optimize project performance¹¹

In conclusion, emerging technologies have the potential to revolutionize sustainable project management by enhancing transparency, real-time monitoring, and data-driven decision-making. The adoption of blockchain, IoT, and advanced analytics in project management can lead to improved efficiency, reduced environmental impact, and better outcomes for projects. As organizations embrace these technologies, they will be better equipped to navigate future challenges, optimize resources, and achieve long-term sustainability goals

5. Conclusion

Technology stands at the forefront of driving sustainable project management practices forward by facilitating efficient resource utilization, promoting stakeholder engagement, and optimizing project processes. Through tools like project management software, resource management systems, automation technologies, and emerging technologies such as blockchain, IoT, and advanced analytics, organizations can enhance transparency, streamline workflows, and make data-driven decisions that prioritize sustainability. Despite challenges in adoption and implementation, continuous advancements in technology offer opportunities for further embedding sustainability into project management practices. As organizations leverage the power of technology to address environmental concerns, drive efficiency, and ensure accountability, the future holds promise for a more sustainable, transparent, and efficient project management landscape that aligns with the evolving needs of stakeholders, society, and the environment.

Compliance with ethical standards

Disclosure of conflict of interest

No conflict of interest to be disclosed.

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