Emerging technologies in information systems project management

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Abstract

The article discusses emerging technologies in information systems project management. Project management is a modern discipline that began to take shape from 1900 and has evolved and adapted to the needs of society and business. Emerging technologies such as artificial intelligence, blockchain, augmented and virtual reality, and process automation are transforming the way information systems projects are managed. These technologies can be used to analyze large amounts of data, ensure data integrity and security, visualize a project's design and perform virtual testing, and automate tasks to reduce project time and cost. It is important for companies to be aware of these technologies and use them effectively to improve the efficiency and profitability of their projects.

1. Introduction

Information systems project management is a modern discipline that has evolved over time. It began to take shape in the 1900s, and its modern father is Henry Gantt, known for developing the famous Gantt Chart, a tool that helps to map the timing and tasks of a project. Since then, project management has been adapting to the needs of society and companies. According to Margaret (2015), IT project management includes overseeing software development projects, hardware installations, network upgrades, cloud computing and virtualization deployments, data management and business analytics projects, and IT services implementation. [1]

In the international context, universities play an important role in the management of emerging technologies.

According to Jiménez (2011) in his article Technological tells us that emerging technologies have a particular space due to their distinctive characteristics associated with risk, uncertainty and lack of historical data. The management of these technologies in the university environment has been analyzed, recognizing their importance and the impact they can have on society. In addition, companies are also adopting emerging technologies to achieve their goals more efficiently. [15]

Information systems project management has benefited from technological advances throughout history. The ability to transmit information and knowledge through the latest technologies, such as networks, has been fundamental in this field. In addition, the relationship between management and information has been close, and information systems have played a crucial role in project management.

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2. Artificial intelligence in project management

Artificial intelligence plays an important role in the area of project management, where artificial intelligence technologies and algorithms are applied to improve planning, execution and monitoring of projects. According to Pinto (2022) AI-PM can help project managers automate routine tasks, such as scheduling meetings, assigning tasks, and tracking progress. In addition, it can help project managers make better decisions by providing predictive analytics and data analysis, finally, it can help project managers collaborate more effectively by providing communication and collaboration tools. [13]

This may involve the use of machine learning, natural language processing and data analysis for the optimization of resource allocation, risk prevention, automation of repetitive activities or tasks and providing data or information necessary for optimal decision making, the objective of which is to achieve efficiency, accuracy and success in project management. Some applications of artificial intelligences that are mostly used for project management are the following:

- **Virtual assistants and Chatbots:** According to Beservices (2019), virtual assistants are support software, oriented to provide help to users to perform tasks, automate them or provide information [2]. Wizard systems and chatbots provide answers or solutions to frequently asked questions, providing data or information on the status of the project and support or help team members with basic questions, saving time for more urgent activities.

- **Machine learning for time and cost analysis:** Machine learning algorithms analyze information and historical data from previous projects to analyze and predict the time and costs that may be generated in the future.

- **Predictive risk analysis**: AIs can analyze various historical factors and information to identify risk patterns, with the objective of preventing possible future problems in the project, putting forward mitigation plans.

- **Resource optimization:** Optimization algorithms help us to efficiently allocate available resources, such as human resources, devices and budget, to leverage and maximize project performance.

- **Natural Language Processing (NLP):** According to Moreno (2022) NLP is the field of knowledge of Artificial Intelligence that deals with investigating how machines communicate with people through the use of natural languages, such as Spanish, English or Chinese. [16] Used in tools on the analysis of texts and comments from team members, NLP can help us understand the sentiment and concerns of those involved, enabling a more informed response.

- **Document and data management:** AI allows us to classify, organize and find necessary documents and information, streamlining the search for data and information and access to various necessary resources.

BLOCKCHAIN AND ITS IMPACT ON PROJECT MANAGEMENT

Blockchain technology, famous for its support of cryptocurrencies, is currently reshaping the business world and has profound potential in project management. It is clear that Blockchain applications in project management go beyond simply transferring virtual payments to subcontractors. Project Portfolio Management (PPM) tools are expected to adopt the use of Blockchain to incorporate business logic into transactions, through "smart contracts," for the purpose of increasing reliability in project management. This would be achieved by automating transactions related to contract clauses, recording key management events, validating deliverables and documents, and maintaining records of follow-up reports [7].

Especially the issuance of certifications for project monitoring reports becomes crucial to verify the authenticity of the project status. This, consequently, reinforces the trust of those involved by ensuring transparent and reliable management. In short, Blockchain technology is transforming project management beyond financial transactions, aiming towards more reliable and efficient management [8]. In March 2017, VEB bank, which is state-owned in Russia, communicated its intention to adopt blockchain technology in the field of project management. In a similar context, in February 2017, the CEO of Russia's largest bank, Sberbank, made public the implementation of blockchain and expressed his expectation that commercial applications of this technology would be evident by the end of 2019. Questioning VEB's CEO about the reasons for considering blockchain technology in their project management platform, he explained that, when looking for efficient methods to manage their projects, they found no other viable alternative. They claim that they observe its potential to raise the quality of governance and decrease bureaucracy [9].

Important aspects of the Blockchain in Project Management

Blockchain technology has enormous potential to improve various aspects of project management. Its characteristics of security, immutability and decentralization open up new opportunities to make the management process more efficient and transparent. When we talk about blockchain, it is important to understand its fundamental features, which we will describe below:

- **Decentralization:** In blockchain, there is no central entity to intermediate transactions between participants who do not necessarily trust each other.

Instead, all participants share the same protocol with predefined rules that they must follow. This eliminates the need for intermediaries and creates a system where the rules are followed by all.

• **Immutability: Once** a block is added to the chain, it becomes permanent and unchangeable. This ensures that data on the blockchain is secure and reliable. Rules established in smart contracts govern how disputes are resolved on the network.

• **Consensus:** Since each node in the system maintains its own registry, there are consensus algorithms that define how agreement is reached in the network. The nodes must agree on which block will be added next, and then that block is "mined" or created.

• **Interoperability:** Blockchain technology can be easily integrated with other financial or management services, thanks to inter ledger protocols that allow communication between different types of blockchains.

• **Digital identity:** In the blockchain world, each user has a unique identifier based on their public key, established using public key cryptographic protocols. This could be used for more secure and trusted digital identity solutions [10].

Impact on companies

Digitization is changing the way we view physical money and how we transact online. Virtual wallets have opened up a world of possibilities for exchanging digital money, and blockchain technology has given rise to a variety of cryptocurrencies. Here are the main benefits of this technology:

• **Increased asset security:** Blockchain technology is transparent, immutable and decentralized, providing exceptional transaction security. Data is stored using mathematical and software rules that are difficult to manipulate. Each block in the chain contains a strong cryptographic reference to the previous block, creating a secure fingerprint called a hash that protects against data tampering.

• **Elimination of intermediaries:** Blockchain replaces intermediaries in transactions, such as banks or third parties in commercial processes. This increases trust by using mathematics instead of human intermediaries. This not only reduces costs, but also streamlines the process and promotes reliability in asset trading.

• **Reduced operating expenses:** Blockchain enables the use of smart contracts, which are programmatic rules on the blockchain. When a condition is met, the smart contract automatically triggers the next action. This eliminates the need for financial intermediaries and reduces costs. Contract transparency also facilitates the

management of global operations and payroll administration in different countries.

• **Supply chain tracking:** Blockchain provides supply chain transparency by tracking products from their origin to their destination. This is especially useful in industries such as food to verify authenticity and ethical sourcing. Transparent audits improve supply chain management and provide confidence to investors and stakeholders [11].

AUGMENTED AND VIRTUAL REALITY IN PROJECT MANAGEMENT

Iberdrola's definition of *virtual reality* is an environment of lifelike scenes and objects generated by computer technology that creates a sense of immersion for the user [18]. Virtual reality and augmented reality are playing an increasingly important role in project management, revolutionizing the way business initiatives are planned, executed and managed. These immersive technologies offer a number of benefits that improve efficiency, accuracy, and collaboration at all stages of a project.

In project management, virtual reality is used to create 3D simulated environments that allow teams to visualize and explore designs and models in a more immersive and realistic way. This facilitates a better understanding of concepts and helps identify potential problems before they occur in physical construction. Teams can conduct virtual tours of project sites, which streamlines decision making and allows for more effective communication between all stakeholders.

Augmented reality superimposes digital information on the real world through devices such as tablets, smartphones or smart glasses. In project management, augmented reality is used to provide real-time data and visualizations directly in the physical environment. This is especially useful in infrastructure planning and construction, where workers can see data about the location of pipes or cables underground, facilitating more accurate decision-making and avoiding costly mistakes.

According to Grapsas (2019), Augmented Reality is already a trend in several markets and is being increasingly used by companies around the world, making the consumption of information and products more practical, easier and faster. To all indications, the use of AR technology will undoubtedly cause an even greater impact in the coming years, turning the shopping experience into an even more personalized experience. [17]

PROCESS AUTOMATION IN PROJECT MANAGEMENT

Process automation is defined as the use of software and technologies to automate business processes and functions to achieve defined organizational objectives, such as producing a product, hiring and onboarding an employee, or providing customer service (SAP, n.d.).

"When automating technical processes, a common approach for some organizations is to automate what they can and leave the more difficult processes for humans to perform manually" (Microsoft, n.d.).

Process automation for project management focuses on the implementation of new technologies and automated algorithms, this is for the execution and control of tasks and activities within projects in an efficient and consistent manner. By scheduling and integrating workflows, we seek to minimize the manual intervention of repetitive processes or activities, such as assigning tasks, job tracking and notifications, allowing a more agile, accurate and reliable resolution or execution of projects. The following are some examples of the application of process automation in project management:

• **Automated notifications and alerts:** Set up systems to automatically notify and warn team members when deadlines, key events or other milestones are reached, keeping them informed and alerting them to potential problems.

• **Automated task assignment:** Using algorithms or systems to quickly assign activities based on availability, techniques or skills and workload for each member of the work team, optimizing the division of tasks or responsibilities.

• **Automatic report generation:** Creating specific templates for reports or reports that are automatically generated with necessary project information, minimizing the need for manual compilation.

• **Automatic progress tracking:** Collect time and progress tracking tools to automatically record tasks and their progress, eliminating the need for manual updates.

• **Automatic answers in Chatbots:** Customize and configure chatbots to solve frequently asked questions from team members about the status and progress of the project, deadlines and many resources, delivering data and information in real time without the need for human intervention.

BENEFITS OF EMERGING TECHNOLOGIES IN PROJECT MANAGEMENT

Emerging technologies offer several benefits in project management, such as automating repetitive tasks, increasing efficiency and accuracy in planning and tracking, improving collaboration and communication of distributed teams, as well as optimizing resources and making decisions based on real-time data.

According to Panetta (2020), there are a variety of must-have trends in emerging technologies. Technologies that will significantly affect business, society and individuals in the coming years are highlighted. Included are technologies that enable businesses and society to aspire to regain confidence in technology. [19]. In addition,

technologies such as artificial intelligence and data analytics can provide valuable insights for continuous improvement of the project management process.

• **Automation:** Emerging technologies can automate repetitive and routine tasks, freeing up time for more strategic and creative activities.

• **Efficient planning and tracking:** Software tools and applications can streamline the creation of project plans, scheduling of tasks and real-time progress tracking.

• **Enhanced collaboration:** Online collaboration platforms enable dispersed teams to work together efficiently, share information and track task status.

• **Real-time communication:** Communication technologies facilitate interaction between team members and stakeholders, regardless of their geographic location.

• **Resource optimization:** The use of tools and algorithms can help to optimally allocate resources, minimizing waste and maximizing productivity.

• **Data-driven decision making:** Data analytics technologies provide real-time information on project progress, allowing informed decisions to be made and strategies to be adjusted as needed.

• **Improved risk management:** Data analytics and predictive modeling can identify potential risks and enable preventive measures to be taken.

CHALLENGES AND CONSIDERATIONS IN THE IMPLEMENTATION OF EMERGING TECHNOLOGIES

The implementation of emerging technologies in information systems project management can present some significant challenges and considerations. Some of the challenges and considerations based on the Servnet (2023) article are as follows [14]:

• **Paradigm shift:** The implementation of emerging technologies may require a paradigm shift in the way projects are managed. It is important that companies are willing to adopt new approaches and adapt to emerging changes.

• **Budget:** Implementing emerging technologies can require a significant investment of financial resources. In Latin America, for example, the lack of budget allocated to the development of cutting-edge technology projects can be a disadvantage compared to other regions of the world.

• **Staff training:** The implementation of emerging technologies may require staff training for their effective use. It is important that companies provide the necessary

training to ensure that staff can use these technologies effectively.

• **Adapting to new paradigms:** The implementation of emerging technologies may require adaptation to new paradigms in project management. It is important that companies are willing to adopt new approaches and adapt to emerging changes.

• **Integration with existing systems:** Implementing emerging technologies may require integration with existing systems. It is important for companies to consider the compatibility of these technologies with existing systems and to plan for integration in an effective way. [22].

3. Discussion

"Information systems (IS) are composed of elements that interact with each other to support business strategies and decision making within organizations" (Bonilla Botia & Briceño Díaz, 2006, p. 53).

Emerging technologies in information systems project management are a topic of great importance today. In the article provided, the importance of artificial intelligence, blockchain, augmented and virtual reality, and process automation in project management is highlighted. In addition, it mentions the importance of training in these technologies for future professionals in the business field.

In the article "Evaluation of the implementation of new technologies in companies" [23], the importance of new technologies in companies and how these can positively or negatively affect them is highlighted. In the article "Emerging technologies: what they are and how to apply them in your company" [24], the importance of innovation and the adoption of new technologies to improve business processes is highlighted. In the article "Emerging information technologies and software development" [25], the importance of constant updating in information technologies and software development is highlighted.

In the article "La Gestión de Tecnologías Emergentes en el Ámbito Universitario"[26], the importance of the management of emerging technologies in the university environment and its potential impact on society is highlighted. In the article "La utilización del blockchain en los procedimientos de concurrencia competitiva"[27], the importance of blockchain in the automation of processes and its application in the legal-administrative field is highlighted. In the article "Technological change and the future of work"[28], the importance of training in emerging technologies for the future of work is highlighted.

3. Conclusions

Emerging technologies are transforming the way information systems projects are managed. Artificial intelligence, blockchain, augmented and virtual reality, and process automation are some of the most relevant technologies in this area.

These technologies provide the ability to analyze large amounts of data, ensure the integrity and security of information, visualize the design of a project and perform virtual testing. In addition, they allow the automation of tasks, resulting in a reduction in both the time and cost of information systems projects.

Effective implementation of these technologies can significantly improve the efficiency, security and cost-effectiveness of information systems projects, giving organizations a competitive advantage in an ever-changing business environment. However, the adoption of emerging technologies also brings with it significant challenges and considerations, such as the paradigm shift in project management, budget allocation, staff training, and integration with existing systems. Universities and companies alike are recognizing the importance of these technologies and are working on their implementation to improve efficiency and achieve their goals more effectively.

In conclusion, emerging technologies are transforming information systems project management. Despite the challenges, organizations that adopt these technologies effectively will improve the efficiency and quality of their projects, giving them a competitive advantage in an ever-changing marketplace. Information systems project management and emerging technologies are topics of great importance today. Training in these technologies is essential for future professionals in business and academia. In addition, the adoption of new technologies can improve business processes and have a positive impact on society.

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