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Navigating the New Creative Frontier: Artificial Intelligence's Role in Enhancing and Challenging Creativity within Project-Based Organizations

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INTRODUCTION

One of the newest technological frontiers, artificial intelligence (AI) has significant ramifications for a number of industries. The purpose of this thesis, "Navigating the New Creative Frontier: artificial intelligence's Role in Enhancing and Challenging Creativity within Project-Based Organisations," is to investigate how AI might affect creativity in project-based organisations (PBOs).

The selection of this subject stems from the increasing curiosity about how artificial intelligence might improve and encourage human creativity. AI has demonstrated in the last few years to have a major influence on many facets of our personal and work lives. It is important and current to research how these technologies could not only automate monotonous tasks but also foster human creativity. AI integration done well inside companies is a chance as well as a problem to enhance innovation and creative processes. The main objectives of this research are encapsulated in the following question: How does the use of artificial intelligence influence the creativity of employees within project-based organizations? To answer this question, several variables were examined, including the frequency of AI usage, the types of AI tools employed, and employees' perceptions regarding AI's impact on productivity and creativity.

The approach used in this work is quantitative. Data on staff perceptions of AI use and their creativity were gathered using a standardised questionnaire. The links between the variables were then found by statistical methods like regression and mediation analysis on the data.

There are three primary chapters to the thesis. After this introduction, the first chapter defines artificial intelligence and goes into its background, uses, and cultural and social effects. In a business environment, it also looks at employee creativity and the variables that affect it, as well as the project-based organizational structure and how AI may be included to improve creativity and innovation. The methodology for gathering and analyzing the data is described in the second chapter. The research findings are presented and critically discussed in the third chapter, which ends with practical implications and future research objectives.

According to the study, AI can boost workers' creativity, especially when it's utilized to automate monotonous tasks and free up time and money for more creative activities. Image and text processor use, for example, has been demonstrated to foster fresh ideas

and enhance creative results. Users of AI technologies like image generators in the study reported higher output quality and productivity perception. Furthermore, a rise in perceived creativity was positively connected with the belief that AI usage had increased productivity.

A noteworthy finding of the study is also that the frequency of realizing creative outputs acts as a mediator between creativity and AI use. This shows that consistent application of AI technologies can increase the generation of creative works, which improves the perception of one's own originality. The mediation of creative output frequency suggests that the impact of AI on creativity is not direct but occurs through increased opportunities to engage in creative activities.

Finally, this thesis proposes new approaches to use this developing technology to foster innovation and competitiveness, therefore offering an in-depth understanding of how artificial intelligence may be a catalyst for creativity in contemporary enterprises. Carefully considered should be taken when integrating AI into project-based organizations to guarantee that AI technologies are not just available but also utilized to help and improve creative processes. Organizations may fully leverage AI technologies by fostering a creative and innovative atmosphere.

CHAPTER 1 – LITERATURE REVIEW

1.1. Definition and History of AI

1.1.1. What is AI?

Artificial intelligence (AI) represents one of the most innovative and powerful frontiers of modern technology. Thanks to its profoundly broad scope of action and knowledge, it can be decisive for society, industry and scientific research (ResearchGate, 2023).
Focusing on its more incisive meaning, it is possible to refer to AI as the ability residing in a computerized system to perform tasks that would require the use of human intelligence (Murthy, 2023).
The spectrum of tasks that AI can perform is wide-ranging and ranges from cognitive functions such as perception, reasoning and natural language understanding to motor functions such as movement and manipulation of objects in the environment (Marr, 2023).
The goal of AI is certainly to simulate, through the creations of computerised and specialized machines, human intelligence to perform the above-mentioned tasks, becoming to all intents and purposes a hypothetical substitute for humans in what are mainly standardized tasks (ResearchGate, 2024).
The techniques through which AI operates include machine learning and deep learning algorithms, with the former referring to machine learning methodologies and the latter to deep learning methodologies (ScienceDirect, 2021). It is thanks to these tools that AI adapts to new inputs and situations, thus improving its efficiency.
It is useful to start with the scientific definitions of artificial intelligence to better clarify many aspects of what a vast world is full of novelties and turning points for the future of every human being's daily life (Caltech Science Exchange, n.d.).

1.1.2. Definitions of AI

When one refers to artificial intelligence, one must understand precisely what one means by it; its connotations are manifold and, for this reason, this concept is in deep need of being explained in a suitable manner.
To achieve this, it is necessary to introduce the definition of AI; as one can imagine, there is no single scientific contribution on the subject: there are many authors who have

attempted to define the subject, but for this research, we chose to use the three most coherent and relevant definitions available.

The first contribution is that of Alan Turing, a pioneer in the field and, above all, among the first to define artificial intelligence. He was an enormously relevant figure in the Second World War scenario as he worked in support of the Americans to decipher Nazi codes (Hofstadter, 2004). Thanks to his brilliant Turing test, also known as the "imitation game" and carried out by means of a machine specially created for this task, he succeeded in his aim and fully demonstrated what is, precisely, his definition of artificial intelligence (Piccinini, 2000). For the American, in fact, AI refers to the fact that a machine can be considered intelligent if it has within its capabilities that of being able to imitate and, therefore, simulate human behavior without being distinguishable from the latter (Turing, 2009). This definition is exactly in line with what is happening today, despite being over seventy years old, and this is one of the reasons why Turing is considered one of the major contributors in this field.

The second definition considered belongs to John McCarty. The latter is regarded as the father of artificial intelligence, having himself coined the term "artificial intelligence" at the 1956 Dartmouth conference (McCarty et al., 2006).

For McCarthy, artificial intelligence refers to the fact that every aspect of human intelligence can be studied and subsequently described to the point of being emulated by a machine designed for that purpose. His theory did not stop at this point but went further, to the point of imagining that through continuous simulation of human processes, machines could go so far as to improve themselves and even the performance of that task (McCarty, 2022).

This definition highlights the importance for the expert of replicating human behavior; the basic idea is to be able to encode cognitive processes through algorithms that lead to perfect simulation. For McCarty, clearly, the production and design of these machines was the most interesting part of the whole mechanism (McCarty, 2007).

The expert's focus on the processes of logical reasoning and mathematical formalization steered work in this field for decades in a direction that he had already imagined at a time when it seemed impossible (McCorduck & Cfe, 2004).

Coming to the last of the three definitions of AI chosen for this research, we come to a definition given directly by the interested party; in fact, one of the most famous

manifestations of AI, ChatGPT, was asked what artificial intelligence was. Specifically, the question asked was: “how would you define artificial intelligence from your perspective and actually being a component of it?”.

The answer provided is interesting in that after defining itself as “a set of technologies and algorithms designed to simulate human cognitive abilities, such as learning, reasoning, perception, language comprehension and creativity, through data processing and pattern analysis” (OpenAI, 2024) it adds important information.

Amongst these, it explains how it is not only limited to the replication of human behavior but to the improvement of human capabilities by analyzing data “with a speed and accuracy far beyond human capabilities” (OpenAI, 2024). It is noted that from the machines’ point of view, there is a full awareness of their own capabilities and there is also a comparison with human intelligence in which it is emphasized that machines are better especially in speed and accuracy.

1.1.3. History of AI

The history of AI is certainly relevant for the purpose of explaining the concept. Its origin, as opposed to what is easy to imagine, is far from current but has roots planted in a past where everything the tool represents in today’s world was unthinkable, to say the least.

In 1950, Alan Turing himself proposed the famous Turing test in his essay “Computing Machinery and Intelligence”; this first application of artificial intelligence is seen as the beginning of something abstract, but which could achieve incredible results (Kaul et al., 2020).

A few years later, in 1956, at the Dartmouth Conference, John McCarty, Marvin Minsky, Allen Newell and Herbert Simon were the first to propose the goal of making machines that use language in addition to producing abstract concepts and continuous autonomous improvement (Moor, 2006). This moment is seen as a real watershed as this conference was defined as the moment when AI had its birth as a disciplinary field (Rajaraman, 2014).

In the 1960s, the first AI programs such as ELIZA and SHRDLU were developed; the former was one of the first programs able to simulate a human conversation and one of its main applications was DOCTOR, in which a therapeutic session was simulated in which the patient, a human, had the impression that the doctor, the machine, was able to

understand him while he was expounding his problems although this was not actually the case (Shum et al., 2018).

The second program, on the other hand, dealt with the manipulation of elementary geometric shapes in what came to be known as the "block world". Using commands in English, the machine was able to move objects and later provide explanations of the move performed, demonstrating elementary understanding (Mind Design, 1979).

Despite the understanding of the potential of AI, the path for this new frontier has not always been linear and smooth. The two decades from 1974 to 1993 saw the darkest periods, also referred to as the "AI winters". In the first (1974-1980), funding was lacking because the limits of technology and innovation at the time could not support the ambitious avant-garde in this field. In the second (1987-1993), the limits were very similar, with the addition of problems inherent in very limited knowledge-based systems (Hendler, 2008).

In 1994, however, thanks to the rise of the Internet, artificial intelligence experienced a renaissance. In those years, there was an exponential increase in computing power and data availability that led to incredible developments including the advancement of machine learning and deep learning algorithms (Tan & Lim, 2018). There were, moreover, episodes that marked the power and credibility of AI, such as the victory of the IBM-designed Deep Blue supercomputer in the game of chess against world champion Garry Kasparov in 1997 (Goodman & Keene, 1997). This episode is of great importance because for the first time, machines proved to be able to compete and even win against humans (Seirawan et al., 1997).

In the period between 2010 and today, AI has gained full credibility and is used worldwide and in virtually every field (Kurian et al., 2023). Tools such as virtual assistants, personalized recommendation systems and more appear indispensable, especially for companies that use AI to enhance creativity and efficiency in addition to performing repetitive tasks (Marr, 2019).

1.1.4. Evolution of AI Technologies

The evolution that artificial intelligence has had regarding its technologies has been marked predominantly by innovative and significant advances in multiple fields.

Developments in algorithms, data availability and computing power have influenced what AI tools are currently available.

In the 1950s, when this scenario took hold, AI systems were driven by algorithms that aimed at human imitation through well-defined rules and logic; later, thanks to the development of machine learning systems, a change in paradigms took place that allowed learning from historical data (Negnevitsky, 2005). The backpropagation algorithm became fundamental to better train neural networks (Rojas & Rojas, 1996). In the early 2000s, Big Data came into play which, together with the exponential improvement in computing power, enabled the processing of much larger and more complex data sets than before, creating more accurate AI models (Mayer-Schönberger, 2013). In the more recent period, the biggest contribution to AI improvements is made by deep learning systems, i.e. a type of machine learning capable of using deeper neural networks (Heaton, 2018). Thanks to these systems, a revolution has taken place in fields such as image recognition and natural language (Heaton, 2018).

One of the most credible demonstrations of the power of deep learning concerns the episode in which Alpha Go, a software developed by Google Deep Mind, was able to defeat the world champion of Go, Lee Se-dol, in a match played over five games, which ended with a total of 4-1 in favor of the software (Silver et al., 2016).

Another technological breakthrough for AI is the development of natural language models, GPTs. Generative Pre-trained Transformers can generate text and images in response to human requests, ensuring consistency in the response to any type of proposed question. It is thanks to these units and other types of progress such as face recognition, image interpretation or autonomous driving of vehicles that the development of human-machine confrontation is opening new research frontiers (Radford et al., 2018).

Throughout its existence, artificial intelligence has encountered social and technological changes that have altered its structure and goals. Primarily, the goal of AI was to succeed in becoming AGI (Artificial General Intelligence) (Mitchell, 2019).

This term refers to the ability of an intelligent system to understand and apply itself like a human being with a wide range covering all disciplines (Goertzel, 2014). Subsequently, it was realized that developing a true human intelligence, which does not require the help of human beings, is a very complex challenge to achieve; being able to adapt to all tasks

and all disciplines for a single intelligence has proven to be far removed from what is reality (Mitchell, 2019).

In parallel, therefore, ANI (Specialized Artificial Intelligence) is developed; it is designed to focus on specific tasks that, therefore, do not require the transfer capability that resides in AGI. These tasks are of many types such as speech recognition, language translation and image analysis (Russel & Norvig, 2010).

The importance of ANI can also be seen from a business point of view, as the major advances of AI in this respect (voice assistants, personalized recommendation systems and others already mentioned) bring great gain (Lee, 2018).

Although AGI remains an appealing goal, it still presents many doubts, especially ethical and realizable ones, ANI, at the same time, has contributed to tremendous progress for many industries and remains the most pursuable frontier in the immediate future (Mitchell, 2019).

1.1.5. Types of AI tools

Artificial intelligence contemplates multiple tools through which individuals can manage and perform their tasks while managing to meet their needs. In particular, the most used types of tools can be divided into four categories (Panciroli et al., 2020):

- Chatbots: this category is the representation of natural language understanding by machines; they are designed to replicate human conversations and provide immediate answers to the counterpart. Their use is extremely varied and extends from e-commerce platforms, within which customer assistance is provided regarding products and orders placed, to software capable of responding to user queries on any subject, such as ChatGPT, Mitsuku and Watson Assistant (Rudolph et al., 2023).
- Word processors: thanks to such tools, sectors such as journalism or marketing can be revolutionized. These processors are designed to edit, understand or even generate multiple texts, thus being useful for grammar corrections and content generation. Examples of some of the most popular include GPT, BERT and T5 (Tunstall et al., 2022).
- Numerical analysis tools: such software is extremely popular in quantitative fields such as finance and science. By analyzing a significant amount of data, they can

predict market trends or calculate multiple risks, thus providing an important service for the companies that use them, enabling them to make more informed decisions. Among the most widely used are TensorFlow and PYTorch (Rothman, 2021).

- Image generators: the avant-garde from the point of view of digital creativity mostly passes through this type of software. They can transform ideas, written at precise prompts, into real digital output, providing their users with a concrete shortcut in terms of timing. This type of tool is mainly used in areas such as entertainment and advertising, but especially in graphic design. Examples of these are DALL-E and Midjourney (Yildirim, 2022).

1.1.6. The social and cultural impact of AI

From a social point of view, it is easy to imagine how a frontier as powerful and innovative as AI could have created debates and questions. Like any big topic, a divide has been created between those who support the technology in question and those who, on the other hand, have doubts about the safety of using such a powerful weapon (Yudkowsky, 2008).
The optimism towards AI is justified by the belief that thanks to artificial intelligence it is possible to solve many problems, decrease execution times, improve process efficiency, and bring about discoveries in specific subject areas of extreme importance to human beings that can contribute to greater social welfare (Chui et al., 2018).
Analyzing in more detail what are thought to be the positive developments caused by AI, it is inevitable to mention the field of medicine, in which, thanks to the use of these technologies, early diagnosis of diseases, even the most dangerous ones, seems possible (Mckinney et al., 2020).
From an economic point of view, in particular, AI seems to be able to bring about a unique progress that would be difficult to achieve without providing itself with the tools that these machines are able to offer (Bughin et al., 2018).
At the same time, as mentioned earlier, there is no shortage of reservations about what negative impacts might occur because of the continued use of artificial intelligence.
The privacy issue remains ever-present when it comes to technologies; the fact that AI software is almost all aware of personal human data puts personal privacy at serious risk.

Once declared the fact that data can be leaked or not maintained properly by software puts the reliability of systems at serious risk (Jobin et al., 2019).

Another issue that raises mistrust in AI seems to be the trade-off between improved process efficiency and the risk of unemployment. The fact that machines are increasingly able to replace people, particularly for standardized tasks, increases unemployment as companies exploit this software to reduce costs by cutting wages (Webb, 2019).

Underlying any idea that individuals have about AI is an important premise, particularly a cultural one. People's culture has a great impact on the acceptability of AI as the future. The education received, as a variable of a person's culture, is crucial in the formulation of one's opinion regarding technological and innovative contexts such as this (Gerlich, 2023).

The adoption of AI technologies significantly impacts team collaboration and project outcomes. AI enhances resource management and real-time data analytics, leading to more informed decision-making processes and better project performance. This transformation underscores the potential of AI to not only optimize operational efficiency but also to drive cultural shifts towards more collaborative and dynamic working environments (McCormack et al., 2019).

Providing campaigns to raise awareness of new technological systems could provide interesting solutions; as mentioned earlier, most negative opinions about AI come from people who are not tech-savvy and are hostile in general (Whittaker et al, 2018).

Other major issues inherent in the AI context include autonomy and control. In the case of the former, the fact that machines have an undefined degree of decision-making is risky particularly in critical domains. It is unclear where they can reach and stop (Tegmark, 2018).

In the case of control, on the other hand, it must be clarified whose responsibility it is for the actions of artificial intelligence systems when they commit damage. Consequently, it appears difficult to be adequately compensated if one becomes a victim of errors by this software (EU Commission, 2020).

1.2. Creativity in the business context

In the era of digitization, the creativity of employees in the business environment appears to be indispensable for organizations to keep pace with change and continuous innovation and to distinguish themselves as successful enterprises.
The ability of individuals to produce many innovative ideas and to solve problems effectively and innovatively is crucial to meet the needs of today's businesses. Maintaining competitiveness and increasing corporate value indirectly allows one to withstand the pressures of ever-changing consumer expectations and consolidate one's position in the market (Prahalad & Ramaswamy, 2004).
All these challenges would in no way be coped with without the value of the employee's creativity, which adds value to the company's performance.

1.2.1. The importance of employee creativity

The creativity of employees is an absolute must in the modern business environment.
Having an innovative working environment that, rather than curbing the creativity of the individual, enhances and disseminates it, becomes of paramount importance for the growth of companies. In today's environment, enhancing creativity equates to the generation of multiple innovative ideas and increasingly efficient problem solutions, as well as the development of revolutionary products and services that could dramatically improve a company's turnover (Amabile, 1998).
One of the essential aspects that managers must pay attention to is the intrinsic motivation of their employees, as this acts as a catalyst for the creative aspect (Amabile, 1998).
In fact, more and more companies are now investing significantly in creativity and work environments that enable their own development (WIPO, 2020).
Social networks play a crucial role in fostering creativity. AI-enhanced communication tools within project teams can extend these networks, facilitating greater interaction and collaboration. This increased connectivity allows for a richer exchange of ideas, thereby enhancing the creative potential of individuals and teams alike (Perry-Smith & Mannucci, 2017).
Fostering an innovative culture within organizations is crucial. AI tools can facilitate creative brainstorming and rapid prototyping, thereby enhancing the creative capacities of employees. By leveraging AI, organizations can create environments that not only

support but actively encourage the generation of innovative ideas, leading to continuous improvement and competitive edge" (Sarooghi et al., 2015).

Through the dissemination of innovative management practices, the development of an inclusive and open corporate culture, training programs that can stimulate creative thinking and reward systems for the most revolutionary ideas, companies can turn this into tangible competitive advantages in terms of growth and success in the marketplace (Sparrow et al., 1994).

1.2.2. Factors influencing employee creativity

For a company to achieve and maintain an appropriate level of creativity in its own context is an arduous task that is influenced by multiple internal factors. These include leadership style, management policies and corporate culture (Szczepańska-Woszczyna, 2015).

As mentioned earlier, Amabile and Kramer's (2011) research emphasizes how an environment in which one breathes trust, autonomy and freedom of exploration contributes profoundly to creativity. In fact, the intrinsic motivation of one's employees should not be hindered or underestimated, as it is thanks to this that the entire creative aspect of the individual can be unleashed (Amabile & Kramer, 2011).

Collaborative environments foster greater creativity. AI-driven collaboration platforms can further amplify this effect by enabling seamless communication and idea sharing among team members. These platforms break down traditional barriers to collaboration, allowing for a more integrated and dynamic creative process" (West & Sacramento, 2012).

Analyzing leadership style, it is worth noting how managers, by maintaining attitudes of deep intellectual inspiration and mindset stimulation, can exponentially increase creativity within teams. Leaders must inspire their employees to think independently, exploring unreached boundaries without fear of failure (George, 2007).

Furthermore, the organizational structure plays an important role in the development of a creative environment. In fact, organizations that possess a system that is not completely hierarchical, but more flexible, foster a greater development of creative ideas and solutions due to a greater network of interactions between employees (Gibson, 2009).

This structure supports and promotes a more dynamic working environment that transcends communication barriers between departments and in which creativity is more prevalent (Gibson, 2009).

1.2.3. Strategies and tools to support creativity

Within organizations, creativity appears to be an aspect that needs continuous development; this is an arduous task that goes hand in hand with sustaining continuous innovation practices over time.

Thus, the approach that companies should adopt certainly includes the creation of a collaborative work environment, special training and the implementation of technologies to share and bring out innovative ideas.

The dynamics of creative leadership can be significantly enhanced by AI. AI can support leaders by providing advanced decision-making tools. These tools allow leaders to better understand and manage the creative processes within their teams, fostering an environment where innovation can flourish. By integrating AI, leaders can make more informed decisions, anticipate potential challenges, and cultivate a culture of continuous creativity" (Mumford et al., 2012).

Indeed, training and development play a key role for employees in the implementation of creativity; through various workshops and training sessions that emphasize lateral thinking, problem solving and in-depth brainstorming techniques, leaders can greatly enhance the creative abilities of their team members (Amabile, 1996).

In this regard, the creation of workspaces that enable collaboration and interaction between employees also plays a key role. Flexible and stimulating environments in which casual contacts between individuals occur and ideas of various kinds are promoted function as catalysts for the development of creativity (Kelley & Kelley, 2013).

As already mentioned, the implementation of digital technologies and collaboration platforms is also an important strategy for enhancing creativity. For instance, the use of software that fosters collaborative work makes it possible to bypass both physical and time barriers. In this way, the sharing of ideas and group presence about creative projects would be facilitated (Bughin et al., 2011).

That is not all, the recognition of the added value that the employee brings to the company through his creative thinking turned into tangible results should be recognized by his

managers through rewarding systems such as rewards, incentives and professional development opportunities. Thanks to such practices, the individual would be more motivated to use his or her creativity while performing his or her job (Amabile, 1993).

1.2.4. Measuring and evaluating creativity

Thinking of being able to measure creativity in the corporate environment is certainly a tall order, the deeply intrinsic and variable nature of creativity makes the process of quantification extremely complex.

However, for companies, developing suitable metrics to measure this becomes essential to cope with innovation; although creativity is unobservable directly, it can be measured through the observation of creative activities such as the number of ideas produced, their impact on the market and their recognition (Csikszentmihalyi, 1996).

One of the most effective methods for assessing creativity is the Consensual Assessment Technique (CAT); this is based on the judgement of experts regarding the applicability and originality of ideas and products. This approach focuses on the importance of clear assessment criteria to determine the value of creativity (Amabile et al., 2005).

Regarding personal perceptions of one's own creative aspect, one of the most frequently used methods is the Short Scale of Creative Self (SSCS); this scale consists of 11 items that investigate one's own and others' ideas of creativity, including dimensions such as originality and applicability (Karwowski, 2011).

Creativity management practices and corporate performance indicators are linked by a correlation relationship, whereby qualitative and quantitative metrics can be used jointly to analyze the impact of creativity on the operational efficiency of companies (Janssen, 2000).

After in-depth studies of each method, it appears that a mix of all these measurement scales, thus considering employees' personal opinions regarding their creative aspect as well as quantitative results such as the number of suitable ideas produced, may be the ideal solution for companies that want to enhance creativity, improve corporate culture and follow a process of continuous innovation (Florida, 2002).

1.3. Project-based Organizations: Features and Advantages

1.3.1. Introduction to Project-based Organizations

Particularly in the technology and consulting industries, but also in engineering and construction, project-based organisations are a very popular organizational structure. Projects are at the core of this very dynamic and flexible organization, which stands apart from conventional organisations in particular because of its inventive imprint.

PBOs are types of organizational structures where work is focused on particular projects with their own goals. Being able to react quickly to demands and stresses allows these structures to concentrate on efficiency and make use of specialised abilities, which is one of their most significant differences from traditional ones (Turner & Makhija, 2006).

These structures find a suitable use in disciplines like technology or engineering and, by organising themselves into adaptable, goal-oriented teams, can traverse the uncertainty that characterises modern companies (Hobday, 2000).

Decision-making procedures are consequently quick and flexible in PBOs; the main priorities are value creation and result delivery. Their style of leadership is typified by cooperation and communication (Lundin & Söderholm, 1995).

1.3.2. Definition and key characteristics of PBOs

While PBOs structure their work around particular projects with specialised objectives, budgets, deadlines, and teams, typical corporate structures function on a consistent functional and departmental basis (Shenhar & Dvir, 2007). More flexibility and adaptability—two essential qualities in a market that is changing quickly—are made possible by this strategy.

As the means of delivering work, projects are the main emphasis of PBOs. This focus enables more flexible organisation of work and more dynamic allocation of resources; these aspects promote flexibility and the capacity to react to change (Söderlund, 2004).

Projects are seen by PBOs as their main business units, each with unique goals, budgets, and schedules. Targeted resource allocation and objective management are made feasible in these companies for every project by this strategy (Shen-har & Dvir, 2007). Turner and Müller (2003) make the point that concentrating on certain initiatives stimulates creativity and productivity and enables businesses to react more quickly to demands in the market.

Characteristics of PBOs are flexibility and adaptability. Taking advantage of opportunities and quickly resolving issues, this organizational structure enables PBOs to handle change more effectively than traditional companies (Söderlund, 2004). For long-term success, an open innovation and culture of ongoing learning are made possible by the flexible organization (Hobday, 2000).

An other crucial quality of these companies is that they use learning and feedback as a manual for creativity and adaptation while projects are being carried out. Actually, it seems that organizational innovation and project performance are mostly dependent on change management (Shenhar and Dvir, 2007). PBOs are remarkably resilient and competitive when they take initiative to handle uncertainties and complexity (Bredillet et al., 2018).

In what is an ever changing corporate environment, this organizational structure also enables a remarkable capacity to quickly adjust to changing consumer wants and market dynamics, giving a competitive edge (Söderlund, 2004). Increasingly innovative initiatives and the accomplishment of strategic objectives are made possible by organizational agility, which highlights the need of flexibility in the effective operation of PBOs (Artto et al., 2008).

1.3.3. Types of PBOs

Project Based Organisations find use in many different industries, each with unique project management and implementation characteristics. A couple of these might be emphasized.

PBOs oversee everything from huge infrastructure projects to residential homes in the construction industry. From design to execution, these projects need for close collaboration between several disciplines. In such cases, success greatly depends on the capacity to control quality, cost, and time as well as cooperation among many stakeholders (Hobday, 2000).

Consulting firms work on anything from complicated IT system implementation to business optimisation. The focus on knowledge transfer and flexibility to meet particular customer needs define PBOs (Turner & Müller, 2003).

PBOs work in the IT industry managing IT infrastructure, systems implementation, and software development. In this field, where projects frequently include cutting-edge

technology and quickly changing objectives, agility and ongoing innovation are crucial (Shenhar and Dvir, 2007).

Highly creative and customer-focused initiatives that need for close cooperation between staff, clients, and other partners define the design and advertising industries. Project management done well is essential in these domains to convert original concepts into observable outcomes that satisfy clients (Hobday, 2000).

Concerning the various kinds of project-based organizations, certain instances can be given, focusing on their project management practices.

Among the biggest construction businesses in the world, Skanska, manages a broad spectrum of projects, from civil infrastructure to building construction, using a PBO methodology. The company coordinates multidisciplinary teams and cutting edge technology to deliver difficult projects, emphasising risk management, sustainability and innovation (Skanska Annual Report, 2019).

PBO is the model used by McKinsey & Company to provide operational, organizational, and strategic consulting. Leveraging a large network of sectoral knowledge and experience, the organization stands out for its capacity to rapidly adjust project teams to particular client demands (McKinsey & organization, 2020).

Managing the creation of new goods and services, Google takes a project approach even though it is not a PBO in the conventional sense. The business, which arranges its resources around initiatives ranging from cloud computing to artificial intelligence, values innovation and cross-functional cooperation (Google Annual Report, 2019).

Leading creative advertising agency Wieden+Kennedy manages campaigns for international companies in its capacity as a PBO. Important components of their design strategy include close cooperation with clients and the capacity to quickly adjust to market trends (W+K, 2020).

1.3.4. Project management in PBOs

Project Based Organisations use several project management approaches to increase productivity, creativity, and innovation. The most often used are Agile, Scrum, and Lean, each having unique characteristics for assisting project processes.

Agile technique stresses flexibility and a quick reaction to change. Agile emphasizes constant input and quick adaption in a PBO setting. As it enables teams to quickly test and refine project ideas, this method is very favourable to innovation (Highsmith, 2009). With its iterative and incremental development cycles, or sprints, Scrum is an Agile framework that accommodates complicated initiatives. Scrum promotes cooperation and communication amongst multidisciplinary teams in PBOs, therefore promoting more adaptability and accountability. While efficiently overseeing the project process, this keeps the creative goal in view (Schwaber & Beedle, 2002).

Originally created for the manufacturing sector, PBOs have adopted Lean to increase productivity by reducing waste. Lean, as used to project management, emphasizes the easy maximization of customer value, which encourages a leaner, more focused approach to innovation (Womack & Jones, 1996).

Particularly with regard to cooperation and project management, technology is essential to enabling project management approaches in PBOs. Effective application of these approaches requires the use of particular technologies such document management systems, collaboration platforms, and project management software.

Agile and Scrum project management is supported by tools such JIRA, Asana, or Trello, which also provide sprint planning, task tracking, and progress visualization. These technologies support teams in staying aligned on project objectives and enable real-time collaboration (Cobb, 2011).

PBOs now rely heavily on platforms like Zoom, Microsoft Teams, and Slack to facilitate teamwork and communication across geographically dispersed teams. Design agility and creative iteration depend on quick ideas and feedback exchanges made possible by these tools (Dingsøyr et al., 2012).

Solutions for project documentation and knowledge management include Dropbox, Confluence, and Google Drive. These systems make it simple for team members to access project materials and information, therefore promoting cooperation and knowledge exchange (Reinhardt et al., 2011).

1.3.5. Challenges and Opportunities for PBOs

Project Based Organisations have to negotiate a difficult terrain while taking use of special chances for creativity and innovation.

Given their frequent resource constraints, PBO optimisation is essential. With projects being unpredictable and availability and talents needing to be balanced, the problem gets increasingly difficult. In these organizations, effective resource management necessitates a strategic approach to planning and distribution; tools and techniques for project needs forecasting and meeting are crucial (Frame, 2002).

The interdisciplinary character of PBO teams can make communication difficult because of disparities in technical jargon, priorities, and expectations. Overcoming these obstacles and encouraging fruitful cooperation need the establishment of efficient channels of communication and team building exercises (Kerzner, 2009).

Projects by nature include hazards pertaining to time, money, quality, and goals. To recognise, evaluate, and resolve possible issues, PBOs must so acquire sophisticated risk management abilities. These companies need to tackle risk proactively, which means using time and cost buffers as essential procedures and strategic planning (Artto et al., 2008). Apart from difficulties, PBOs have a lot of opportunities in front of them.

They have a special position to promote creativity and innovation because of their adaptable and project-oriented organization. The chance to investigate novel concepts and methods in a controlled environment provided by project management promotes experimentation and quick learning (Shenhar & Dvir, 2007). This setting promotes the creation of creative solutions and the ongoing enhancement of procedures and goods.

One of PBOs' advantages is their capacity to adjust fast to changes in the external environment and market demands. They can react proactively to market chances by using agile and lean approaches, modifying plans and resources to take advantage of competitive advantages (Highsmith, 2009).

Understanding the need of human capital, PBOs take great care to help their members acquire motivation and skills. PBOs can maximize individual skills and enhance the inventive potential of the organization by leading diverse teams and encouraging a feedback and ongoing learning culture (Dingsøyr et al., 2012).

1.4. The impact of AI on Creativity

1.4.1. Optimistic vs. pessimistic view

Analyzing the hypotheses now in existence about creativity and the possible impact of artificial intelligence on it exposes a complicated area that is ready for investigation.

About the effects of AI on creativity, the academic literature offers both hopeful and negative opinions.

Positively speaking, AI is thought to improve human creativity by providing new instruments and avenues for exploring original concepts. AI can produce previously unthinkable patterns, symbols, and even artistic forms. By enabling people to investigate hitherto unreachable creative potential areas, these AI technologies can broaden the boundaries of human creativity (Boden, 1998).

Further study indicates that by automating repetitive chores, AI can improve creativity and allow people to work on more creative and important projects (Del-lermann et al., 2019). AI solutions, including design assistants, can also offer instant feedback, which encourages more creative iteration and critical thinking (Dellermann et al., 2019).

Conversely, there are other, more circumspect or negative opinions about how AI will affect creativity. Some detractors contend that AI could restrict human creativity by forcing it to fit into patterns that the algorithm has identified, therefore reducing it to a set of predictable parameters (Brynjolfsson & McAfee, 2014). From this angle, there is a risk of "homogenization" of creativity, in which the biases and constraints of the algorithms themselves are reflected in the increasing similarity of creative products (Brynjolfsson & McAfee, 2014).

A further worry voiced is the possibility that AI would supplant human creativity, therefore devaluing human input to the creative process (Ford, 2015). Important moral and societal problems are brought up by this situation, such the possibility of losing creative occupations and the devaluation of the human experience.

Project Based Organizations that use AI face both the difficulties of pessimistic viewpoints and the potential of positive ones. The secret for PBOs is to employ AI as a tool to enhance human creative potential without superseding or displacing the special and priceless worth of human creativity itself.

1.4.2. Case studies of the phenomenon

The use of artificial intelligence to foster creativity in Project Based Organizations has seen many interesting case studies. These examples illustrate how AI can be used to enhance creative processes, generate new ideas and overcome traditional challenges in the workflow of PBOs. However, the adoption of AI also brings with it significant challenges.

1.4.2.1 IBM Watson and Creative Advertising

IBM Watson has demonstrated its strength in the creative advertising space, assisting agencies in producing advertising material based on study of intricate data and consumer trends. Large volumes of customer data could be analysed by Watson to find trends and preferences, which allowed agencies to develop very creative and targeted advertising campaigns. PBOs have developed creative advertising material that more effectively connects with their target consumers thanks to this data-driven strategy (Liu, 2017).
The primary difficulty lay in integrating Watson's skills such that human creativity was enhanced rather than replaced. Over-reliance on statistics also carried a risk of limiting the range of impromptu creativity (Liu, 2017).

1.4.2.2. Autodesk and Generative Design

Utilising artificial intelligence, Autodesk has created generative design tools that quickly investigate a large number of design possibilities according to user-defined criteria. This has greatly increased productivity and creativity in the design process by allowing designers to investigate creative alternatives that they would not have otherwise thought of. Applying its technologies to anything from automobile engineering to architectural design, Autodesk has shown how artificial intelligence can enhance human creativity by offering the best answers to challenging design challenges (Bendsøe & Sigmund, 2003).
The advent of generative design forced designers to adjust their perspective and come to view AI as a cooperative partner. A further difficulty was to keep the creative process end-user-centered and prevent technology from pushing design in unfeasible or unattractive areas (Bendsøe & Sigmund, 2003)

1.4.2.3 Spotify and Creative Customization

Using AI algorithms, Spotify tailors its users' listening experiences to their individual preferences by building customised playlists. This has raised user engagement and given Spotify the opportunity to find and highlight undiscovered music that might not have otherwise been heard. With its AI, Spotify fosters artistic discovery and links listeners and artists in novel and significant ways (Agrawal et al., 2018).
Spotify has struggled most to strike a balance between the requirement to preserve some musical variety and discovery and AI-based suggestions. Algorithms run the danger of

creating “filter bubbles,” which would restrict the exposure to new artists and genres (Agrawal et al., 2018).

1.4.3. Artificial intelligence as a creative tool

With their new approaches to idea development, issue resolution, and quick prototyping, artificial intelligence-based tools are transforming creative processes in many different fields. Together with increasing productivity, these technologies also open up new creative avenues and enable users to investigate hitherto unthinkable ideas.

AI may help generate ideas by providing unexpected inputs and original thought pairings. AI algorithms can analyze vast volumes of data and find hidden patterns, pointing up fresh avenues for creative thought. Examples of these algorithms are those used in machine learning and natural language processing. AI is repurposing concepts to explore previously unexplored creative domains. Using these resources can help to spark more varied and broad brainstorming sessions that produce ideas that defy convention (Boden, 1998).

Because AI provides predictive analysis and data-driven solutions, problem solving is improved. Machine learning and other methods allow AI-based systems to analyze historical examples and simulate various resolution tactics in order to propose creative solutions to problems. AI has a major potential to improve creative problem solving in processes by providing fresh viewpoints derived from the examination of enormous data sets that are beyond the capacity of human processing (Amabile, 1996).

Test and refine concepts in product design and development require quick prototyping. Prototyping is much accelerated by AI technologies like generative design, which employ user-defined parameters to autonomously investigate various configurations and designs. To help designers quickly assess hundreds of design possibilities, Autodesk, for instance, has adopted generative design. This technique improves creativity by reducing the time and expense of human experimentation (Autodesk, 2020).

Notwithstanding the advantages, there are drawbacks to include AI into creative processes, such as the risk of over-reliance on technology and the loss of human control over the creative process (Brynjolfsson & McAfee, 2014).

1.5. Artificial Intelligence in Project-based Organizations

1.5.1. The role of Artificial Intelligence in PBOs

Within Project Based Organisations, the application of artificial intelligence is revolutionising project management and teamwork. Advanced tools made available by AI enhance project planning, execution, and monitoring while also enabling more efficient teamwork.

By use of algorithms that can forecast the critical path and spot possible bottlenecks before they become issues, AI helps optimize project scheduling. Through the analysis of past project data, these AI systems can offer suggestions on the best timetable, resource allocation, and risk management, therefore raising the overall efficiency of the project (Davenport & Ronanki, 2018).

Artificial intelligence based technologies like machine learning and predictive analytics can be used to track project development in real time and foresee delays or overruns in the budget. Project managers can then react quickly and modify plans and resources to maintain the project on course (Hassan et al., 2019).

In geographically dispersed teams in particular, AI can greatly enhance communication inside PBOs. Intelligent chatbots and machine translation systems, for example, can help team members who speak many languages communicate more easily, fostering teamwork and lowering miscommunication (Huang & Rust, 2018).

Systems of knowledge management based on artificial intelligence can assist in gathering, classifying, and providing easy access to knowledge produced by projects. These systems employ artificial intelligence to examine emails, documents, and chats to find important information and company knowledge, therefore promoting organizational learning and knowledge exchange (Shrestha et al., 2019).

1.5.2. Challenges and opportunities

Project Based Organisations with artificial intelligence installed have many of chances to improve innovation and creativity. To fully benefit from AI, companies must, however, handle the particular issues brought about by this digital change.

One of the main problems is employee reluctance to change; they can view AI as a threat to their employment rather than as a tool that would enable them (Kaplan & Haenlein,

2019). This calls for cautious change management and efficient explanation of the additional benefits of AI.

An other major obstacle is the dearth of technical expertise required to create, deploy, and oversee AI solutions (Davenport & Ronanki, 2018). To close this gap, PBOs must spend in training and development or look outside for talent.

Complicated and requiring a lot of engineering work is the integration of AI with current systems and procedures. Often, this suggests that current procedures must be updated to accommodate new technology (Huang & Rust, 2018).

Particularly with regard to the gathering and processing of enormous amounts of data, the application of AI presents ethical and privacy concerns. By making sure privacy regulations are followed and by setting explicit ethical guidelines, PBOs must manage these issues (Brynjolfsson & McAfee, 2017).

AI can be a very useful instrument to improve creativity since it offers fresh approaches to idea and inspiration generating. By use of pattern and data analysis, AI can provide unexpected connections and creative opportunities, hence enhancing the creative process (Boden, 1998).

AI can quicken the innovation cycle by enabling PBOs to test and prototype new ideas fast. Reduced time-to-market and better market need response follow from this (Dellermann, Ebel, Söllner, & Leimeister, 2019).

Project management can be much enhanced by AI, which can also make processes more efficient and cut project costs and time from planning and scheduling to monitoring and control (Hassan et al., 2019).

By removing language and location obstacles and encouraging more integration and idea sharing, AI tools like chatbots and collaboration platforms can enhance team communication (Shrestha et al., 2019).

1.5.3. Academic debates

The integration of artificial intelligence into Project Based Organisations has prompted several academic arguments, mainly addressing the impact of AI on creativity, eth-ical consequences, the fear of replacement of human labour, and questions of equity. These de-bates represent both optimism and concerns about the future of creative labor and project man-agement in PBOs.

While some scholars consider AI as an amplifier of human creativity, others fear that technology may constrain creativity to predictable machine-generated patterns. AI can push the bounds of human creativity by introducing new options for idea generation (Boden, 1998). Howev-er, an over-reliance on AI could lead to a convergence towards "safe" solutions, inhibiting actual innovation (Brynjolfsson & McAfee, 2014).

The application of AI creates important ethical challenges, specifically around transparency, ac-countability and permission in the usage of data. The issue is that AI, especially when used to analyse sensitive data or to make creative judgments, may operate in ways that are not fully intelligible or controllable by humans (Bostrom, 2014). Furthermore, the collec-tion and analysis of personal data to feed AI algorithms raises questions about privacy and the ethical use of information.

A recurring element in the debate about AI is the fear that it could replace human work, espe-cially in creative professions where human intuition and empathy are thought to be irreplacea-ble. AI is growing increasingly capable of executing complicated jobs, raising concerns about potential technological unemployment (Ford, 2015). However, AI should be considered as an opportunity for enhancement of human work, not its replacement, highlighting the possibility for human-machine collaborations that boost human capabilities (Davenport and Kirby, 2016).

Access to AI technology and the ability to utilize them create challenges of equity, both with-in businesses and in society at large. There is a concern that AI may accentuate existing ine-qualities, as only select companies or individuals may have the resources to deploy it efficiently (Crawford, 2021).

1.5.4. Summary of results and practical implications

AI boosts human creativity by giving tools that enable larger idea development and the potential to explore new solutions that would otherwise be inaccessible (Boden, 1998). Autodesk and Spotify are examples of how AI may be used to push the frontiers of innovation and customisation.

Integrating AI into project management processes offers more efficient planning and monitoring, enhancing scheduling and resource allocation and decreasing the risks of schedule and cost overruns (Davenport & Ronanki, 2018).

AI solutions such as chatbots and collaboration platforms promote communication across teams, especially in global environments, overcoming language hurdles and promoting stronger team cohesion (Huang & Rust, 2018).

Despite the benefits, the employment of AI poses ethical challenges, fear of human labour substitution, and worries about fairness. These discussions underline the necessity for a balanced strategy that values both human and computer capabilities (Brynjolfsson & McAfee, 2014).

CHAPTER 2 – METHODOLOGY

Any academic research's success depends critically on its methodological selection since it lays the groundwork for the entire project. This chapter explains the methodological technique used to look at how artificial intelligence affects employee creativity in project-based organizations. Because quantitative analysis may produce quantifiable, repeatable results—which are necessary to support the research hypotheses—it was selected as the best approach for this study (Bryman, 2012).

Because a structured questionnaire was used in this study, data could be gathered methodically and uniformly, which gave the objectivity needed to assess the connections between the variables examined (Fowler Jr., 2013). We want to investigate, using quantitative analysis, not only how much AI affects creativity but also how precisely this technology might change creative processes inside companies.

The chapter guarantees the openness and repeatability of the study by adhering to the survey's structure from sample description to data collecting to analytic methods employed. Building reliable and scientifically sound study that successfully adds to the body of knowledge on the dynamics of AI and creativity in the workplace requires this kind of methodology.

2.1. Research Design

The present study adopts a quantitative research design to explore the impact of artificial intelligence on employee creativity in project-based organizations. The decision to use a quantitative approach was guided by the need to obtain accurate numerical data that would allow statistical analyses to test the hypotheses formulated. According to Creswell (2014), quantitative research is particularly suitable when the goal is to assess relationships between variables and quantify variations.

In this study, quantitative design allows data to be collected through a questionnaire, thus providing standardized measures of employees' perceptions of creativity and AI use. This approach supports the goal of generalizing results to a larger group of populations in PBOs, providing clear and direct answers to research questions (Babbie, 2015).

In addition, the quantitative design facilitates the use of statistical inference techniques that are essential to determine whether the observed differences in perceptions of creativity are statistically significant and whether they can be attributed to the influence of AI.

Using statistical tools such as regression analysis, mediation and correlation tests, this study aims to rigorously and systematically examine potential correlations between AI adoption and creativity in work settings.

The research design is thus closely aligned with the objectives of the survey, allowing for valid, evidence-based conclusions that can influence organizational policies and innovation management strategies in project-based organizations.

2.2. Data Collection

Data collection for this study was done using a standardized questionnaire intended to gauge how artificial intelligence affects employee creativity in project-based companies. An indispensable instrument for obtaining quantitative data, the questionnaire enables a uniform evaluation of participants' opinions.

The quiz was created by carefully going over the body of research on artificial intelligence and creativity in the workplace. Several questions were developed, based on measuring scales verified in earlier research and adjusted to suit the particular setting of PBOs, to capture different facets of creativity and AI use (Karwowski et al., 2018). The respondent's degree of agreement was measured using a 5-point Likert scale that ranged from "Strongly disagree" to "Strongly agree" for each question.

To ensure the questions were clear and the questionnaire worked, a pilot test was run with a small group of PBO staff members before it was distributed. The necessary adjustments were made previous to the official launch using the input received.

Participants received the questionnaire digitally by email, WhatsApp, and LinkedIn link. They were told that answering the questionnaire would take around three minutes and that their participation was totally voluntary and anonymous. Two weeks passed while responses were gathered, and then the information was taken out for examination.

The procedure of collecting data is intended to reduce any potential bias and guarantee maximum participation, privacy protection, and accuracy of the information gathered.

2.3. Description of the Sample

The validity of the conclusions of a quantitative survey depends largely on the representativeness of the sample used. In the present study, the sample was selected from employees of various project-based organizations. The only inclusion criterion adopted was being currently employed in a PBO, thus ensuring that all participants had direct experience

with work dynamics related to creativity and potentially the use of artificial intelligence in their work environment.

The sampling method used is non-probabilistic and for convenience, given the ease of access to participants through the companies' internal channels. This method was chosen to maximize the response to the questionnaire in a short time frame, which is essential to meet the research project's time deadlines. Although convenience sampling may limit the generalizability of results, it is often used in initial research on new study topics, where access to participants can be a significant challenge (Etikan et al., 2016).

The questionnaire was administered to 338 employees of various PBOs. This sample size was determined based on the variability of expected responses and the need to have adequate statistical power to detect significant differences, according to the criteria described by Cohen (1992) for quantitative studies.

Ultimately, the chosen sample allows for an adequate exploration of employees' perceptions of the impact of artificial intelligence on creativity, while taking into account the limitations imposed by the convenience sampling method.

2.4. Variables

In this study, the analysis focuses on the interactions between the impact of artificial intelligence and employee creativity, mediated by the frequency of participation in creative projects. Variables are divided into independent, dependent and mediator, each essential to explore the research objective.

2.4.1. Independent variables

Frequency of using AI in the work: Measures the frequency and intensity with which employees use AI tools in their daily work. This usage is assessed through questions that investigate several aspects, including types of AI technologies employed and the context of use. According to Jia et al., (2020), integrating AI into work processes can potentially improve productivity and stimulate creativity through automating repetitive tasks and providing new analytical capabilities.

Type of AI tools used: image generators: Specifies whether employees use AI software to generate images needed for their jobs. The initial question in the survey allowed for multiple available options regarding which artificial intelligence tools were used;

therefore, this variable is dichotomous and was created to ascertain whether employees were using image-generating software.

Perception on productivity as a result of using AI**:** This variable refers to an employee's perception regarding the impact AI is having on productivity. It is measured based on a Likert Scale of 1 to 5 where 1 indicates that the employee disagrees with the statement and 5 indicates that he or she completely agrees.

2.4.2. Dependent variable

Creativity**:** Employee creativity was measured using the scale developed by Karwowski et al., (2018), which assesses creative self-efficacy and creative personal identity. This scale was chosen for its ability to measure complex aspects of creativity, combining items of self-perception and self-assessment of an individual's creative ability. The questionnaire includes items that investigate employees' confidence in their ability to generate innovative ideas and their perception of themselves as creative individuals. Using a Likert scale, participants rate various statements that reflect their experiences and attitudes toward creative activities in the work context. Taking this specific measure allows us to explore not only the external manifestations of creativity, but also the internal components that motivate and influence creative behavior, which is particularly relevant in examining the impact of AI technologies on individual creativity.

2.4.3. Mediator

Frequency of realization of creative outputs: Represents how often employees are involved in tasks that require creative thinking and innovation, such as developing new products or services or implementing original marketing campaigns. This variable is crucial for determining whether artificial intelligence impacts creativity by measuring the frequency of creative project implementation. Shalley et al., (2004) showed that the frequency of creative assignments can amplify the effects of environmental stimuli, such as the use of AI, on individual creativity.

2.4.4. Control variables

Year of birth: Considered as a continuous variable, the age of participants could influence their propensity to use new technologies and their experience in creative activities.

Company size: Measured through the number of employees, company size can influence the availability of resources for innovative projects and AI adoption.
Years of work experience: Years of experience can reflect skill level and comfort with tasks that require creative thinking and innovation.
Highest level of education attained: From a high school diploma to a doctorate, the level of education can influence the ability to work with advanced technologies and contribute to creative projects.

2.5. Measurement scales

These variables are integrated into the analysis to explore how artificial intelligence may affect creativity differently in different contexts and under different conditions. The clear definition and measurement of these variables are essential to ensure the reliability and validity of the study results (Table 1).

Constructs	*N of items*	*Scales*
Gender	1	1 = Male, 2 = Female, 3 = Prefer not to answer
Year of birth	1	1 = Baby Boomers, 2 = Generation X, 3 = Millennials, 4 = Generation Z
Highest level of education attained:	1	1 = Compulsory schooling, 2 = High school diploma, 3 = Bachelor's degree, 4 = Master's or Master's degree, 5 = PhD or equivalent degree, 6 = Other
Years of work experience:	1	1 = 1-5 years, 2 = 6-10 years, 3 = Over 10 years
Current job description:	1	None
Sector of the organization (ATECO code)	1	1 = C (Manufacturing), 2 = D (Electricity, gas, steam and air conditioning supply), 3 = E (Water supply), 4 = F (Construction), 5 = G (Wholesale and retail trade), 6 = H (Transportation and storage), 7 = J (Information and communication services), 8 = K (Financial and insurance activities), 9 = L (Real estate activities), 10 = M (Professional, scientific, technical activities), 11 = N (Rental, travel agencies, business support activities), 12 = O (Public administration and defense; Compulsory social insurance), 13 = P (Education), 14 = Q (Health care and social assistance), 15 = R (Arts, sports, entertainment and recreation activities), 16 = S (Other service activities), 17 = U (Extraterritorial organizations and bodies), 18 = Other
Company size	1	1 = 1-10 employees, 2 = 11-50 employees, 3 = 51-250 employees, 4 = 251-500 employees, 5 = Over 500 employees

Frequency of realization of creative outputs	1	1 = Never, 2 = Rarely, 3 = Sometimes, 4 = Often, 5 = Always
Creativity	9	5-point Likert scale: 1 = Completely disagree, 5 = Completely agree
Frequency of use of AI in the work	1	1 = Never, 2 = Rarely, 3 = Sometimes, 4 = Often, 5 = Always
Type of AI tools used: Chatbot	1	1 = Yes, 0 = No
Type of AI tools used: Image generators	1	1 = Yes, 0 = No
Type of AI tools used: Word processors	1	1 = Yes, 0 = No
Type of AI tools used: Numerical analysis tools	1	1 = Yes, 0 = No
Perception on productivity as a result of using AI	1	5-point Likert scale: 1 = Completely disagree, 5 = Completely agree
Perception on creativity as a result of using AI	1	5-point Likert scale: 1 = Completely disagree, 5 = Completely agree
Perception on outputs as a result of using AI	1	5-point Likert scale: 1 = Completely disagree, 5 = Completely agree

Table 1: Number of items and measurement scale

2.6. Research Framework and Hypotheses

This research aims to investigate the impact of artificial intelligence on employee creativity within project-based organizations. The central research question is: Does the use of AI in project-based organizations impact employee creativity? To address this question, several hypotheses have been formulated based on an extensive literature review and the examination of relevant variables. The first hypothesis posits that the frequency with which AI is utilized in work activities significantly affects employee creativity. Regular interaction with AI tools is expected to stimulate creative thinking and enhance problem-solving skills. The second hypothesis suggests that the type of AI tools used, specifically image generators, has a significant impact on creativity. Image generators are believed to provide unique visual stimuli that can inspire innovative ideas and enhance creative outputs. The third hypothesis explores the perception of productivity resulting from AI use and its effect on creativity, positing that employees who perceive AI as a tool that boosts

their productivity are likely to exhibit higher levels of creativity, as productivity gains can free up cognitive resources for creative thinking.

In addition to these direct effects, the study also considers mediation effects through the frequency of realization of creative outputs. The fourth hypothesis proposes that the frequency of realizing creative outputs mediates the relationship between the frequency of AI use in work and creativity, suggesting that regular AI use leads to more frequent creative outputs, which in turn enhances overall creativity. Similarly, the fifth hypothesis posits that the frequency of realizing creative outputs mediates the relationship between the use of image generators and creativity, with the use of image generators expected to result in more frequent creative outputs, thereby boosting creativity. Lastly, the sixth hypothesis asserts that the frequency of realizing creative outputs mediates the relationship between the perception of productivity resulting from AI use and creativity, hypothesizing that employees who perceive AI as enhancing their productivity are likely to produce creative outputs more frequently, thus increasing their overall creativity. The proposed mediation model hypothesizes that AI use, measured through the frequency of use, the use of image generation tools, and the perceived impact on productivity, directly influences employee creativity and indirectly through participation in creative projects. This model aims to elucidate the pathways through which AI integration in project-based organizations can foster a more creative and innovative workforce, providing a comprehensive understanding of how AI tools can be leveraged to enhance creativity in organizational settings.

2.7. Data Analysis

In the data preparation phase of our study, we implemented several essential techniques to ensure the accuracy and validity of subsequent analyses. Initially, we performed a cleanup of the dataset by removing all incomplete responses (24), then we eliminated all responses in which the employee stated that he did not use artificial intelligence in their work. To do this, a recode of the variable “Frequency of AI Use” was performed by removing the responses in which the candidate answered “Never” to the question (39). In doing so, we ensured that every data point used was complete. Maintaining the excellent quality of the dataset and preventing bias in the analysis results depend on this stage (Tabachnick & Fidell, 2013). 277 replies were in the final sample after dataset cleaning.

Finally, we grouped items related to the measurement scales of creativity by averaging the items for each construct, resulting in a single representative score for creativity. Next, our mean value of creativity given by the Likert scale was 3.729, consequently we created a dummy variable indicating whether an individual feels creative depending on whether his or her score is above or below the mean value of creativity (Table 2). This choice was made based on the data treatment of the Karwovski scale, where even in the paper "Measuring creative self-efficacy and creative personal identity" (Karwovski et al., 2018) the mean value of individuals' responses was identified and distinguished on that basis into creative and non-creative. This method made it possible to synthesize the data while preserving high precision and detail in the variable analyzed.

Constructs	Coding
Creativity	0 = < 3.729, 1 = ≥ 3.729

Table 2. Dummy variable

In assessing the validity of the measurement model, we conducted an analysis of Cronbach's alpha (α) for the creativity scale. The results of this analysis are presented in Table 3. The measurements showed that the construct related to creativity recorded the following alpha value:

Constructs	Cronbach's alpha (α)
Creativity	0.928

Table 3. Cronbach's alpha (α)

The constructs related to creativity showed an alpha of 0.928. All the constructs show an alpha over the commonly accepted threshold of 0.70 (Nunnally, 1978); for that reason, the scale for measuring creativity (Karwovski et al., 2018) is considered very reliable.

Following collection, IBM SPSS Statistics software was used to handle and evaluate the data gathered via the questionnaire. Reliability and sophisticated statistical analysis capabilities of this program were selected since they are necessary to guarantee correct interpretation of quantitative data (Field, 2013).

The distribution of age, gender, education level, and years of work experience was one of the sample features that was generally summarized by descriptive analyses. With the

computation of averages, standard deviations, and frequencies for every significant characteristic, the responders' profile was well understood.

Spearman correlations and multiple linear regression were two inferential methods used to evaluate the link and influence of the independent variables on the dependent variable to test the study hypotheses (Cohen et al., 2003).

Furthermore, linear regression and binary logistic regression were used in mediation analyses to look at the relationship between employee creativity and AI use as mediated by the frequency of creative projects. This stage gave us a more matrixed knowledge of the dynamics between technology and innovation by enabling us to ascertain if mediating the frequency of creative projects between AI use and creativity has an impact.

All through the analysis, the 90% confidence interval was used. The p-value less than 0.1 was then used to judge the hypotheses to be significant.

These analysis methods working together provide strong, trustworthy, and valid study findings, enabling well-founded conclusions on the influence of artificial intelligence on creativity in the workplaces of PBOs.

2.8 Ethical Issues

Trust and integrity of the scientific process depend on ethical behavior in research. The rights and welfare of participants were safeguarded by several ethical steps in this study on the influence of artificial intelligence on employee creativity in project-based organizations.

Before taking the questionnaire, each participant received an informed consent form that outlined in great depth the goals of the study, the voluntary character of their involvement, the processes involved, and the freedom to withdraw at any moment without consequence. All responses would be handled with utmost secrecy and utilized exclusively for study, the form explicitly stressed (Resnik, 2010).

All data was anonymized before analysis to protect privacy. To protect participants' identity, all references that would have allowed for their direct or indirect identification were tagged out of the gathered data. This method guarantees that, in compliance with the General Data Protection Regulation (GDPR) principles, participants' personal information is kept safe and private (European Parliament and Council, 2016).

Verifying that the study complies with international research ethical standards and guaranteeing participant rights are always respected is dependent on this stage (World Medical Association, 2013).

Following these moral guidelines helps to establish participant and scientific community confidence in the study, which in turn enhances the validity of the findings.

CHAPTER 3 – FINDINGS AND DISCUSSION

In this section of our study, we will present and discuss findings from our investigation of the impact of artificial intelligence on the creativity of the employees. Through descriptive statistics, correlations, and regressions with mediation, we will explore how our independent variables can influence the creativity. The discussion will integrate our findings with existing literature to assess adherence to or deviations from theoretical assumptions, highlighting new potential implications for the field of project-based organizations.

3.1. Frequencies and Descriptive Statistics

Table 4 illustrates the distinct features of the sample composition across the variables. Out of 277 participants, the gender breakdown shows that most were male (60.3%), followed by female (38.3%), and a tiny percentage (1.4%) who would have rather not answered. In the sample, this distribution points to a little higher proportion of men.

The birth year of participants shows a notable preponderance of younger people; 39.7% of them were born between 1996 and 2004, which reflects a focus on the younger working population. Among them, 34.7%, were early to mid-career professionals born between 1981 and 1995. In the meanwhile, just 4.0% of those born between 1959 and 1964 represented a small portion of the older age group, whereas 21.7% of those born between 1965 and 1980 represented more experienced people.

The participants ranged in their highest degree of schooling. A highly educated group, the majority of participants (42.2%) had master's degrees. Furthermore, demonstrating a varied educational background were 29.2% with a bachelor's degree and 24.2% with a high school diploma. Of those, just 2.9% had a doctorate or its equivalent, and 1.4% had other degrees.

Participant years of work experience ranged greatly. The workforce is very young and developing, as seen by the fact that over half of the sample (54.5%) had 1–5 years of experience. With over ten years of expertise, another 34.3% showed a sizable percentage of seasoned experts. Less people (11.2%) have six to ten years of experience. Regarding the industry sector (ATECO code), the participants came from many different industries. Information and communication services (16.2%) and professional, scientific, and technological activities (18.1%) were the most often occurring sectors, suggesting a significant presence of knowledge-based companies. Further noteworthy industries were

manufacturing (7.9%), health and social work (6.1%), and other service activities (9.4%). Sectors less represented were public administration and defense (3.6%), wholesale and retail trade (5.8%), and construction (2.2%).

The companies where the participants worked ranged in size as well (number of workers). Significant presence in large corporations was shown by the largest group (35.4%), which worked for firms employing more than 500 people. The 28.9% of small enterprises with 1–10 employees indicate a sizable proportion of small business owners. Less represented medium-sized businesses had 11–50 employees (19.5%), 51–250 employees (10.5%), and 251–500 employees (5.8%).

Thirteen percent of participants occasionally, twenty-two percent frequently, and seventeen percent always completed creative output projects. This suggests that a sizable percentage of the sample routinely works on creative projects.

Participants used AI with varying degrees of frequency at work; 43.7% used them occasionally, 32.9% frequently, and 6.1% always. This implies that while not yet universal, AI tools are becoming more and more common in the workplace.

Chatbots were the most often utilized AI tool type—87.7% of participants reported utilizing them daily. Of the participants, 34.7% used image generators, 40.1% text processors, and 11.2% numerical analytic tools. This shows how widely different AI tools are being used, chatbots being the most common.

According to a survey on participants' perceptions of the influence of AI on productivity, 39.7% said that AI increased their productivity, and 18.1% said that it did so strongly. Regarding creativity, 25.3% agreed, 11.9% said they felt more creative as a result of AI, and 27.4% said nothing at all.

About the enhancement of outputs brought about by AI, 35.0% agreed and 15.5% strongly agreed, indicating a generally positive opinion of the advantages of AI for work quality. The construct of creativity finally revealed that 52.0% of participants scored 1, indicating a binary measurement of creativity and implying that a small majority of participants satisfied the requirements for being deemed adequately creative.

Constructs	Categories	N	%
Gender	Male	167	60.3
	Female	106	38.3
	I prefer not to answer	4	1.4
Year of birth	1959-1964	11	4.0
	1965-1980	60	21.7
	1981-1995	96	34.7
	1996-2004	110	39.7
Highest level of education attained	High school diploma	67	24.2
	Bachelor's degree	81	29.2
	Master's or Master's degree	117	42.2
	Ph.D. or equivalent degree	8	2.9
	Other (specify)	4	1.4
Years of work experience	1-5 years old	151	54.5
	6-10 years	31	11.2
	Over 10 years old	95	34.3
Sector of the organization (ATECO Code):	C (Manufacturing activities)	22	7.9
	D (Electricity, gas, steam and air conditioning supply)	2	0.7
	F (Construction)	6	2.2
	G (Wholesale and retail trade)	16	5.8
	H (Transportation and warehousing)	5	1.8
	J (Information and communication services)	45	16.2
	K (Financial and insurance activities)	12	4.3
	M (Professional, scientific, technical activities)	50	18.1
	N (Rental, travel agencies, business support activities)	1	0.4
	O (Public administration and defense; compulsory social insurance)	10	3.6
	P (Education)	18	6.5
	Q (Health care and social assistance)	17	6.1
	R (Arts, sports, entertainment and recreation activities)	16	5.8
	S (Other service activities)	26	9.4
	U (Extraterritorial organizations and bodies)	3	1.1
	Other	28	10.1
Company size (number of employees)	1-10 employees	80	28.9
	11-50 employees	54	19.5
	51-250 employees	29	10.5
	251-500 employees	16	5.8
	Over 500 employees	98	35.4

Frequency of realization of creative outputs	Never	19	6.9
	Rarely	57	20.6
	Sometimes	86	31.0
	Often	67	24.2
	Always	48	17.3
Frequency of using AI in the work	Rarely	48	17.3
	Sometimes	121	43.7
	Often	91	32.9
	Always	17	6.1
Type of AI tools used: Chatbot	0	34	12.3
	Chatbot (ChatGPT, Mitsuku, Watson Assistant ecc.)	243	87.7
Type of AI tools used: Image generators	0	181	65.3
	Image generators (DALL-E, Midjourney, ecc.)	96	34.7
Type of AI tools used: Word processors	0	166	59.9
	Word processors (GPT, Bert, T5, ecc.)	111	40.1
Type of AI tools used: Numerical analysis tools	0	246	88.8
	Numerical analysis tools (TensorFlow, PyTorch, ecc.)	31	11.2
Type of AI tools used: Other	Other	10	3.6
	Missing	267	96.4
Perception on productivity as a result of using AI	1	10	3.6
	2	33	11.9
	3	74	26.7
	4	110	39.7
	5	50	18.1
Perception on creativity as a result of using AI	1	27	9.7
	2	71	25.6
	3	76	27.4
	4	70	25.3
	5	33	11.9
Perception on outputs as a result of using AI	1	19	6.9
	2	33	11.9
	3	85	30.7
	4	97	35.0
	5	43	15.5
Creativity	0	133	48.0
	1	144	52.0

Table 4. N, %

In addition to the frequency distributions, we also assessed participants' perceptions on specific aspects of AI use in their work, using a scale from 1 to 5, where 1 represents "Strongly disagree" and 5 represents "Strongly agree."

Perception on productivity as a result of using AI was measured with the question "Using artificial intelligence has improved my work productivity", which had a mean score of 3.57 (Std. Deviation = 1.032). This suggests that, on average, participants tend to agree that AI has improved their productivity, although there is some variability in responses.

Perception on creativity as a result of using AI was measured with the question "Using artificial intelligence in my work makes me feel more creative", which had a mean score of 3.04 (Std. Deviation = 1.174). This indicates a more neutral stance, with participants being somewhat divided on whether AI enhances their creativity.

Perception on outputs as a result of using AI was measured with the question "I believe that my outputs have improved as a result of using artificial intelligence", which had a mean score of 3.40 (Std. Deviation = 1.098). This reflects a general agreement that AI has led to improved outputs, albeit with a range of opinions.

Finally, the overall creativity score (before converting to a binary variable) had a mean of 3.7292 (Std. Deviation = 0.97146), indicating a relatively high self-assessment of creativity among participants. This measure provides a more nuanced view of creativity before it was simplified into a binary variable for further analysis.

3.2. Correlations

In this section, we explore the relationships between the various constructs measured in our study using Spearman's correlations. This analysis helps us understand the degree to which different variables are associated with each other.

Multiple noteworthy connections between the constructs are shown by the Spearman's correlation study, as shown in Table 5. Gender significantly negatively correlates with the kind of AI tools employed, picture generators ($\rho = -0.147$, $p < 0.05$), suggesting that women are marginally less likely than men to use image generators. This raises the possibility that gender disparities in the use of particular AI tools may reflect different degrees of interest or familiarity with particular technology.

Table 5. Correlations

Constructs	*1*	*2*	*3*	*4*	*5*	*6*	*7*	*8*	*9*	*10*	*11*	*12*	*13*	*14*	*15*	*16*
1. Gender	--															
2. Year of birth	.075	--														
3. Highest level of education attained	.048	-.049	--													
4. Years of work experience	-.102	-.787**	.028	--												
5. Company size	-.036	-.005	.264**	.036	--											
6. Sector of the organization (ATECO code)	.080	.047	-.047	-.057	-.067	--										
7. Frequency of realization of creative outputs	.038	-.253**	.061	.279**	-.107	-.053	--									
8. Frequency of using ai in the work	.004	.104	.088	-.107	-.034	.078	.146*	--								
9. Type of ai tools used: chatbot	-.082	.207**	-.034	-.262**	.032	-.042	-.081	.084	--							
10. Type of ai tools used: image generators	-.147*	.003	-.033	.023	-.183**	-.030	.223**	.223**	.111	--						
11. Type of ai tools used: word processors	.031	-.032	.173**	.077	.020	-.128*	.081	.192**	-.210**	.024	--					
12. Type of ai tools used: numerical analysis tools	-.117	.108	.108	-.117	.109	.001	-.039	.133*	-.077	-.138*	.084	--				
13. Perception on productivity as a result of using ai	.007	.137*	.008	-.130*	.009	-.045	.164**	.630**	.009	.165**	.146*	.060	--			
14. Perception on creativity as a result of using ai	-.065	.016	.008	-.010	.022	-.104	.086	.407**	.057	.216**	.107	.014	.597**	--		
15. Perception on outputs as a result of using ai	-.044	.143*	.018	-.134*	.037	-.083	.092	.485**	.108	.216**	.169**	.021	.706**	.699**	--	
16. Creativity	.069	-.107	-.113	.177**	-.111	-.087	.354**	.148*	-.051	.123*	.049	-.048	.190**	.071	.108	--

* p < 0.1, ** p < 0.05, *** p < 0.01

Birth year shows several noteworthy links. As may be predicted, there is a strong negative connection ($\rho = -0.787$, $p < 0.01$) with years of work experience because younger people by nature have less job experience. Year of birth is further positively connected ($\rho = 0.207$, $p < 0.01$) with the kind of AI technologies used: chatbots. These results show a generational trend of younger workers using AI more frequently and including these capabilities into their work.

Higher educated people are more prone to work for bigger companies, as seen by the positive correlation ($\rho = 0.264$, $p < 0.01$) between the greatest degree of education acquired and firm size. A positive association ($\rho = 0.173$, $p < 0.01$) with the kind of AI tools used—word processors—also suggests that highly educated people are more likely to employ sophisticated AI text processing tools, maybe because they have more extensive training and experience with these technologies.

Several important connections are shown by years of job experience. It shows that more seasoned employees are more involved in creative activities since it is favorably connected with the frequency of realization of creative products ($\rho = 0.279$, $p < 0.01$). On the other hand, a negative association exists with the kind of AI tools used: chatbots ($\rho = -0.262$, $p < 0.01$), indicating that less seasoned professionals are more likely to utilize chatbots. Work experience also positively correlates with creativity ($\rho = 0.177$, $p < 0.01$), suggesting that more seasoned people are likewise regarded as being more creative.

Significant correlations between the sector of the business (ATECO Code) and most components indicate that sector-specific features might not have a major impact on the use of AI technologies or the production of creative products.

The kind of AI tools utilized, picture generators, is negatively correlated with company size ($\rho = -0.183$, $p < 0.01$), suggesting that workers in larger firms are less likely to use image generators, for reasons that could include organizational policies or resource availability.

Because people working on creative projects are more likely to employ AI tools, the frequency of realizing creative outputs is positively connected with the frequency of using AI in the work ($\rho = 0.146$, $p < 0.05$). Higher creativity is also linked to regular participation in creative activities, as seen by the positive association ($\rho = 0.354$, $p < 0.01$). This implies that participating in creative activities might improve one's creative skills, maybe by giving one more chance to try new things and invent.

Strong connections are found with several particular AI tools regarding the frequency of AI use in the job. The kind of AI tools employed is positively correlated with chatbots ($\rho = 0.630$, $p < 0.01$) and mediumly positively with word processors ($\rho = 0.192$, $p < 0.01$) and picture generators ($\rho = 0.223$, $p < 0.01$). This implies that people that use one kind of AI tool a lot are probably going to use other types as well, which reflects a general tendency to include AI into their work processes.

Positively with the kind of AI tools used, picture generators, and significantly with the frequency of using AI in the task ($\rho = 0.630$, $p < 0.01$) is perception on productivity as a result of using AI. These associations imply that people who enjoy creative pursuits and use AI tools see their productivity improving more. Moreover, the notion that creative involvement improves perceived productivity is supported by the strong positive connection with creativity ($\rho = 0.164$, $p < 0.01$).

Strong associations between perception of creativity as a result of AI and frequency of utilizing AI in the work ($\rho = 0.407$, $p < 0.01$) and creativity ($\rho = 0.071$, $p = 0.238$) suggest that those who use AI tools regularly feel more creative. This implies that by offering new capacities and efficiency, AI tools may promote original thought and innovation.

The frequency of utilizing AI in the task ($\rho = 0.485$, $p < 0.01$) and the kind of AI tools used (image generators, $\rho = 0.216$, $p < 0.01$) are substantially connected with perception on the outputs resulting from using AI. This implies that active participation in creative initiatives and regular usage of AI tools result in a perception of better work results. Furthermore, a positive connection ($\rho = 0.108$, $p = 0.073$) shows that people who believe that AI has enhanced their outputs also think of themselves as more creative.

Years of job experience ($\rho = 0.177$, $p < 0.01$), frequency of realizing creative products ($\rho = 0.354$, $p < 0.01$), and frequency of using AI in the work ($\rho = 0.148$, $p < 0.05$) are among the factors with which creativity itself significantly correlates. According to these associations, using AI technologies, engaging in creative activities, and having work experience all affect creativity. Furthermore, supporting the notion that creative involvement improves perceived productivity and overall work effectiveness is the positive correlation between creativity and perception of productivity as a result of applying AI ($\rho = 0.164$, $p < 0.01$).

In general, these correlations show complex links between work characteristics, demographics, the use of AI tools, and views of productivity, creativity, and work outputs.

These discoveries stress the intricate relationship between technology use and both human and organizational results and help us comprehend how many factors interact and affect one another in the context of AI adoption in the workplace.

3.3. Regressions

CONCEPTUAL FRAMEWORK 1

The logistic regression analysis was conducted to examine the impact of various predictors on the likelihood of increased creativity among respondents. The choice of these independent variables was guided by the significant results observed in the correlation analysis, which indicated potential relationships between these variables and creativity. The research model is presented in Figure 1.

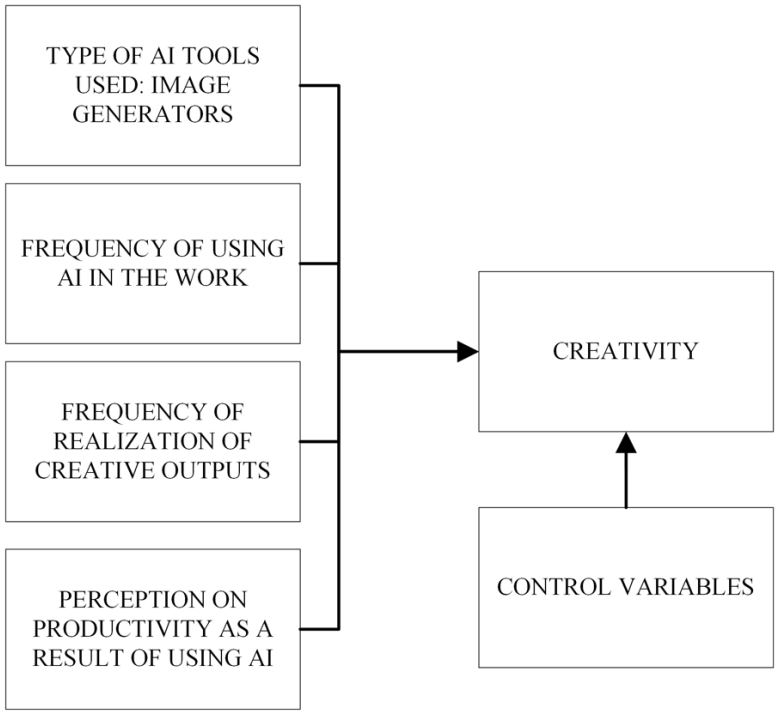

Figure 1. Research model 1

The results of the logistic regression analysis are presented in the Table 6.

Variables	Creativity
Year of birth	0.056
Highest level of education attained	-0.291*
Years of work experience	0.344
Company size (number of employees)	-0.075
Frequency of realization of creative outputs	0.591***
Frequency of using AI in the work	0.126
Type of AI tools used: Image generators	0.062
Perception on productivity as a result of using AI	0.289*
R^2	0.225

* p < 0.1, ** p < 0.05, *** p < 0.01

Table 6. Regressions of conceptual framework 1

Several new information on the variables influencing the possibility of higher creativity is provided by the logistic regression model. Year of birth does not significantly affect creativity, as seen by the coefficient (B = 0.056, p = 0.816) being not statistically significant. Comparably, the greatest degree of schooling obtained has a detrimental but almost significant impact on originality (B = -0.291, p = 0.059). Though this effect is not strong enough to be definitive, it implies that having a higher education degree may somewhat lower the chance of being regarded as creative.

Since the coefficient for Years of job Experience (B = 0.344, p = 0.135) is not statistically significant, creativity is not much influenced by the amount of job experience. Moreover, creativity is not much influenced by the size of the organization (B = -0.075, p = 0.366). By contrast, the frequency with which creative products are realized has a very significant positive impact on creativity (B = 0.591, p < 0.001). Accordingly, those who work creatively on a regular basis are far more likely to be seen as creative. Still, creativity is not much influenced by how often AI tools are used at work (B = 0.126, p = 0.547).

Furthermore, not significantly affecting creativity is the use of image generators (B = 0.062, p = 0.832). Conversely, creativity is positively but not statistically significantly impacted by the perception of productivity brought about by AI (B = 0.289, p = 0.083). This suggests a tendency—more research is required to verify this—that seeing AI as boosting productivity may increase creativity.

Setting the baseline in logistic regression, the constant term is significant (B = -2.899, p = 0.035). The strongest favorable impact of the frequency of realizing creative outputs on the possibility of being regarded as creative is, overall, the most significant discovery. Use of AI techniques and demographic characteristics are two other variables that do not have statistically significant effects. The need of doing creative activities to improve creativity is highlighted by these findings.

CONCEPTUAL FRAMEWORK 2

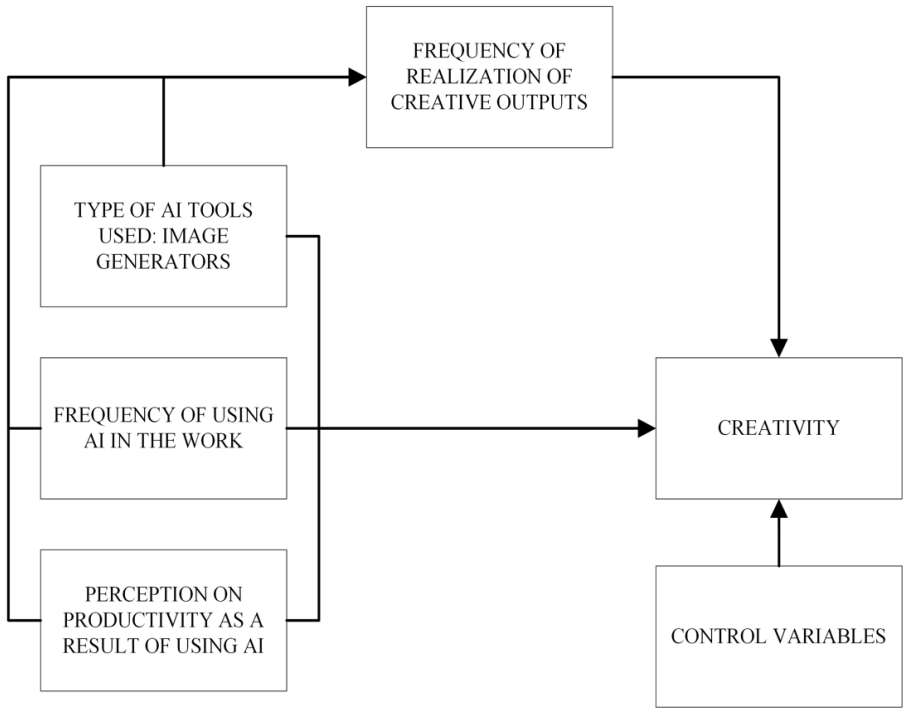

Figure 2. Research model 2

The mediation model depicted in the conceptual framework examines the impact of various predictors on creativity, with the frequency of realization of creative outputs serving as a mediating variable. The independent variables include the type of AI tools used (specifically image generators), the frequency of using AI in the work, and the perception on

productivity as a result of using AI. Creativity is the dependent variable, and several control variables are included to account for potential confounding factors (Figure 2).

3.3.1. Mediation analysis

The first step in the mediation analysis involves examining the effect of the independent variables on the mediator, which in this case is the frequency of realization of creative outputs. The results of the regression analysis are shown in Table 7.

Variables	Frequency of realization of creative outputs
Year of birth	-.138
Highest level of education	.105
Years of work experience	.273*
Company size (number of employees)	-.067
Frequency of using AI in the work	.133
Type of AI tools used: Image generators	.419**
Perception on productivity as a result of using AI	.101
R^2	0.168

* p < 0.1, ** p < 0.05, *** p < 0.01

Table 7. Regressions of conceptual framework 2 for the mediator

3.3.1.1 Regression Analysis for the Dependent Variable with the Mediator

The next step involves examining the effect of the independent variables and the mediator on creativity. The results of the logistic regression analysis are shown in Table 8.

Variables	Creativity
Year of birth	.056
Highest level of education attained	-.291*
Years of work experience	.344
Company size (number of employees)	-.075
Frequency of realization of creative outputs	.591**
Frequency of using AI in the work	.126
Type of AI tools used: Image generators	.062
Perception on productivity as a result of using AI	.289*
R^2	0.168

* p < 0.1, ** p < 0.05, *** p < 0.01

Table 8. Regressions of conceptual framework 2 for the dependent with the mediator

3.3.1.2. Mediation Analysis Calculation

The mediation analysis reveals several key effects of the use of artificial intelligence on employee creativity within project-based organizations. Initially, we consider the direct effects of independent variables on the mediator, which in this case is the frequency of realization of creative outputs. The analysis shows that the frequency of using AI in work directly impacts the frequency of realizing creative outputs, with a direct effect magnitude of 0.133. Additionally, the type of AI tools used, particularly image generators, exhibits a substantial direct effect on the frequency of realizing creative outputs, quantified at 0.419, indicating a strong and significant influence. Furthermore, the perception of productivity as a result of using AI also directly affects the frequency of realizing creative outputs, albeit with a smaller magnitude of 0.101.

Next, the effect of the mediator (frequency of realization of creative outputs) on creativity is considered. This relationship shows a strong direct effect, with a coefficient of 0.591,

indicating that the frequency with which creative outputs are realized significantly enhances overall creativity.

When examining the direct effects of the independent variables on creativity, not mediated by the frequency of realizing creative outputs, the frequency of using AI in work directly contributes to creativity with an effect size of 0.126. The use of image generators has a smaller direct effect on creativity, measured at 0.062. Conversely, the perception of productivity resulting from AI use shows a more considerable direct effect on creativity, quantified at 0.289.

The mediation analysis also explores the indirect effects of the independent variables on creativity through the mediator. The indirect effect of the frequency of using AI in work on creativity is calculated as 0.079, derived from multiplying its effect on the frequency of realization of creative outputs (0.133) by the effect of the mediator on creativity (0.591). Similarly, the indirect effect of using image generators on creativity is substantial at 0.248, while the indirect effect of the perception of productivity due to AI use on creativity is 0.060.

Finally, the total effects, which are the sum of both direct and indirect effects, provide a comprehensive understanding of the impact of AI use on creativity. The total effect of the frequency of using AI in work on creativity is 0.205, combining the direct effect of 0.126 and the indirect effect of 0.079. The total effect of using image generators on creativity is 0.310, with a direct effect of 0.062 and an indirect effect of 0.248. The total effect of the perception of productivity resulting from AI use on creativity is the highest at 0.349, combining a direct effect of 0.289 and an indirect effect of 0.060.

This mediation model underscores the nuanced pathways through which AI use influences creativity in project-based organizations, highlighting both direct and mediated effects, and providing a detailed understanding of how different aspects of AI integration can enhance creative outcomes.

3.3.2 Interpretation

The findings from the mediation analysis reveal several key insights into how the use of artificial intelligence tools impacts employee creativity within project-based organizations. The analysis indicates a significant positive effect of using image generators on the frequency of realization of creative outputs. This relationship, combined with the

significant positive effect of the frequency of realization of creative outputs on creativity, robustly supports the mediation hypothesis. This implies that the use of image generators indirectly enhances creativity by increasing the frequency with which employees engage in creative tasks. The use of image generators provides unique visual stimuli and creative prompts that inspire employees, leading to more frequent creative outputs and, consequently, higher overall creativity.

Additionally, the perception of productivity resulting from AI use also shows a significant positive direct effect on creativity. This finding suggests that when employees perceive AI tools as enhancing their productivity, they are likely to be more creative. The increased efficiency and reduction in routine tasks provided by AI tools allow employees to dedicate more cognitive resources and time to creative endeavors, thus boosting their creativity.

The total effects analysis reveals that both direct and indirect pathways significantly contribute to enhancing creativity. The use of image generators exhibits the most substantial total effect on creativity, with a combined direct and indirect effect of 0.310. This underscores the powerful role that specific AI tools can play in fostering a creative work environment. Image generators serve as a catalyst for creative thinking and innovation by providing immediate visual feedback and stimulating new ideas.

The perception of productivity as a result of using AI also has a notable total effect on creativity, measured at 0.349. This indicates that employees who recognize the productivity benefits of AI are more inclined to engage in creative activities, resulting in enhanced creative outputs. This finding highlights the importance of promoting a positive perception of AI tools within the organization to maximize their creative potential.

The frequency of using AI in work, with a total effect of 0.205, further demonstrates that regular interaction with AI tools can lead to higher creativity. This regular use facilitates familiarity with the tools and their capabilities, allowing employees to integrate AI more effectively into their creative processes.

Moreover, the findings suggest that years of work experience also positively influence creativity indirectly through their impact on the frequency of engaging in creative tasks. Experienced employees are likely to have developed a more refined creative process and can leverage AI tools more effectively, resulting in more frequent and higher-quality creative outputs.

In conclusion, the mediation analysis highlights the critical role of the frequency of realization of creative outputs as a mediator in enhancing creativity. The use of specific AI tools, such as image generators, and the perception of productivity gains from AI, contribute indirectly to higher creativity by fostering more frequent engagement in creative activities. These findings underscore the importance of practical engagement in creative tasks and the supportive role of AI tools in facilitating such engagement. Organizations aiming to enhance employee creativity should focus on integrating AI tools that directly stimulate creative processes and promote a positive perception of AI's productivity benefits. By doing so, they can create an environment conducive to innovation and sustained creative growth.

3.4. Discussions

3.4.1. Key findings

A study of how artificial intelligence affects employee creativity in project-based organisations produced a number of important conclusions on how creative people believe they are. First of all, although the regression analysis showed that the frequency of using AI in the work was not statistically significant (B = 0.126, p = 0.547), it was originally predicted to have a substantial impact on self-perceived creativity. This implies that employees' sense of their own creativity is not immediately improved by just employing AI tools more often.

But it matters a lot what kind of AI technologies are used. In particular, the frequency of the realization of creative outputs is greatly influenced by the variable Type of AI tools used: image generators, which in turn has a major favorable effect on creativity. Higher levels of creative production were reported by employees using AI software for image creation, such DALL-E and Midjourney. By providing quick idea prototyping and instant visual feedback, these tools let staff members more freely and effectively explore innovative ideas. This finding supports the theory of Boden (1998), according to which artificial intelligence expands human creativity by bringing new patterns and shapes that are hard to imagine without the use of technology.

Moreover, creativity and perception of productivity as a result of using AI were positively associated (B = 0.289, p = 0.083). This implies a propensity that workers who believe AI has increased productivity are more inclined to feel creative. This is probably true because

more output gives one more time and mental capacity for creative thought. Brynjolfsson and McAfee (2014), who emphasize how AI might improve efficiency as well as creative potential, bolster this link.

A major mediating element found by the study was the frequency of realization of creative outputs. The mediation analysis showed that the higher frequency of creative project participation is a partial realization of the effect of AI on self-perceived creativity ($B = 0.591$, $p < 0.001$). As Shalley et al., (2004) found, regular creative activity increases the impact of environmental factors, such artificial intelligence, on individual creativity. This mediating effect emphasizes the need of consistently using AI technologies in creative projects in addition to having access to them in order to fully exploit their potential advantages.

Regression study also showed that although the frequency of realizing creative products has a very substantial positive impact on creativity, the direct impacts of the frequency of utilizing AI in the task and the type of AI tools used: image generators were not statistically significant. This result emphasizes how complicated and mediated by the frequency of creative interactions rather than the use of AI tools is the process by which AI affects self-perceived creativity.

These important results show, finally, that the efficient application of AI in PBOs can greatly increase the perceived creativity of employees. Important aspects are the function of particular AI tools, such picture generators, and the impression of productivity gains. In this connection, the frequency with which workers produce creative outputs also plays a crucial mediator role, underscoring the need of creating a work environment that promotes and supports regular creative activities. These revelations advance knowledge of how artificial intelligence can be used to increase perceived creativity in work environments.

3.4.2. Interpretations

The results of this study provide multiple interpretations on the connection between AI use and employees' self-perceived creativity in project-based organizations. First of all, although the frequency of AI use in the workplace did not directly improve self-perceived creativity, its indirect impacts via other factors point to a more complex role. The assumption that the context of AI use is important is supported by Amabile's (1996)

emphasis on the complicated interaction of elements, such as the surroundings and available tools.

The noteworthy result is the significant improvement in self-perceived creativity of the frequency of realization of creative outputs. Regular creative work improves people's confidence in their own creative ability. Shalley et al., (2004) discuss how regular creative activity can enhance originality and creative thinking. The mediation effect discovered in this work supports the findings of Mumford, Scott, Gaddis, and Strange (2002), which emphasize the need of participating in creative activities for fostering creative self-efficacy.

The great influence of the image generators type of AI tools on the frequency of creative output realization implies that particular AI tools offer special advantages. Boden (1998) talks on how AI technologies can provide new patterns and stimuli, hence increasing the creative options accessible to users. This is especially important in professions that need for visual and design skills since image generators can quickly turn abstract concepts into concrete products, increasing perceived inventiveness and creative confidence. Likewise, McCormack et al., (2019) investigate how new kinds of inspiration and instant feedback offered by AI-driven visual tools can improve creative processes.

The significance of perceived efficiency in creative processes is shown by the favorable link between perception of productivity as a result of applying AI and self-perceived creativity. Brynjolfsson and McAfee (2014) contend that as technology improves productivity, it can free up cognitive resources so people can concentrate more on creative activities. This study bolsters this idea by demonstrating that workers who use AI feel more productive and creative as well, probably because they can devote more time and mental energy to creative activities and less time to routine chores. Research by Sarooghi et al., (2015) that discovered apparent productivity gains frequently result in higher creative output lends further credence to this link.

The little direct effect of frequency of utilizing AI in the task on perceived creativity by the individual implies that the simple existence of AI tools is insufficient. The research of Amabile and Kramer (2011) emphasizes how important the environment and tool use are to promoting creativity. AI needs to be integrated so as to support creative processes rather than just acting as an extra tool if it is to have a good effect on creativity. West and

Sacramento (2012), who stress the requirement of suitable tool integration and encouraging surroundings to optimize creative potential, share this view.

The good influence of years of work experience on self-perceived creativity, mediated by the frequency of creative outputs, suggests that experience affects how well people can use AI tools for creative purposes. This is consistent with the research of Mumford et al., (2012) who stress the need of experience in developing original problem-solving abilities. Moreover, the research by Perry-Smith and Mannucci (2017) implies that people can better use new technology for creative results when they have experience and the ensuing familiarity with creative procedures.

The study's results emphasize that, although using AI tools directly may not immediately increase self-perceived creativity, their function in enabling frequent creative tasks and increasing productivity is essential. The kind of AI technologies and how they are applied greatly affect how well they work to boost creativity. This emphasizes the requirement of creating settings in which AI tools are not just accessible but also incorporated in ways that facilitate and improve creative processes inside enterprises. In this way, PBOs may use AI to increase staff members' self-esteem in their creative capacities, which will encourage creativity and excellence in their projects. These discoveries advance knowledge about the use of artificial intelligence to increase perceived creativity in work environments.

CONCLUSION

According to the study's findings, AI technologies must be included into a supportive atmosphere that encourages regular creative activity in order to effectively improve employee creativity in project-based organizations. Just giving AI technologies is not enough; businesses must actively create the environment that encourages their innovative and efficient application. Several important findings and recommendations from the study are included into this conclusion.

To improve creativity generally, one must regularly engage in creative activities. This result implies that PBOs should give top priority to organizing project assignments and work conditions such that staff members can regularly participate in creative activities. Establishing a friendly environment where staff members feel motivated to try new things and be creative is essential. This includes putting into place rules that set out time specifically for creative endeavors, honoring and rewarding creative work, and encouraging a collaborative and always learning culture (Shalley et al., 2004).

Creative processes need the purposeful integration of AI technologies. Organizations must make sure AI technologies are applied in ways that foster creativity; it is not enough to just give access to these tools. This is choosing the appropriate AI tools according to particular creative requirements. For example, by allowing fast prototyping and offering direct visual feedback, image generators have demonstrated to be highly beneficial in fostering creativity (Boden, 1998; McCormack et al., 2019). As such, PBOs ought to make investments in AI technologies that complement their creative objectives and the particular needs of their projects.

Optimizing the potential of AI tools mostly depends on training and development. Not only must employees receive sufficient training in the technical components of these instruments, but also in their creative application. Establishing ongoing professional development initiatives will enable staff members to remain current with innovative approaches and AI developments. Particularly crucial is this for less seasoned employees who might need more help to apply AI technology to improve their creativity (Mumford et al., 2012).

The report also emphasizes the need of skilled personnel when applying AI for creative reasons. Experts in incorporating AI into creative processes are usually more experienced

workers, hence companies can gain from using their knowledge. Specially successful are mentoring programs in which seasoned workers impart their expertise and abilities to less seasoned coworkers.

Another important element is to encourage a culture that values frequent creative outputs. Creativity is greatly impacted by organizational culture, hence PBOs should work to foster a culture that supports and promotes creative endeavors. This can be accomplished by means of a number of tactics, including encouraging open communication, cross-departmental cooperation, and giving staff members forums on which to express their opinions. By doing this, businesses can foster a creative and dynamic work atmosphere (Perry-Smith & Mannucci, 2017).

A structural adjustment could be required in addition to cultural and procedural ones. Companies may have to reconsider how they handle projects in order to successfully include AI. Particularly suited to develop creativity are agile and lean approaches, which stress adaptability and ongoing improvement. Through iterative development and regular goal and process reevaluation, these approaches enable AI tools to be more suited to creative aims (Highsmith, 2009; Womack & Jones, 1996).

Putting money into AI systems that make repetitious jobs easier can also help to indirectly increase creativity. AI can release workers' cognitive resources to concentrate more on original problem-solving and innovation by automating repetitive and boring tasks. This double advantage of AI, improving productivity and creativity, can greatly boost the success of a business as a whole (Brynjolfsson & McAfee, 2014).

In many respects, this work advances the body of current literature. First of all, it offers actual data in favor of the idea that, when carefully integrated, AI technologies might improve creativity in work places. This supports earlier research but also provides a more sophisticated knowledge of the most useful AI tools, such picture generators (Boden, 1998; McCormack et al., 2019). Second, and this underlines the value of frequent creative activity, the study highlights the mediating function of the frequency of creative outputs. By showing how AI's influence on creativity is indirect and rather enhanced by more chances for creative activity, this discovery enhances the body of research (Shalley et al., 2004).

This work also advances the conversation on AI's dual function in boosting creativity and productivity. Though earlier studies have frequently addressed these results

independently, this study shows how they are related and how AI-enabled efficiency gains can free up cognitive resources for creative pursuits. With this integrative viewpoint, the function of AI in the workplace is better understood overall (Brynjolfsson & McAfee, 2014).

The study also fills up a knowledge vacuum on how job experience affects how well AI is used for creative goals. The study sheds light on the need of focused training and development initiatives by demonstrating that seasoned employees are better at using AI tools. The importance of continuous professional growth to optimize the advantages of AI integration is highlighted by this feature of the study (Mumford et al., 2012).

Finally, a multidimensional strategy is needed to effectively improve employee creativity in PBOs using AI technologies. Companies need to spend money on certain AI technologies that satisfy their creative requirements, give enough training for efficient use, and promote a culture that values frequent creative outputs. Crucial actions include also incorporating AI into collaborative and learning-oriented settings, using the experience of seasoned employees, and implementing adaptable project management techniques. Using these tactics, PBOs can use AI to boost output and creativity, which will eventually spur innovation and project success. With this all-encompassing strategy, businesses will be able to fully use AI technology, which will promote a more creative and dynamic work environment.

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