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USE OF AI FOR IDEA GENERATION TO INCREASE INNOVATION
OUTCOMES AT THE WORKPLACE: A MODERATION ANALYSIS

Dissertation to Universidade Católica Portuguesa to obtain a
Master's Degree in Psychology in Business and Economics

By

Yash Sham Wagle

Faculdade de Ciências Humanas

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Abstract

Innovation is essential for organizational success in today's dynamic business landscape. This study investigates the impact of individual idea generation on innovation outcomes within the workplace and examines the moderating role of Artificial Intelligence (AI) in this relationship. Utilizing a sample of 154 employees across various industries, a regression analysis was conducted to test hypotheses concerning the relationships among idea generation, AI use, and innovation outcomes, while controlling for demographic variables such as age, gender, education, and industry.

The findings confirm a significant positive relationship between idea generation and innovation outcomes, underscoring the crucial role of individual creativity in fostering organizational innovation. AI use also exhibited a significant positive effect on innovation outcomes, indicating that AI technologies can enhance innovation processes. However, contrary to the hypothesis, the moderating effect of AI Use on the relationship between Idea Generation and Innovation Outcomes was not statistically significant. This suggests that while AI contributes independently to innovation outcomes, it may not necessarily amplify the effect of idea generation on innovation within the context of this study.

These results imply that organizations should strategically implement AI tools that directly support creative processes and provide tailored support to employees to enhance technological proficiency. Limitations of the study include the sample size, reliance on self-reported data, and the cross-sectional design. Future research should consider longitudinal studies, larger and more diverse samples, and explore how different types of AI integration affect the relationship between creativity and innovation.

Keywords: Idea Generation, Innovation Outcomes, Artificial Intelligence, Workplace Innovation, Creativity

Resumo

A inovação é essencial para o sucesso organizacional no dinâmico panorama empresarial atual. Este estudo investiga o impacto da geração de ideias individuais nos resultados da inovação no local de trabalho e examina o papel moderador da Inteligência Artificial (IA) nesta relação. Utilizando uma amostra de 154 trabalhadores de várias indústrias, realizámos análises de regressão para testar hipóteses relativas às relações entre a geração de ideias, a utilização da IA e os resultados da inovação, controlando simultaneamente variáveis demográficas como a idade, o sexo, a educação e a indústria.

Os resultados confirmam uma relação positiva significativa entre a geração de ideias e os resultados da inovação, sublinhando o papel crucial da criatividade individual na promoção da inovação organizacional. A utilização da IA também apresentou um efeito positivo significativo nos resultados da inovação, indicando que as tecnologias de IA podem melhorar os processos de inovação. No entanto, contrariamente à nossa hipótese, o efeito moderador da utilização da IA na relação entre a geração de ideias e os resultados da inovação não foi estatisticamente significativo. Isto sugere que, embora a IA contribua de forma independente para os resultados da inovação, pode não amplificar necessariamente o efeito da geração de ideias na inovação no contexto deste estudo.

Estes resultados implicam que as organizações devem implementar estrategicamente ferramentas de IA que apoiem diretamente os processos criativos e forneçam apoio personalizado aos funcionários para melhorar a proficiência tecnológica. As limitações do estudo incluem a dimensão da amostra, a dependência de dados auto-relatados e a conceção transversal. A investigação futura deve considerar estudos longitudinais, amostras maiores e mais diversificadas e explorar a forma como diferentes tipos de integração da IA afectam a relação entre criatividade e inovação.

Palavras-chave: Geração de ideias, Resultados da inovação, Inteligência artificial, Inovação no local de trabalho, Criatividade

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1. Introduction

In today's rapidly growing business landscape, innovation is a vital factor of organizational success and sustainability. As marketplaces grow more dynamic and competitive, firms must be able to produce and implement new ideas in order to preserve a competitive advantage (Drucker & Maciariello, 2014). Innovation involves a wide range of processes, from the development of new goods and services to the improvement of existing operations, all with the goal of increasing performance and producing value (West & Farr, 1990). Within this setting, workplace innovation—defined as the deployment of new and integrated interventions in work organization, human resource management, and supported technologies—is critical in cultivating a culture of continual improvement and flexibility (Pot, 2011).

The process of idea generation is central to innovation—the creation of unique and useful concepts that serve as the foundation for innovative products, services, and processes (Amabile, 1988). Idea generation is a critical stage in the innovation cycle because it directly influences the quality and success of innovation outputs (Shalley & Gilson, 2004). Firms risk stagnation and losing their competitive edge if they lack a robust pipeline of new ideas (Nonaka & Takeuchi, 1995).

In recent years, the use of artificial intelligence (AI) technology has emerged as a critical component in boosting organizational innovation processes. AI has the potential to change the way employees generate ideas by providing improved data analytics, pattern recognition, and even autonomous idea generation using machine learning algorithms. (Davenport & Ronanki, 2018). Despite AI's promise capabilities, there is a significant research gap in understanding its precise influence on the interaction between individual employees' idea generation and innovation outcomes. While current literature acknowledges AI's potential to affect creativity and invention, empirical research on AI's function as a moderating variable in this setting is scarce (Brynjolfsson & Mitchell, 2017); (Schmidt, 2020).

2. Literature Review

2.1 Innovation Outcomes

In today's dynamic business environment, it is of paramount importance that companies and firms are constantly evolving and staying innovative and relevant to compete (Drucker & Maciariello, 2014). Innovation encompasses a whole gamut of processes, ranging from new ideas, products, or services to improve performance and create value (West & Farr, 1990). Workplace innovation refers to the implementation of new and combined interventions in work organization, human resource management, and supportive technologies (Pot, 2011). Implementation of innovation can be in various spheres at the workplace, in order to enable a more holistic innovative outcome for the company and the employees. Workplace innovation is influenced by a wide array of factors (Ayinaddis, 2023), from individual behaviors to organizational culture and resources. Workplace Innovation has importance and is vital for several reasons. Ma (2000) highlights the importance of innovation in the context of competitive markets, wherein organizations must innovate to differentiate and meet the ever-evolving needs of the customers. Innovation plays an ever so important role in the capitalistic markets of the world, wherein there is a need for differentiation on various fronts to boost an organization's productivity.

Workplace innovation enhances a firm's ability to develop unique products and services, adapt to technological changes, and respond swiftly to market dynamics (Lawson & Samson, 2001). As discussed, it is important for organizations to be dynamic and quick on their feet to adapt swiftly to the ever-changing needs of the customers and landscape of the market. Innovation proves to be a vital instrument to enable this. This adaptability of the organization brought about by unique workplace innovative measures also becomes vital in keeping up with advancements in technology, changes in workplace cultures and development of novel products and services. By fostering a culture of innovation at the workplace, organizations can aim to maintain a sustainable and significant competitive advantage over competitors and also the market (Barney, 1991).

Along with competitive advantages, workplace innovation also promotes employee engagement. Bakker & Demerouti (2008) have researched the role of workplace innovation in employee engagement by involving employees in decision-making processes, encouraging autonomy, and recognizing their contributions. Their research concludes that having employees engaged and enforcing their work with autonomy and recognition leads to higher productive and innovative outcomes. Employees are found to be more committed to their work, but also to the organization and its goals and objectives. Spreitzer (1995) adds on to say that empowered workers are more likely to offer innovative ideas and creative problem-solving techniques, both of which are critical for the development of an organization. Because they feel empowered to try new things, take calculated risks, and actively shape the direction of their work, employees are more likely to be creative in an environment where autonomy is valued.

Employees were also found to be willing to put in more work and go the extra mile when they were given more freedom to be innovative at the workplace. Hence, giving employees this freedom in innovation and decision-making through autonomy leads to a more engaged and motivated workplace (Saks, 2006).

Along with employee engagement, innovation also has been found to lead to enhanced productivity and improvements in work efficiency. Ichniowski et al. (1995) have highlighted the importance of innovative measures in improving work efficiency amongst employees, streamlining operations and reducing waste. By implementing innovation via measures like redesigning workflows, implementing new technologies, and encouraging continuous improvement, organizational productivity can be enhanced (Black & Lynch, 2004). Implementing new technologies is another crucial factor in improving productivity. Technology can automate routine and repetitive tasks, freeing employees to focus on more complex, creative, or strategic work. These processes allow organizations to identify inefficiencies, such as redundant or unnecessary steps, and implement changes that streamline operations. By actively engaging employees at all levels in identifying areas for improvement, organizations foster an environment of shared responsibility for innovation. This proactive

approach can help businesses remain agile and competitive, as they continuously refine operations, adapt to new challenges, and seek out opportunities for further optimization.

By fostering an environment that is more stimulating and rewarding, workplace innovation dramatically raises worker satisfaction. Prioritizing innovation in a business typically results in the introduction of tasks that are more meaningful and fit the interests and strengths of the workforce. This results in a more profound feeling of purpose in day-to-day work, which raises job satisfaction. The Job Characteristics Model developed by (Hackman & Oldham, 1976) highlights the positive effects of meaningful activities, autonomy, and feedback on employee motivation and job satisfaction. Parker et al. (2001) provide support for the idea that employees who find their work enjoyable are more likely to feel a sense of success, which enhances their general psychological well-being. An innovative workplace naturally promotes progress, which benefits workers' mental and emotional well-being. Employees grow more competent, self-assured, and adaptive as they pick up new abilities; this helps them advance personally in their careers while also improving performance and fostering innovation inside the company.

2.2 Idea Generation

At the heart of innovation lies the process of idea generation—the creation of novel and useful concepts that serve as the seeds for innovative products, services, and processes (Amabile, 1988). Idea generation is a vital process in the innovation cycle, as it represents the creation of new, original, and valuable concepts that drive workplace innovation. Idea generation, according to (Shalley & Gilson, 2004), is the process by which individuals or groups generate original concepts that can be developed into workable solutions through brainstorming, creative thinking, and problem-solving. This process is especially crucial since an organization cannot innovate or successfully address changing difficulties if it does not get new ideas. The ability to come up with ideas is fundamental to attaining organizational growth and adaptability because it is frequently viewed as the spark that lights the entire innovation process.

Idea generation is not merely a preliminary step but a critical determinant that directly influences the quality and success of innovation outcomes (Shalley & Gilson, 2004). It serves as an important factor in achieving innovation results since it involves the creative process of producing novel and useful ideas to fuel innovation (Amabile, 1996). Numerous research have found a beneficial link between idea creation and the subsequent inventive outcomes. Diehl and Stroebe (1987) discovered that firms with high levels of idea creation frequently create a greater volume and higher quality of creative solutions. This research underscores the importance of creating a work atmosphere that encourages people to think creatively and share fresh ideas.

The importance of idea generation is further demonstrated by the direct effect it has on an organization's capacity for adaptation. Without a robust pipeline of creative ideas, organizations risk stagnation and may fail to maintain a competitive edge (Nonaka & Takeuchi, 1995). In dynamic settings, companies need to constantly come up with fresh approaches to tackle new challenges or possibilities. This is an iterative process in which ideas are generated, tested, and then refined before being implemented. Idea creation is therefore a crucial area of study in workplace innovation since it is not only a creative endeavor but also a necessary component of sustainable innovation.

Idea generation, as defined by (Paulus & Nijstad, 2003), is the cognitive and creative process by which individuals or groups develop new concepts, solutions, or innovative approaches to problems. This process is critical for encouraging innovation in any company because it supplies the raw material—new and original ideas—that can be turned into practical implementations. According to (Guilford, 1950), idea generation is not a random or spontaneous process; rather, it necessitates a conscious effort to engage in divergent thinking, in which people or teams deliberately search for a broad variety of options rather than settling too quickly on a single solution.

Idea generation is at the core of the innovation process (Rietzschel & Zacher, 2015), understanding the broader effects of idea generation on innovation helps contextualize why

focusing on idea generation is critical. The success and robustness of innovative initiatives are determined by a number of factors that are directly influenced by the foundational element of the innovation process. The following sections delve deeper into key determinants that shape innovation in the workplace: Source of Novelty, Diversity of Solutions, Accelerated Innovation Process, Enhanced Problem Solving.

2.2.1 Novelty

Ideas are the fundamental components of invention. Organizations cannot accomplish genuine innovation unless they generate fresh and creative ideas. According to Nonaka and Takeuchi (1995), the development and distribution of new ideas is critical to maintaining a competitive edge in dynamic marketplaces. The novelty of ideas is important because it distinguishes an organization's offers from those of its rivals, resulting in new value propositions for customers. The number and quality of ideas developed are important indicators of an organization's inventive capacity. According to (Girotra et al., 2010), generating more high-quality ideas enhances the chance of inventing breakthrough goods, services, or processes. High-quality ideas are distinguished by their uniqueness, viability, and connection to business objectives.

Furthermore, the concept of "idea novelty" is inextricably tied to an organization's capacity to create new market areas and successfully adapt to developing trends and consumer requirements (Amabile, 1996). Amabile further argues that individual creativity is a precursor to innovation, as novel ideas generated by employees can lead to breakthrough products and services. Organizations that cultivate individual creativity through supportive environments and incentives are better positioned to harness high-quality ideas that drive substantial innovation outcomes (Oldham & Cummings, 1996). As a result, creating an atmosphere that promotes the ongoing development of new ideas is critical for long-term innovation.

2.2.2 Diversity of Solutions

Individual idea creation has a tremendous impact on the diversity of solutions inside a business. Runco & Jaeger (2012) argue that when people bring varied backgrounds, experiences, and cognitive processes to the idea generation process, the spectrum of viable solutions widens. This variety is critical for tackling complicated and diverse challenges because it allows many viewpoints to be examined and included into the innovation process.

Page (2007) emphasizes the significance of cognitive variety, which stems from individual variances in knowledge, abilities, and thought processes. Employees that generate ideas from a variety of disciplines are more likely to provide novel solutions based on a wide range of data and approaches. This diversity of ideas improves organizational adaptation and resilience, allowing businesses to successfully traverse uncertain and quickly changing contexts . Furthermore, individual contributions minimize idea stagnation and limit the potential of groupthink, ensuring that the innovation process stays dynamic and inclusive of many perspectives.

2.2.3 Accelerated Innovation Process

Individual generation of ideas speeds the innovation process by focusing on the early phases of ideation and concept development. When employees are encouraged to produce and offer ideas on their own, businesses benefit from a constant stream of new concepts that can be quickly reviewed for practicality and potential effect. According to Seidel (2007), allowing individuals to submit ideas early in the innovation cycle enables the rapid discovery of high-potential concepts, which may then be selected and developed further. This early-stage interaction guarantees that promising ideas receive the attention and resources they require as soon as possible, accelerating their development along the innovation pipeline. Individual idea generation allows for faster screening and refining of concepts, which is necessary for an effective innovation process. Cooper (2008) emphasizes that a strong individual idea creation process allows businesses to swiftly dismiss non-viable ideas, focusing resources on those with the greatest potential for success. This selective strategy reduces the amount of time and

effort spent exploring ideas that are unlikely to produce major advantages, hence simplifying the entire innovation process. Organizations may ensure that only the most promising ideas move on to the next phases of development and implementation by using human creativity and critical review.

Empirical research support the hypothesis that individual idea creation considerably speeds the innovation process and improves innovation results. For example, Lichtenthaler (2009) discovered that firms that aggressively support individual idea creation had shorter innovation cycles and a greater rate of successful product launches than those that rely only on group brainstorming sessions. Similarly, West and Farr (1990) found that individual contributions to idea development are linked to enhanced innovation pace and better alignment of inventions with market demands. Individual idea generation also improves business learning and knowledge management, which are critical for maintaining faster innovation processes. Nonaka and Takeuchi (1995) suggest that individuals' constant development and sharing of ideas contributes to the formation and diffusion of organizational knowledge, establishing a culture of collective learning and adaptation. This continuous knowledge upgrading helps firms to adapt more quickly to external changes and internal issues, while maintaining a consistent rate of innovation.

2.2.4 Enhanced Problem-Solving Capabilities

The ability of people to tackle problems creatively is key to stronger problem-solving skills. According to Mumford (2000), people who generate ideas on a regular basis are better at thinking outside of standard frameworks, allowing them to design unique solutions that would not arise through typical problem-solving techniques. This creative flexibility is essential in dynamic work situations where challenges are frequently complex and developing. Individual idea generation is critical for improving an organization's problem-solving capacities in the workplace. Empowering people to offer their unique views and creative thoughts allows firms to solve difficulties more efficiently and build a culture of continuous growth.

The ability to be creative and propagate ideas has a direct impact on the creation of new solutions adapted to specific organizational demands. According to Amabile (1996), individuals who are intrinsically motivated to create are more likely to provide high-quality, creative ideas that are aligned with the organization's strategic objectives. This connection guarantees that the solutions generated are not only innovative, but also useful and relevant. This leads to a culture of creativity at the workplace as well. An organization that supports individual idea creation naturally fosters a culture of experimentation and judicious risk-taking. Employees who are convinced that their ideas will be acknowledged and evaluated are more inclined to try new ways and take risks, which may lead to breakthrough breakthroughs. Mumford (2000) suggest that such a culture not only improves problem-solving ability, but also promotes ongoing innovation. In such a culture, diverse perspectives and expertise are also inculcated into the problem-solving processes.

Diehl and Stroebe's (1987) seminal study on group brainstorming offers valuable insights that are highly relevant to your research on the determinants of workplace innovation, particularly the role of individual idea generation. The study emphasizes the efficiency of individual idea generation in creating a large number of concepts. This underlines the importance of concentrating on individual contributions as a main driver of innovation a work context. Organizations can avoid the challenges described by Diehl and Stroebe by encouraging employees to produce ideas independently before discussing them in groups, resulting in increased total idea production and a stronger innovation pipeline.

2.3 Drivers of Idea Generation

Individual creativity is an essential driver of idea generation, playing an important role in fostering workplace innovation. Creativity is not merely an intrinsic attribute; it is influenced by a combination of personal and external factors. Understanding these effects is crucial for organizations looking to improve their innovation capabilities. Intrinsic motivation is a potent stimulus for creativity. According to Amabile (1993), those who are internally motivated by interest, enjoyment, or personal challenge are more likely to be creative. This internal drive results in higher engagement with work and perseverance in solving creative hurdles. When

individuals find personal fulfillment and significance in their work, they are more willing to devote the time and effort required to investigate new ideas and solutions. For example, an employee who is passionate about sustainable practices may be more likely to discover novel techniques to reducing the company's environmental imprint, so significantly contributing to workplace innovation. Creative thinking skills, which include adaptability, inventiveness, and elaboration, are required for the production of innovative ideas. (Guilford, 1950) recognized these cognitive qualities as significant predictors of creativity for idea generation. Runco and Acar (2012) back this up by proving that those who excel at divergent thinking exams, which evaluate these skills, are better at developing innovative outcomes.

Certain personality traits are strongly related with higher levels of creativity. Feist (1998) lists openness to experience, curiosity, and tolerance for ambiguity as important determinants of creative activity. Individuals that are open to new experiences are more likely to embrace new ideas and viewpoints, creating a climate receptive to creativity. Curiosity motivates individuals to investigate and challenge existing procedures, resulting in the identification of new potential for change. Tolerance for ambiguity enables people to handle difficult and complex situations without feeling disheartened, allowing them to keep their creative energy. Furthermore, individual creativity is strongly influenced by one's work environment. According to Oldham and Cummings (1996), supportive work settings that offer autonomy, resources, and encouragement boost individual creativity dramatically. Employee autonomy allows them to take ownership of their initiatives and pursue innovative ideas without being micromanaged. Individuals have access to resources such as time, equipment, and information, which allow them to experiment and perfect their ideas. Encouragement from leadership develops a creative culture in which people feel valued and inspired to share their unique ideas.

By fostering intrinsic motivation, enhancing domain-relevant skills, developing creative thinking abilities, nurturing favorable personality traits, and creating supportive work environments, organizations can significantly boost individual creativity. This, in turn, leads to a higher volume and quality of ideas, which are essential inputs for innovative outcomes.

2.4 Organizational Practices Enhancing Idea Generation

To successfully promote idea generation amongst employees, organizations can implement certain strategies that nurture both individual and group creativity. These practices not only promote the open exchange of ideas, but also offer the frameworks and incentives required to turn these ideas into concrete innovative outcomes.

Innovation workshops and hackathons are intensive, time-limited activities that promote creative problem solving and speedy idea creation. Workshops and hackathons are organized but dynamic, creating a high-energy environment favorable to the generation of creative ideas. Fairbank & Williams (2001) identify Idea Management Systems as organized forums where workers may contribute ideas, receive feedback, and be recognized for their efforts. By establishing a systematic procedure for idea submission, these systems guarantee that individual ideas are collected and examined, avoiding important insights from being lost. According to Edmondson & Nembhard (2009), cross-functional collaboration not only broadens the scope of ideas developed, but also increases their quality and application. When people from different disciplines work together, they may use their particular expertise to create more complete and inventive solutions. Allocated Innovation Time, pioneered by organizations such as Google, allows employees to pursue creative projects that coincide with their interests and passions. Allocated innovation time also stimulates individual idea development by offering the autonomy and flexibility required for creative research. It is observed that when people are given the freedom to work on initiatives that interest them, they are more likely to generate high-quality, innovative ideas. Individuals are motivated by personal interests and the desire to solve problems that are important to them, therefore autonomy generates a sense of ownership and intrinsic motivation.

2.5 The Role of Resources in Innovation

Innovation is resource-intensive, and access to the necessary resources—whether financial, technological, or human capital—is critical for making ideas a reality. According to Damanpour (1991), one of the most important factors influencing innovation is resource availability, particularly when it comes to supporting the creation and implementation of

innovative ideas. Even the most creative concepts may fail to materialize into unique goods or services if sufficient resources are not available. Empirical research supports the idea that firms with more resources are more likely to be creative. For example, (Crossan & Apaydin, 2010) discovered that resource allocation, which includes both financial investment and time, is a major predictor of innovation results. Companies that provide employees the time and equipment to experiment are more likely to have effective innovation activities. This is especially true in industries where technology plays a critical role in the innovation process. For example, in the technology and pharmaceutical industries, investment in research and development (R&D) is a significant driver of innovation. Larger R&D resources enable companies to explore new ideas, develop prototypes, and bring breakthrough goods to market. Resources include not just financial investments, but also technology, tools, and time. In today's fast changing work environment, access to cutting-edge technology like artificial intelligence (AI), big data analytics, and automation tools may considerably speed up the innovation process.

2.5.1 Impact on Idea Generation

In terms of idea generation, resources such as technology (e.g., AI tools) and access to data can enhance employees' ability to generate creative solutions. AI can help analyze vast datasets, uncover trends, and even generate ideas through predictive models, enabling employees to build on these insights. Without adequate resources, however, employees may lack the tools or time necessary to engage in creative thinking, limiting their ability to contribute innovative ideas. Organizations that fail to invest in the necessary infrastructure for idea generation—such as collaboration tools, data analytics platforms, and R&D labs—may find themselves falling behind in the innovation race. On the other hand, companies that actively invest in these resources can create environments where employees are empowered to generate and develop creative ideas.

From an organization perspective, substantial research has been done to identify measures and practices that enhance innovation and creativity at the workplace. Creativity and Idea generation is an important aspect in determining workplace innovation outcomes. It has a

direct impact on the organization's ability to develop innovative and effective solutions, resulting in competitiveness and success in a rapidly changing environment. Technology integration is also helpful for accelerating the innovation process by providing unique ideas. Employees may debate and create ideas in real time utilizing digital collaboration platforms and idea management systems, regardless of their physical location. These technologies enable the rapid exchange of information and collaborative refinement of ideas, hence enhancing the overall rate of creation. Furthermore, data analytics tools may assist businesses in swiftly reviewing and prioritizing ideas based on specified criteria, helping them to make informed decisions faster (Chesbrough, 2003).

The process of innovation is inextricably tied to the creation of ideas, which serve as the foundation for producing new goods, services, and processes (Amabile, 1996). With the growing prevalence of artificial intelligence (AI) technology, firms are increasingly using AI tools to improve different parts of their operations, including innovation processes. AI has the ability to transform the way employees generate ideas by offering enhanced data analytics, pattern identification, and even autonomous idea production using machine learning algorithms (Davenport & Ronanki, 2018). However, the influence of AI on individual employees' creativity and idea development is relatively unstudied. This literature review aims to fill this study vacuum by investigating the function of AI in the context of idea generation's influence on innovation outcomes in the workplace, with a focus on specific workers.

2.6 Artificial Intelligence Technologies and Idea Generation

Artificial intelligence (AI) technologies have become more important in boosting human creativity in the workplace. By automating regular and monotonous work, AI allows employees' time and cognitive resources for higher-order functions like creative thinking and problem solving. This move not only increases productivity, but it also creates an environment in which inventive ideas may thrive. AI systems excel at analyzing large amounts of data, recognizing patterns, and extracting insights that people may struggle to perceive on their own. Shrestha et al. (2019) argue that these qualities establish AI as a potent facilitator for the process of ideation. For example, AI-powered data analytics tools can quickly and accurately

assess market trends and client preferences, giving staff with important information that might spark new ideas and initiatives. By revealing underlying trends and projecting future demands, AI helps employees to build solid, data-driven foundations for their creative work.

Generative AI models, particularly those that employ deep learning techniques, broaden the scope of idea creation. (Goodfellow, 2014) show that these models may generate new ideas, designs, and solutions that can then be refined and implemented by humans. Human designers may then review, improve, and alter these AI-generated designs to match individual demands and preferences, expediting the creative process and improving outcomes. Generative AI models can also promote collaborative creativity by acting as intelligent assistance throughout the ideation process. These AI-powered tools may provide alternate viewpoints, identify potential design faults, and recommend improvements based on specified criteria. Huang & Rust (2018) emphasize that AI-powered suggestion systems may give real-time feedback and recommendations during brainstorming sessions, assisting humans in overcoming cognitive biases and expanding their creative thinking. This connection between AI and human designers promotes a more dynamic and iterative creative process, in which ideas are constantly developed and enhanced through a collaborative effort. Furthermore, including generative AI into the creative process improves the efficiency and efficacy of idea production (Goodfellow et al., 2014). By automating the production of early thoughts, AI decreases the time and effort necessary to generate novel solutions, allowing individuals to concentrate on higher-order cognitive activities like strategic planning and enactment. This division of labor not only boosts production, but it also assures that creative endeavors are more focused and effective.

Artificial intelligence (AI) tools not only boost humans' creative potential by automating tedious jobs, but they also improve numerous cognitive processes required for idea development. Parviainen et al. (2022) refer to this enhancement as cognitive augmentation, in which AI systems assist and increase the user's cognitive capacity, resulting in more effective and original idea development. By incorporating AI technologies into regular operations, employees may do more meaningful and creative work, harnessing AI's skills to supplement

their own. AI's role in processes of decision-making also promotes innovation. By offering data-driven insights and advanced analytics, AI assists humans in making educated, inventive, and strategic decisions. For example, in product development, AI can simulate multiple scenarios and anticipate the effects of alternative design choices, allowing product managers to prioritize the most promising concepts for future development. This use of AI into decision-making guarantees that innovative ideas are not only original, but also viable and in line with company objectives. Furthermore, AI tools can help to mitigate the impacts of cognitive overload, which frequently impairs creativity and innovative thinking. AI decreases the cognitive strain on employees by automating data analysis and mundane jobs, freeing them up to focus on creative tasks that demand deep thought and invention. This transformation not only boosts individual productivity, but it also fosters a more sustainable and interesting work environment in which creativity may flourish (Dellermann, Lipusch, et al., 2019)

2.7 Attitudes towards AI

Artificial intelligence (AI) integration in the workplace has grown in popularity, with potential for increased efficiency, decision-making, and creativity (Haenlein & Kaplan, 2019). However, employee attitudes regarding AI have a substantial impact on the effective adoption and application of AI technology (Glikson & Woolley, 2020). Attitudes regarding AI include people's views, beliefs, and emotional reactions to AI technology (Schepman & Rodway, 2020). These attitudes can influence how workers interact with AI tools, hence impacting organizational innovation outcomes. Attitudes regarding AI can impact how much employees use AI technologies during the idea generating process. Positive attitudes may encourage employees to use AI for brainstorming, data analysis, and accessing various information sources, hence increasing creativity (Kaplan & Haenlein, 2019). However, if employees harbor negative attitudes toward AI, they may not fully engage with these technologies, diminishing the potential impact on innovation outcome. Employees who have different attitudes may utilize AI differently, influencing both idea creation and innovation outcomes, regardless of the AI's real capabilities. Employees' impact of AI as a competitor rather than a collaborator might influence their readiness to include AI into their creative processes.

Attitudes regarding AI have a huge impact on the acceptance and effectiveness of AI technology in the workplace. These attitudes determine how employees interact with AI during idea creation, hence influencing innovation outcomes. In studies looking at AI's moderating influence on the link between idea generation and innovation, adjusting for attitudes regarding AI is critical for determining the real effect of AI technology. Accounting for these views allows researchers to more correctly analyze AI's influence in boosting or obstructing organizational innovation processes.

2.8 The Research Gap in AI's Role in Idea Generation

While the integration of artificial intelligence (AI) into organizational processes has been studied and explored there is still a considerable gap in determining how AI particularly affects the interaction between individual employees' idea generation and innovation outcomes. Existing literature recognizes AI's ability to affect creativity and invention (Kaplan & Haenlein, 2019), but empirical research on AI's role as a moderating variable in this setting is limited. . Most studies focus on organizational-level analyses or the technical capabilities of AI, with limited attention to the micro-level interactions between employees and AI tools in the creative process (Jarrahi, 2018). Despite the potential benefits and challenges outlined, there is limited empirical research specifically examining how AI impacts individual employees' idea generation and the subsequent effect on innovation outcomes (Brynjolfsson & Mitchell, 2017). There is a need for empirical studies that investigate the extent to which AI enhances or impedes individual creativity within workplace settings (Schmidt 2020). Understanding this interaction is critical because it reveals how AI might improve or hinder the efficacy of idea creation in delivering important innovation outcomes. Furthermore, there is a scope to study industry-specific insights within this context as well. Different industries may experience varying effects of AI on creativity and innovation. Sector-specific research can provide tailored insights for practitioners (Dwivedi, 2021).

3. Hypotheses Development

Based on the literature review and identified research gaps, the following hypotheses are proposed:

Hypothesis 1 (H1): *There is a positive correlation between Idea Generation and Innovation Outcomes & Use of AI and Innovation Outcomes.*

Hypothesis 2 (H2): *There is a positive correlation between Idea Generation and Use of AI.*

Hypothesis 3 (H3): *There is a positive relationship between individual employees' idea generation and innovation outcomes in the workplace.*

Hypothesis 4 (H4): *Demographic factors have a significant effect on the relationship between Idea Generation and Innovation Outcomes.*

Hypothesis 5 (H5): *Artificial intelligence positively moderates the relationship between idea generation and innovation outcomes, such that the relationship is stronger when AI tools are utilized effectively, controlling for employees' attitudes toward AI demographics.*

Based on this review of extant literature on the subject of Innovation and the role of Idea Generation and Artificial Intelligence, this study presents an exploration of the role of AI in facilitating creativity and innovation at the workplace. Using the aforementioned variables and other controls such as Age, Gender, Education and Industry, the present study aims to expand the knowledge on this subject. Using the hypotheses presented, this research aims to understand the role of AI at the workplace, and how it can be leveraged to boost productivity. These objectives guided the development of the following research question:

Can employees leverage Use of AI for Idea Generation to increase Innovation Outcomes at the Workplace?

4. Methodology

4.1 Instruments

The questionnaire included 5 different sections: personal variable such as age, gender, educational qualifications, industry most worked in; Innovation Outcomes (IO), Idea Generation (IG); Attitude towards AI (AI_Att) and Use of AI (AI). These variables have been further discussed in detail below.

4.1.1 Personal Variables

When conducting a study on the determinants of workplace innovation and idea generation, it is critical to include personal characteristics that give both descriptive insights and control variables for the analysis. Personal characteristics like age, gender, industry, and education are critical in comprehending participants' different viewpoints and experiences, assuring the strength and validity of the study findings. This section describes the methods used to gather these personal variables and discusses their function in descriptive statistics and as control variables.

a. Age:

Age is measured as a categorical variable, being categorised into age brackets e.g 18-24 years. Participants are requested to choose their relevant age bracket. Age distribution sheds light on the sample's demographic composition, revealing trends and patterns across age groups. Age is controlled for in regression models to account for its possible impact on creativity and invention, as cognitive ability and professional experiences might differ dramatically across age cohorts.

b. Gender

Gender is recorded as a categorical variable, with possibilities of Male, Female or Prefer not to say. This inclusive approach recognizes the variety of gender identities among individuals. Gender distribution aids in understanding the representation of various genders in the sample.

Gender is included as a control variable to account for any gender-specific differences in creativity and invention, as prior research has shown that creative processes and outputs vary between genders.

c. Industry

Participants identify their industry using an established categorization system. Options include information technology, healthcare, manufacturing, and education, among others, with the opportunity to customize if not mentioned. Identifying the sectors represented in the sample adds context to the study's findings and reveals industry-specific trends in innovation. The study controls for industry to account for sector-specific elements that may impact idea generation and innovation methods, ensuring that industry-related variances do not muddle the results (Ancona & Caldwell, 1992).

d. Education

Education levels are classified by highest degree earned, including High School Diploma, Bachelor's Degree, Master's Degree and Doctorate. This categorization method makes it easier to examine how educational attainment affects creativity and innovation. The distribution of educational backgrounds reveals information about the sample's credentials and the possible association with innovative skills. Education level is included as a control variable to account for the function of formal education in improving cognitive and creative skills, which are essential for successful idea production (Weisberg, 1998).

4.1.2 Attitudes towards AI

Using standardized instruments like the General Attitude Toward Artificial Intelligence Scale (GAAIS) allows for the reliable assessment of employees' attitudes toward AI (Schepman & Rodway, 2020). A self-reported 4-item measure was adapted from GAAIS, wherein respondents reported answers on a 5-point Likert scale, ranging from 1 - strongly disagree to 5 - strongly agree (eg. "I believe AI can effectively support me in generating creative ideas at

work.”). The item for “Attitude_AI_Risk” was reverse coded. The scale had a cronbach alpha of 0.86.

4.1.3 Innovation Outcomes

A 3-item measure was adapted from Innovative Behavior Scale (Scott & Bruce, 1994) to measure the Innovation Outcomes of employees at the work place. Respondents reported answer on a 5 point likert scale, ranging from 1 - strongly disagree to 5 - strongly agree (eg. “I was often successful at work in implementing my ideas and putting them in practice.”). The scale had a cronbach alpha of 0.83.

4.1.4 Idea Generation

For Idea Generation, a 3 - item scale was once again adapted from Innovative Behavior Scale (Scott & Bruce, 1994) to measure the level of Idea Generation at the workplace. Respondents reported answers on a 5 point likert scale, ranging from 1 - strongly disagree to 5 - strongly agree (eg. “I try new ways of doing things at work”). The scale had a cronbach alpha of 0.88.

4.1.5 AI Use

A 3-item scale on a 5-point Likert scale measures Use of AI, capturing respondents' applicability of AI in terms of Efficiency, Creativity and Decision-making. Respondents rate their agreement from 1 (strongly disagree) to 5 (strongly agree) for each statement. The scale is adapted from the General Attitude Towards Artificial Intelligence Scale (GAAIS) as well (Schepman & Rodway, 2020). The scale focuses on how AI can assist in generating creative ideas, solve problems, and support innovative thinking and how respondent's use applications of AI in creative capacities.. This tool helps evaluate employees' perceptions of AI's role in enhancing their creativity and productivity at work. The scale had a Cronbach alpha score of 0.86.

4.2.Data Collection

The survey was hosted online via Google Forms, and participants were recruited via convenience sampling. To determine the required sample size, the statistical software G*Power was employed, which indicated that a minimum of 77 participants was necessary to ensure adequate statistical power for the study (reference to appendix).

Participants were provided with a detailed explanation of the study's procedures prior to their involvement. Additionally, they were assured that all data collected would be kept confidential and used solely for the purposes of this research. Participation was voluntary, and only after giving informed consent did participants proceed with the survey. The database for this study was designed to capture specific personal variables including age, gender, education level, industry, and other relevant factors to ensure thorough analysis. These variables were included as both descriptive statistics and control factors to provide a comprehensive understanding of their potential impact on innovation outcomes. The statistical analyses were conducted using RStudio, ensuring that all necessary corrections were made to the database prior to analysis. Spearman correlation analysis was performed on the variables related to the research model, with further exploration of relationships between variables such as age, gender, industry, education, and AI use. This approach allowed for a more nuanced understanding of the data, ensuring that the analysis captured both direct and indirect effects of individual variables on innovation, while controlling for demographic factors.

4.3 Participants

A total of 154 participants responded completely to the survey, with 74 (48.05%) identifying as female and 80 (51.95%) as male. In terms of age, the majority of participants fell within the younger age groups, with 61 (39.61%) of respondents between 18-24 years and 44 (28.57%) between 25-34 years, totaling almost 70% of the sample. Meanwhile, 27 (17.53%) of participants were between 35-44 years, 16 (10.39%) were aged 45-54 years, and a smaller group of 6 participants (3.90%) were 55 years or older. For the latest completed education, 60 participants (38.96%) were holding a Bachelor's Degree, 42 (27.27%) having earned a

Master’s Degree, 19 (12.34%) with a Doctorate Degree, and 33 (21.43%) with a High School Diploma. In terms of industry representation, participants were drawn from a variety of sectors, with Healthcare being the most represented industry at 25.32%, followed by Research & Development at 21.43%, Manufacturing at 18.83%, Creative Industries at 16.23%, and Telecommunications at 18.18% (reference to appendix).

5. Results

5.1 Correlation Matrix for Variables

The correlation matrix reveals numerous significant correlations between Innovation Outcome (IO), Idea Generation (IG), and AI Use (AI). The association between IO and IG is positive and moderate ($r = 0.55$, $p < 0.001$), indicating that increased idea generation leads to better innovation results.

Table 1. Correlation Matrix

Variable	IO	IG	AI
IO	1 (p=NA)	0.55 (p<0.001)	0.65 (p<0.001)
IG	0.55 (p<0.001)	1 (p=NA)	0.07 (p=0.385)
AI	0.65 (p<0.001)	0.07 (p=0.385)	1 (p=NA)

This association is statistically significant, implying a link between the frequency or quality of ideas created in the workplace and the subsequent innovation success. Furthermore, IO and AI use have a positive correlation ($r = 0.65$, $p < 0.001$). This substantial and statistically significant link shows that incorporating AI into daily work might improve innovation outcomes. The positive link shows that increasing the usage of AI technology is expected to enable higher performance in developing innovative products, services and outcomes.

However, the correlation between IG and AI use is weak and insignificant ($r = 0.07$, $p = 0.385$). This suggests that there is little to no direct correlation between how frequently AI is utilized and the capacity to develop new ideas. The lack of statistical significance shows that other factors may have a greater influence on idea production than AI use alone.

In summary, the findings show that AI Use and Idea Generation have substantial relationships with Innovation Outcomes, emphasizing the relevance of both factors in supporting workplace innovation. However, the poor relationship between AI Use and Idea Generation implies that AI may not have a direct impact on the creative components of innovation, but rather improves the whole innovation process through other methods. This forms the basis of the rest of the study.

Table 2. Linear Model Summary: IO ~ IG

Term	Coefficient Estimate	Standard Error	t-value	p-value	sig.
Intercept	1.8653791	0.16863000	11.061964	3.08e-21	***
IdeaGeneration	0.4143618	0.05068454	8.175311	1.08e-13	***

Note: Significance levels are indicated by *** $p < 0.001$, ** $p < 0.01$, * $p < 0.05$

Table 3. Model Fit Statistics

Model Fit Statistic	Value
Residual Standard Error	0.7535
Degrees of Freedom	152
Multiple R-squared	0.3054
Adjusted R-squared	0.3008
F-statistic	66.84
p-value	1.078e-13

A simple linear regression was conducted to examine the relationship between Idea Generation (IG) and Innovation Outcomes (IO). The analysis aimed to determine whether variations in IG significantly predict variations in IO within the workplace context.

The regression model was statistically significant, $F(1, 152) = 66.84$, $p < .001$, indicating that Idea Generation is a significant predictor of Innovation Outcomes. The model explained approximately 30.54% of the variance in Innovation Outcomes (Multiple $R^2 = 0.3054$, Adjusted $R^2 = 0.3008$).

The Intercept was estimated at 1.86538 (Standard Error = 0.16863), with a t-value of 11.062 and a p-value of $< .001$, indicating that the intercept is significantly different from zero. The coefficient for Idea Generation (IG) was 0.41436 (Standard Error = 0.05068), with a t-value of 8.175 and a p-value of $< .001$. This suggests a positive and significant association between Idea Generation and Innovation Outcomes.

5.2 Linear Regression with Controls

The multiple linear regression analysis was used to analyze the influence of Idea Generation (IG) on Innovation Outcomes (IO) while adjusting for demographic and educational characteristics yielded numerous major findings relevant to the research. The regression model

demonstrated a robust fit, explaining approximately 48.85% of the variance in Innovation Outcomes (Multiple R-squared = 0.4885, Adjusted R-squared = 0.441). The overall model was highly significant, as indicated by an F-statistic of 10.28 with a p-value of < .001, suggesting that the predictors collectively have a substantial impact on innovation outcomes.

Idea Generation emerged as a highly significant predictor of Innovation Outcomes (Estimate = 0.365291, $p < 0.001$). This positive relationship indicates that for each unit increase in idea generation, innovation outcomes are expected to improve by approximately 0.365 units, underscoring the critical role of employee creativity in fostering organizational innovation.

The analysis revealed varying effects of age and education on innovation outcomes. Employees aged 25-34 (Estimate = -0.321438, $p = 0.022482$) and those 55 and above (Estimate = -0.731606, $p = 0.020383$) showed significant negative relationships with Innovation ($p < 0.05$). In contrast, the 35-44 age group exhibited a marginally significant positive effect on innovation (Estimate = 0.320946, $p = 0.049412$), while the 45-54 group showed no significant impact. Regarding education, individuals with Doctorate and Master's degrees had a strong positive effect on innovation ($p < 0.05$), emphasizing the importance of advanced education. Conversely, having only a high school diploma did not significantly influence innovation. Gender and industry categories (Healthcare, Manufacturing, R&D, Telecommunications) were non-significant predictors, suggesting these factors may not critically impact innovation within the scope of this study.

Table 4. Linear Model Coefficients

Term	Estimate	Std..Error	t.value	p.value	
(Intercept)	1.812264	0.228537	7.930	6e-13	***
IG	0.365291	0.048523	7.528	5.7e-12	***
Age 25-34 years	-0.321438	0.139290	-2.308	0.022	*

Age 35-44 years	0.320946	0.161912	1.982	0.049	*
Age 45-54 years	-0.073732	0.194501	-0.379	0.705	
Age 55 years and above	-0.731606	0.311861	-2.346	0.02	*
Gender Male	0.017992	0.117314	0.153	0.878	
Industry Healthcare	0.161979	0.177239	0.914	0.362	
Industry Manufacturing	0.214755	0.188263	1.141	0.255	
Industry R&D	0.084874	0.184907	0.459	0.646	
Industry Telecommunications	0.012370	0.188952	0.065	0.947	
Education Doctorate Degree	0.672416	0.186923	3.597	4.5e-4	***
Education High School Diploma	0.003646	0.150399	0.024	0.98	
Education Master's Degree	0.301299	0.141309	2.132	0.035	*

Note: Significance levels are indicated by *** $p < 0.001$, ** $p < 0.01$, * $p < 0.05$

Model Fit Statistics

Residual Standard Error: 0.6738 on 140 degrees of freedom

Multiple R-squared: 0.4885, Adjusted R-squared: 0.441

F-statistic: 10.28 on 13 and 140 DF, p-value: 5.531e-15

The Generalized Variance Inflation Factor (GVIF) analysis was used to evaluate multicollinearity among the regression model's independent variables, with centering applied to the continuous variables included in interaction terms. Centering was used in AI Use and Idea Generation to decrease multicollinearity between the major effects and their interaction terms.

Table 5. Generalized Variance Inflation Factor (GVIF)

Variable	GVIF	Degrees of Freedom (Df)	GVIF ^{1/(2Df)}
IG_c	1.362918	1	1.167441
AI_c	1.630886	1	1.277061
Age	1.989583	4	1.089796
Education	1.414405	3	1.059487
Industry	1.281498	4	1.031489
Gender	1.176222	1	1.084538
AI_Att	1.640160	1	1.280687
IG_c:AI_c	1.345619	1	1.160008

The results indicate that multicollinearity is not an issue, since all $GVIF^{1/(2Df)}$ values are close to 1, much below the threshold of 2 that would indicate moderate multicollinearity. The $GVIF^{1/(2Df)}$ values for AI Use (1.28), Idea Generation (1.17), and their interaction term (1.16) indicate a low correlation between these variables. Other control variables, such as Age (1.09), Education (1.06), and Industry (1.03), exhibit modest multicollinearity. Therefore, the

regression model is well-specified, and the estimates of the coefficients can be interpreted reliably, without concerns about inflated standard errors due to correlations between the predictors.

5.3 Moderation Analysis with control variables

The regression analysis investigates the relation between Idea Generation (IG) and Innovation Outcomes (IO), factoring in the moderating effect of AI Use for Daily Tasks (AI) and adjusting for a variety of demographic and attitudinal factors. The model seeks to understand how idea creation effects innovation results, as well as how AI might improve or modify this interaction among individuals in the workplace.

Table 6. Moderation Analysis with control variables.

Variable	Estimate	Std..Error	t.value	p.value
(Intercept)	3.10728	0.26100	11.905	< 2e-16 ***
IG_c	0.35544	0.04032	8.816	4.78e-15 ***
AI_c	0.45385	0.04809	9.437	< 2e-16 ***
Age 25-34	-0.06799	0.10996	-0.618	0.537
Age 35-44	0.10819	0.12639	0.856	0.394
Age 45-54	-0.14086	0.14980	-0.940	0.349
Age 55+	-0.32684	0.25830	-1.265	0.208
Education Doctorate	0.16470	0.15111	1.090	0.278
Education High School Diploma	-0.08802	0.11604	-0.759	0.449
Education Master's	0.12488	0.11098	1.125	0.262
Industry Healthcare	0.17143	0.13592	1.261	0.209

Industry Manufacturing	0.19883	0.14447	1.376	0.171
Industry R&D	0.16018	0.14226	1.126	0.262
Industry Telecommunications	0.01912	0.14467	0.132	0.895
Gender Male	-0.04170	0.08980	-0.464	0.643
AI_Att	-0.01989	0.06507	-0.306	0.760
IG_c:AI_c	0.05919	0.03601	1.644	0.103

Note: Significance levels are indicated by *** $p < 0.001$, ** $p < 0.01$, * $p < 0.05$

Table 7. Model Statistics

Statistic	Value
Residual standard error	0.5134 on 137 degrees of freedom
Multiple R-squared	0.7094
Adjusted R-squared	0.6754
F-statistic	20.9 on 16 and 137 DF
p-value	< 2.2e-16

The regression study investigates the association between Idea Generation (IG) and Innovation Outcomes (IO), accounting for the moderating influence of AI Use for Daily Tasks (AI) and adjusting for a variety of demographic and attitudinal factors. The model seeks to understand

how idea creation affects innovation results, as well as how AI might improve or modify this interaction among individuals in the workplace.

The regression model has a Multiple R-squared of 0.7094 and an Adjusted R-squared of 0.6754, suggesting that it accounts for roughly 67.54% of the variation in innovation outcomes. The F-statistic of 20.9, with a p-value $< 2.2e-16$, indicates that the model is statistically significant and the predictors have a significant impact on innovation outcomes.

The Intercept has an estimate of 3.10728 with a standard error of 0.26100 and is highly significant ($t = 11.905$, $p < 2e-16^*$). This value shows the predicted level of innovation results when all predictor variables are at their reference levels or are centered on zero. In this application, it represents the baseline innovation outcome for an average employee who has mean-centered values for idea generation and AI usage and fits into the control variables' reference categories.

The coefficient of focused idea creation is 0.35544 ($t = 8.816$, $p = 4.78e-15^*$). This positive and highly significant relationship suggests that for every unit increase in idea production (above the mean), innovation results improve by about 0.355 units, assuming all other factors remain constant. The coefficient for centered AI use is 0.45385 ($t = 9.437$, $p < 2e-16^*$). This significant positive effect suggests that employees who use AI more frequently in their daily tasks tend to have higher innovation outcomes. Specifically, for each unit increase in AI use (above the mean), innovation outcomes increase by about 0.454 units, controlling for other factors.

The interaction between idea generation and AI use has a coefficient of 0.05919 with a t-value of 1.644 and a p-value of 0.103. While this coefficient is positive, indicating that the relationship between idea generation and innovation outcomes may be strengthened by AI use, it is not statistically significant at the conventional 0.05 level. This suggests that the moderating effect of AI use on the relationship between idea generation and innovation outcomes is not strongly supported by the data in this model.

The coefficient is -0.01989 with a p-value of 0.760, suggesting that attitudes toward AI, as measured by the GAAIS, do not have a significant direct effect on innovation outcomes when controlling for other variables.

6. Discussion

Hypothesis 1 (H1): There is a positive correlation between Idea Generation and Innovation Outcomes & Use of AI and Innovation Outcomes.

Hypothesis 2 (H2): There is a positive correlation between Idea Generation and Use of AI.

The objective of this study was to understand the impact of AI on Idea Generation and Innovation, and to build on the existing literature in this field. For the analysis of H1 and H2, a Spearman's Correlation Analysis was employed to understand the correlations between the variables.

The correlation matrix shows that both idea generation and AI use have strong positive correlations with innovation outcomes, supporting the assumption that both play an important role in increasing creativity inside the firm. However, the lack of a substantial association between idea generation and AI use shows that employees may be utilizing AI technologies unrelated to their idea generating activities.

Employees may be divided into two groups: those who are more involved in creative idea development and those who are more likely to utilize AI technologies, with little overlap between them. Employees may primarily employ AI technologies for jobs other than idea development, such as data processing, administrative duties, and routine decision-making. Employees engaged in idea generation may not be leveraging AI tools to enhance their creative processes, possibly due to a lack of awareness, skills, or suitable AI applications for creativity support.

Organizations may explore interventions to encourage the incorporation of AI tools into idea creation processes. Employees can benefit from training programs that teach them how AI can improve their creativity. The significant positive correlations of both idea generation and AI use with innovation outcomes reinforce their importance in driving organizational innovation. The lack of a significant correlation between idea generation and AI use highlights an area for potential development, suggesting that integrating AI more effectively into creative processes could further enhance innovation outcomes. These findings led to the acceptance of *H1* and *H2* was rejected due to insignificant results.

Hypothesis 3 (H3): There is a positive relationship between individual employees' idea generation and innovation outcomes in the workplace.

The regression analysis used to investigate the direct influence of Idea Generation (IG) on Innovation Outcomes (IO) in the workplace produced significant and relevant findings. The findings support Hypothesis 3 (H3), which states that more idea creation by individual workers is related with better organizational innovation outcomes. The positive relationship between Idea Generation and Innovation Outcomes is consistent with fundamental ideas and empirical research in the field of organizational innovation. The linear regression results were consistent with the conclusions presented in his study's literature review portion.

While idea creation contributes significantly to variation in innovation results, the R-squared value suggests that other factors account for around 69.46% of the variability. To explore this rudimentary model further, the next model was employed using control variables for demographics.

Hypothesis 4 (H4): Demographic factors have a significant effect on the relationship between Idea Generation and Innovation Outcomes.

The multiple linear regression analysis was used to investigate the direct influence of Idea Generation (IG) on Innovation Outcomes (IO) while accounting for a variety of demographic and organizational characteristics such as age, gender, industry, and education. This comprehensive model seeks to separate the impact of idea generation on innovation outcomes

while guaranteeing that observed interactions are not influenced by these control factors. This finding reinforces the central hypothesis of the study, aligning with Amabile's (1988) Componential Theory of Creativity, which posits that idea generation is a critical precursor to successful innovation.

Employees aged 25-34 exhibit significantly lower innovation outcomes compared to the reference group. This negative relationship suggests that individuals in this age bracket may face challenges that hinder their creative output. These blockers could be due to career transitional phases (Super, 1980) or stressors arising from work-life balance (Greenhaus & Beutell, 1985). Employees 55 and older had significantly poorer innovation outcomes as well. Older personnel may be less familiar or comfortable with new technology, such as AI tools that promote creativity (Czaja Czaja, 2006), Resistance to change (Gomez-Mejia & Balkin, 1984), or Impending Retirement. As employees approach retirement, their motivation to participate in long-term creative initiatives may decline (Wang & Shi, 2014).

Organizations should explore age-specific tactics to boost innovation. Mentorship and integration programs can enhance confidence and creativity among younger employees (ages 25 to 34). Training in new technology and establishing an inclusive culture can help older employees (55 and above) overcome their reluctance to innovation. The favorable impact reported in the 35-44 age range emphasizes the importance of experience mixed with an openness to new ideas. Encouraging cross-generational collaboration can help different age groups use their abilities (King & Lee, 2016).

As for Level of Education, Employees holding Doctorate and Master's degrees exhibit significantly higher innovation outcomes compared to the reference education level; Bachelor's. The substantial positive coefficient for doctorate holders suggests that advanced education is strongly associated with enhanced innovation capabilities, potentially due to specialized knowledge, critical thinking skills, and research experience. The non-significant coefficient for high school diploma holders indicates that lower educational attainment does not significantly differ from the reference category in terms of innovation outcomes.

The inclusion of demographic variables as controls provides a clearer picture of the specific impact of Idea Generation on Innovation Outcomes by accounting for potential confounding factors. The age-related findings add a layer of complexity, suggesting that life stage and associated factors such as experience, adaptability, and career stage influence innovation outcomes. This is consistent with studies that indicate varying levels of creative engagement and openness to new ideas across different age cohorts (Martins & Terblanche, 2003).

Even after adjusting for demographic and educational characteristics, the multiple regression analysis shows that Idea Generation has a substantial and beneficial influence in generating Innovation Outcomes at work. Furthermore, the findings emphasize the relevance of higher education in encouraging creativity, while age-related disparities point to the necessity for focused measures to maximize the creative potential of varied workforce cohorts. However, it is essential to note that this hypothesis could only be partially supported due to several demographic variables having no significant effects on Innovation or Idea Generation. These findings add to a better understanding of the mechanisms that drive idea creation and innovation, laying the groundwork for the research into moderating elements such as artificial intelligence (AI).

Hypothesis 5 (H5): Artificial intelligence positively moderates the relationship between idea generation and innovation outcomes, such that the relationship is stronger when AI tools are utilized effectively, controlling for employees' attitudes toward AI and demographics.

While the current analysis focuses on the direct association between Idea Generation and Innovation Outcomes, the study's larger scope includes investigating the moderating influence of Artificial Intelligence (AI) in the relationship. Attitudes towards AI was measured with (AI_Att) serving as a control variable for individual variations in receptiveness to AI tools. To explore the effect of AI Use on relationship between Idea Generation and Innovation Outcomes, moderation analysis was conducted using an Interaction Term between IG and AI. The regression analysis provided valuable insights into the relationship between idea generation, AI use, and innovation outcomes in the workplace. While the main effects of Idea

Generation (IG) and AI Use for Daily Tasks (AI) on Innovation Outcomes (IO) were both positive and highly significant, the interaction term between IG and AI use was not statistically significant. Additionally, most control variables, including age, education, industry, gender, and attitude toward AI, did not show significant effects. Therefore, the hypothesis H5 was not supported.

The interaction term aimed to assess whether AI use moderates the relationship between idea generation and innovation outcomes. The coefficient was positive but not statistically significant at the conventional 0.05 level (Estimate = 0.05919, $t = 1.644$, $p = 0.103$). Although the coefficient is positive, indicating a possible enhancement impact, the interaction was not statistically significant ($p = 0.103$). This lack of significance indicates that, in the circumstances of this study, the employment of AI has no meaningful effect on the strength of the association between idea production and innovation results.

With 154 data points and 16 predictors, the statistical ability to identify relatively small interaction effects might be limited. Interaction terms often require higher sample sizes to acquire appropriate power, and the reported effect size may be too small to be statistically significant in the current sample (Aguinis et al., 2005). Furthermore, If there is limited variability in AI use or idea generation among participants, it reduces the ability to detect interaction effects. A homogeneous sample regarding AI Use frequency could have masked potential moderating effects.

Individual characteristics among employees, including as technological skill, openness to innovation, and attitudes toward AI, are critical in deciding how well AI technologies can manage the link between idea creation and innovation results. These human characteristics determine not just the acceptance and use of AI technology, but also the degree to which employees can use AI to improve their creative contributions.

When AI is used mostly for non-creative tasks like data input, scheduling, or basic information retrieval, it helps to streamline operational efficiencies while not directly contributing to the creative components of idea production. In such cases, AI serves as a supplemental tool, freeing up employees' time and perhaps allowing them to concentrate more on creative efforts.

However, this indirect effect may be insufficient to improve the link between idea creation and innovation outcomes. This multi faceted utility of AI might have influenced the self-reporting by participants.

Furthermore, the degree to which AI technologies are adaptable and user-friendly might impact their acceptance and use in creative projects. Tools that enable employees to adjust AI features to their individual requirements are more likely to be used effectively for idea development. Furthermore, enterprises must ensure that AI integration is consistent with their innovation goals, creating an atmosphere in which AI serves as an amplifier of creativity rather than a replacement for human inventiveness. This necessitates comprehensive training programs, clear guidelines on AI usage, and a supportive organizational culture that encourages experimentation and embraces technological advancements (Dellermann, Calma, et al., 2019).

The current study's non-significant moderating effect of AI on the link between idea production and innovation results may be ascribed in part to the type of AI integration used by sampled participants. If AI technologies in these situations are mostly used for non-creative objectives, their ability to improve idea creation directly is restricted. This highlights the need of firms deliberately using AI in jobs that actively support and enhance workers' creative processes.

7. Limitations and Future Research

While the sample size was appropriate for some statistical analyses, it may not have been big enough to identify minor interaction effects, especially in moderation studies that require more statistical power (Aguinis et al., 2005). Furthermore, the sample may lack diversity in terms of industry representation and organizational settings, limiting the generalizability of the results. The inclusion of self-reported measures for important categories such as idea generation, AI usage, and innovation results increases the risk of response biases, such as social desirability and common method variation. The tools utilized may not have properly captured the complexities of AI application in creative processes, nor the diverse nature of innovation outputs.

The research did not consider how AI technologies are incorporated into participants' processes. Differences in AI applications, user usability, and alignment with creative objectives may have influenced AI's efficacy as a moderator. Participants' technological competency, openness to innovation, and views toward AI may have impacted the outcomes. While views about AI were assessed, additional individual characteristics such as technical self-efficacy and past experience with AI technologies were not thoroughly investigated.

Building on the results of the study and the limitations highlighted above, there are some future research opportunities that can be explored. Longitudinal study allows for the investigation of causal links as well as the tracking of changes over time. This method may illustrate how the adoption of AI technologies and their influence on idea creation and innovation results change. Future study should look into how different types of AI tools (e.g., generative vs. analytical AI), levels of user control, and integration techniques influence the link between idea production and innovation outcomes. Qualitative research might give detailed information into employees' interactions with AI products. Experimental designs containing interventions (for example, AI competence training programs) could also be used to assess the efficacy of certain tactics targeted at increasing AI integration into creative processes.

8. Conclusion

In summary, *H1* and *H3* were supported, confirming that both idea generation and AI use independently contribute positively to innovation outcomes. *H4* was partially supported, with age and education showing significant effects on innovation outcomes, while gender and industry did not. *H2* and *H5* were not supported, suggesting no significant correlation between idea generation and AI use, and no moderating effect of AI use on the relationship between idea generation and innovation outcomes.

The findings suggest that both idea generation and AI use have a considerable favorable impact on innovation outcomes. Employees that often participate in idea generating activities likely to contribute more significantly to innovation, which is consistent with core notions of creativity and innovation. Similarly, the adoption of AI tools is linked to better innovation results, suggesting that AI technologies can play an important role in enabling inventive processes. However, contrary the initial hypothesis, the moderating effect of AI use on the connection between idea production and innovation results was not statistically significant. This shows that, while AI technologies contribute to innovation outcomes on their own, they may not necessarily improve the efficacy of idea creation in driving innovation in the setting of this study. Several variables might explain this outcome, including the form of AI integration in the workplace, employee variations, and potential measurement limits.

Even though results were narrowly insignificant, there still remains the scope for organizations to leverage technologies such as AI for cultivation of creativity and innovation at the workplace. Organizations must intentionally implement AI capabilities in positions that directly assist creative processes. This necessitates a thorough knowledge of how AI may augment human creativity, as well as the development of AI applications that are intuitive and personalized to improve idea generation.

Organizations should provide individualized support systems to employees, taking into account their variability in technology competency and openness to innovation. This involves

implementing targeted training programs, providing mentorship opportunities, and building inclusive settings that encourage all employees to use AI technologies. Organizations may boost employee engagement with AI technology by promoting favorable views toward AI and stressing its function as a catalyst for creativity. This not only improves individual innovation outputs, but also increases the organization's total inventive capability.

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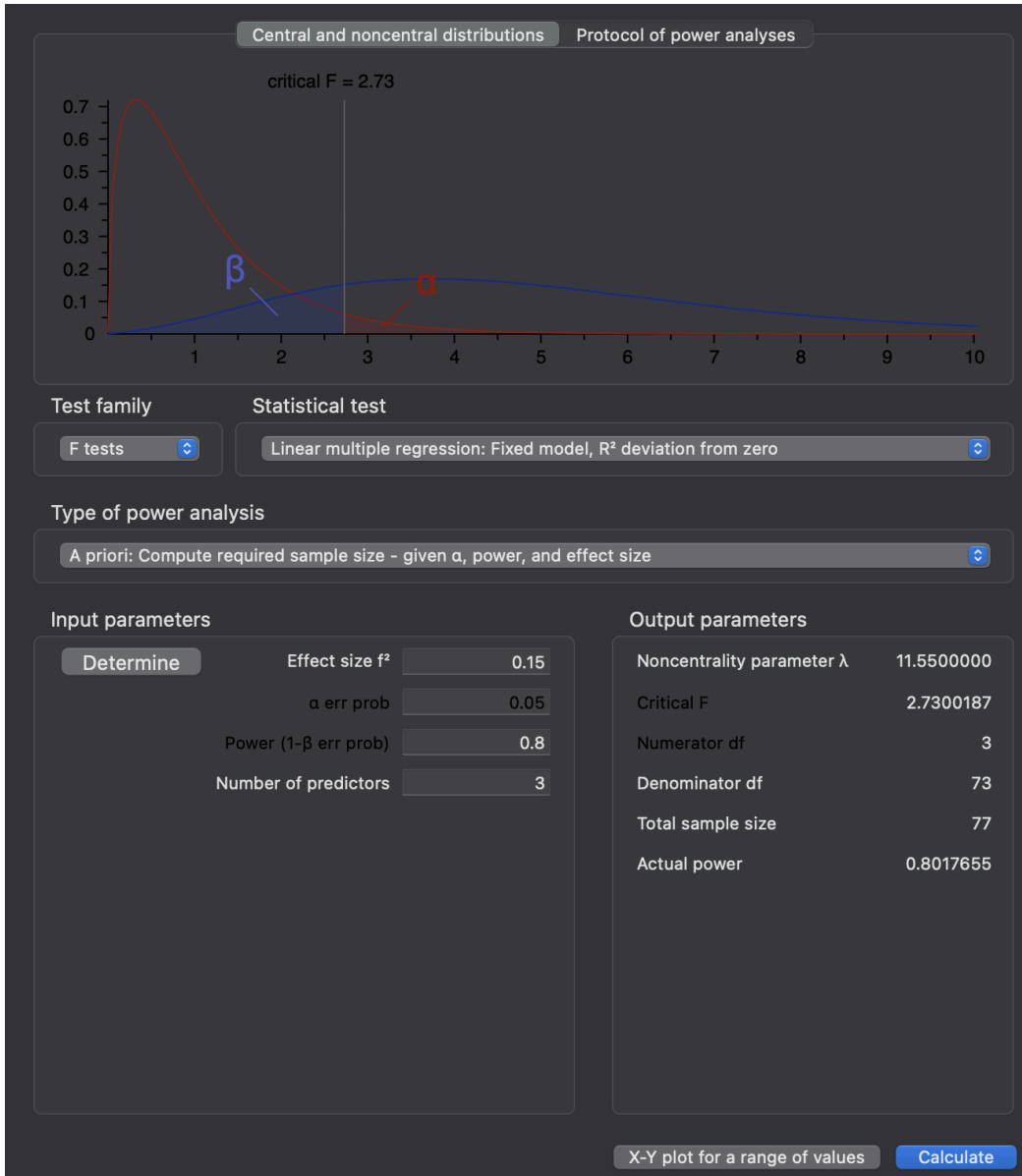
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10. Appendix

Appendix 1. Descriptives of demographics

	Variable	Category	Count	Percentage
1	Age	18-24 years	61	39.61
2	Age	25-34 years	44	28.57
3	Age	35-44 years	27	17.53
4	Age	45-54 years	16	10.39
5	Age	55 years and above	6	3.90
6	Gender	Female	74	48.05
7	Gender	Male	80	51.95
8	Education	Bachelor's Degree	60	38.96
9	Education	Doctorate Degree	19	12.34
10	Education	High School Diploma	33	21.43
11	Education	Master's Degree	42	27.27
12	Industry	Creative Industries	25	16.23
13	Industry	Healthcare	39	25.32
14	Industry	Manufacturing	29	18.83
15	Industry	Research & Development	33	21.43
16	Industry	Telecommunications	28	18.18

Appendix 2. G*Power Statistics



Appendix 3. Conceptual Framework

