Analyzing the Relationship Between Technology Usage and Work Productivity

1* Ammar Muhtadi

1 Sanskara Karya Internasional
*correspondence e-mail: ammar.muhtadi@sanskarakarya.com

Article Info	Abstract
Keywords: *Technology Usage,* *Work Productivity,* *Employee Skills,* *Training, Job* *Satisfaction*	*This research investigates the intricate relationship between technology use and employee work productivity within the realm of start-up companies. Operating in dynamic, competitive environments, start-ups have increasingly leveraged technology to optimize their performance and efficiency. The study employs a quantitative research approach, utilizing surveys to gather data from employees in various start-up companies. The primary objectives include elucidating the connection between technology use and productivity, exploring mediating and moderating factors, and providing actionable insights for start-ups aiming to enhance employee performance through technology. The findings reveal a moderately positive correlation between technology use and productivity. Mediation analysis highlights the significance of employee skills, training, and job satisfaction, while moderation analysis underscores the role of organizational culture and leadership style. This research equips start-up companies with valuable knowledge to optimize technology utilization in their quest for success.*

INTRODUCTION

Adopting technology in start-ups has become a central pillar in their operations, with various tools and technologies being utilized to streamline operations, enhance communication, and increase productivity. These technologies range from cloud computing and mobile applications to project management software and collaborative platforms.

Start-ups are increasingly adopting Industrial Revolution 4.0 (IR4.0) technologies, which include advanced technologies like artificial intelligence, IoT sensors, augmented and virtual reality, 3D modelling, and more. These technologies are being integrated with existing systems to offer innovative approaches to operations (Lombardi et al., 2019; Noeh et al., 2022). Social media has also become a significant tool for start-ups, primarily used for creating brand

awareness and as an alternative sales channel. It provides a platform for start-ups to interact with their customers and promote their products or services (Glowatz et al., 2013).

In the financial sector, the adoption of fintech has been transformative. Traditional financial institutions are now using fintech, and the banking sector is progressively being shaped by it. Fintech start-ups in India, for example, are addressing crucial structural issues plaguing Indian financial services to improve customer experience, stimulate acceptance and utilization of the digital channel, and minimize operational friction (Nordin & Zainuddin, 2023; Rajeswari & Vijai, 2021).

Blockchain technology is another area where start-ups are making significant strides. Despite the challenges, such as a widespread lack of understanding of the technology and its potential benefits, start-ups are finding ways to overcome these barriers and successfully deploy blockchain technology (Treiblmaier et al., 2021).

The adoption of technology in start-ups is not only enhancing their operations but also creating new opportunities for innovation and growth. However, it's important to note that the adoption of these technologies also comes with challenges, such as the need for a deeper understanding of the technologies and the need to balance the potential benefits of innovation with the potential risks of new approaches (Noeh et al., 2022; Rajeswari & Vijai, 2021; Treiblmaier et al., 2021).

In the ever-evolving landscape of the business world, start-up companies stand out as dynamic entities driven by innovation, resourcefulness, and growth potential. Thriving in this highly competitive environment requires nimble adaptation and a keen focus on efficiency and productivity. With its ever-expanding array of tools and solutions, technology has emerged as a pivotal factor in enabling start-ups to survive and excel. This research explores the intricate relationship between technology use and employee work productivity within start-up companies. It explores the extent to which technology utilization affects the productivity of employees and the underlying factors that mediate or moderate this relationship.

However, the integration of technology is full of challenges. Embracing new technologies often requires significant investments in terms of time and resources. Moreover, not all technologies are created equal, and their influence on employee productivity can vary considerably, contingent upon a host of factors. Recognizing how different technologies impact employee work productivity is imperative for

start-up companies. It allows for informed decisions regarding technology adoption and utilization, ensuring that such investments effectively bolster employee performance.

This research quantitatively explores the relationship between technology use and employee work productivity in start-up companies. It aims to unveil the complex interplay between these variables, uncover the factors that mediate or moderate this relationship, and provide actionable insights for start-ups seeking to harness technology for productivity enhancement.

LITERATURE REVIEW

Technology Use in Start-up Companies

Start-up companies, often characterized by their entrepreneurial spirit and rapid growth trajectory, thrive in an environment that demands adaptability and efficiency. In this context, technology has emerged as a catalyst for their success. Start-ups have increasingly harnessed a plethora of technological tools and solutions to gain a competitive edge. Technologies like project management software, cloud-based collaboration tools, and customer relationship management (CRM) systems have become indispensable in empowering start-ups to operate effectively (de Nigris et al., 2020; Paspalakis, 2018; Sreenivasan & Suresh, 2023).

Research within this domain underscores the positive influence of technology adoption on the growth and development of start-up companies. (de Nigris et al., 2020; Dinh-Le et al., 2019) found that technology adoption is positively correlated with the growth of start-ups. (Akiyama & Nakamura, 2008; Paspalakis, 2018) echoed these findings, emphasizing the transformative potential of technology tools in enhancing innovation and overall firm performance within start-ups.

Employee Work Productivity

Employee work productivity stands as a pivotal factor impacting the success of any organization, with start-ups being no exception. In a start-up's unique and often resource-constrained environment, optimizing employee productivity takes on heightened significance. Employee productivity is multifaceted, influenced by factors such as motivation, engagement, and the organizational work environment (Manés & Andreasson, 2018; OMOSEBI, n.d.; Sengupta et al., 2021).

Research suggests that employee productivity can be substantially augmented through various means, including training, effective leadership, and the strategic use of technology. For instance, conducted a study highlighting the

positive correlation between technology adoption and increased productivity, especially when complemented by appropriate training and organizational support (Azmy & Priyono, 2022; Juneja & Matharu, 2021; Naringrekar & Jain, 2020).

The Relationship Between Technology Use and Employee Work Productivity

The relationship between technology use and employee work productivity has been a subject of continuous exploration and debate. Technology brings many benefits, yet it also introduces challenges and potential distractions that can impede productivity. The nature of this relationship is not absolute. Various factors, including the technology employed, employee skills, and the overarching organizational culture, can significantly impact it.

Various studies have explored the intricate connection between technology use and employee work productivity. For example, (Cahyono et al., 2022; Chesley & Johnson, 2015; Elizabeth Robberts et al., 2020) conducted a study that examined the impact of mobile technology on employee productivity in the workplace. Their findings suggested that mobile technology can enhance productivity when used effectively but can also lead to distractions and decreased productivity when mismanaged.

Mediating and Moderating Factors

The relationship between technology use and employee work productivity is inherently complex and can be influenced by several mediating and moderating factors. These factors, while not central to the relationship itself, provide valuable insights into the nuances of how technology impacts productivity. Mediating factors explain the relationship's occurrence, while moderating factors influence its strength or direction.

Mediating factors are critical in understanding the mechanism through which technology affects productivity. For example, employee skills, training, and job satisfaction may mediate the relationship between technology use and productivity. Employees with the necessary skills or adequate training to effectively use a specific technology may improve productivity.

On the other hand, moderating factors are pivotal in understanding under what conditions technology has a more significant or diminished impact on productivity. Organizational culture and leadership style are examples of moderating factors. A supportive and flexible organizational culture may enhance the positive impact of technology on productivity, while a more rigid culture may mitigate its influence.

RESEARCH METHODS

This study adopted a quantitative research design to investigate the relationship between technology use and startup employee work productivity. A quantitative approach was deemed appropriate as it facilitates the collection of numerical data that can be statistically analyzed. This method allows the identification of patterns, trends, and correlations that are important for uncovering the relationship's dynamics. Data for this study will be collected through a structured survey. Surveys are a highly effective method for collecting quantitative data from a diverse and representative sample of respondents. The survey instrument is designed to include questions and statements relating directly to technology use, employee work productivity, and factors that could mediate or moderate the relationship between them. To ensure a broad and diverse sample, the survey will be distributed to employees working in various startups, covering a range of sectors and geographical locations.

This approach captures various experiences, technology practices, and productivity dynamics within the startup ecosystem. The survey is being conducted through multiple channels, including email, online survey platforms, and social media. In addition, efforts will be made to maximize the response rate and encourage participation, as a higher response rate will increase the representativeness and reliability of the data collected. A total of 300 samples were involved in this study.

The core variables of this study include:

a. Independent Variable: Technology Use: This variable assesses how technology is integrated into startup employees' work processes and tasks. It measures the frequency and proficiency of technology use.

b. Dependent Variable: Employee Productivity: Employee work productivity is the primary outcome variable, measuring the efficiency and effectiveness of employees' output in terms of their job duties and responsibilities.

c. Mediating Variables: Employee Skills, Training, and Job Satisfaction: These variables are examined as potential mediators that help explain the mechanism by which technology affects employee productivity. Employee skills and training reflect employees' competence in using technology. At the same time, job satisfaction measures the extent to which employees are satisfied with their jobs, which can be influenced by technology use.

d. Moderating Variables: Organizational Culture and Leadership Style: These variables are explored as potential moderators that influence the strength

and direction of the relationship between technology use and employee productivity. Organizational culture reflects the values and norms within the company, while leadership style characterizes the approach leaders take.

Data Analysis

The data collected through the survey will undergo rigorous data analysis using SPSS statistical software version 26. Descriptive statistics, such as means, standard deviations, frequencies, and percentages, will be used to summarize and present the data in a way that is easily accessible and understandable. Correlation analysis, including Pearson's correlation coefficient, will be used to determine the strength and direction of the relationship between technology use and employee work productivity. This analysis will initially assess the relationship between these two variables. Multiple regression analysis will be used to explore potential mediating and moderating factors affecting the relationship between technology use and employee work productivity. This analysis will help uncover the different effects of variables such as employee skills, training, job satisfaction, organizational culture, and leadership style.

This research will use moderation analysis to investigate how organizational culture and leadership style affect the strength and direction of the relationship between technology use and employee work productivity. This analysis will provide insight into the conditional nature of this relationship. Mediation analysis will be used to explore how variables such as employee skills, training, and job satisfaction mediate the relationship between technology use and employee work productivity. This analysis will help explain the mechanism by which technology affects productivity.

RESULTS

This section presents the results and subsequent discussion of the quantitative analysis of the relationship between technology use and employee work productivity in the context of startups. The main objectives of this study were to determine the nature and strength of the relationship, explore mediating factors, and assess the moderating influence of organizational culture and leadership style. The results presented here provide insights into how technology adoption and utilization affect employee productivity in the dynamic landscape of startups.

Descriptive Statistics

Descriptive statistics were initially used to provide an overview of the survey data. The sample consisted of respondents working in various startups, covering

various industries and geographical locations. The average age of respondents was 29 years, with a standard deviation of 4.3 years. Most respondents reported using technology frequently in their work, with an average score of 4.3 on a 5-point scale, where 5 indicates frequent use. Employee work productivity was evaluated on a scale of 1 to 10, resulting in an average score of 7.2, signifying a moderate level of productivity in the sample.

Correlation Analysis

The Pearson correlation coefficient was calculated to assess the relationship between technology use and employee work productivity. The results showed a moderately positive correlation ($r = 0.479$, sig < 0.01) between technology use and employee work productivity. This finding suggests that as technology use increases, employee work productivity also increases, indicating a positive relationship between the two variables.

Regression Analysis

Multiple regression analysis was conducted to investigate potential mediating and moderating factors affecting the relationship between technology use and employee work productivity. The following variables were included in the analysis:

a. Independent Variable: Technology Use
b. Dependent Variable: Employee Work Productivity
c. Mediating Variables: Employee Skills, Training, and Job Satisfaction
d. Moderating Variables: Organizational Culture and Leadership Style

The results of the regression analysis yielded valuable insights:

Employee skills, training, and job satisfaction were identified as mediating variables that explain how technology affects employee work productivity. This implies that much of the impact of technology on productivity can be attributed to the level of skills employees possess, the quality of training they receive, and their overall job satisfaction. Organizational culture and leadership style emerged as moderators of the relationship between technology use and employee work productivity. A supportive organizational culture and transformational leadership style were found to enhance the positive impact of technology on productivity, thereby strengthening the overall relationship.

Discussion

This quantitative analysis provides valuable insights into the intricate relationship between technology use and employee work productivity in start-up

companies. The moderately positive correlation between technology use and productivity confirms that, on average, employees who use technology more frequently tend to be more productive. This finding is consistent with existing research, which highlights the role of technology in enhancing productivity, particularly within the unique context of start-up companies.

The mediation analysis underscores the pivotal role played by employee skills, training, and job satisfaction in explaining how technology influences productivity. It emphasizes the significance of investing in employee development and providing practical training to optimize technology utilization. Job satisfaction, influenced by technology use, is a crucial factor that can substantially affect employee work productivity.

Furthermore, the moderation analysis draws attention to the influential impact of organizational culture and leadership style. A supportive and flexible corporate culture, combined with a transformational leadership style, amplifies the positive influence of technology on employee productivity. Start-up companies that cultivate a culture of innovation led by visionary leaders are better positioned to harness technology effectively for productivity gains.

The findings from this research illuminate that technology can be a potent tool for enhancing employee work productivity in start-up companies. However, the extent of this impact is intricately linked to various mediating and moderating factors. To harness technology for optimal productivity, start-ups should focus on technology adoption and prioritize employee skills, training, job satisfaction, and cultivating a supportive organizational culture and visionary leadership.

CONCLUSION

The quantitative analysis of the relationship between technology use and employee work productivity in start-up companies provides important insights for researchers and practitioners. The findings demonstrate a significant and positive association between technology use and employee work productivity, emphasizing the importance of technology adoption in the start-up ecosystem. Moreover, mediating factors, such as employee skills, training, and job satisfaction, play a vital role in explaining how technology affects productivity. These factors should be considered when seeking to optimize productivity through technology.

The results further emphasize the critical influence of organizational culture and leadership style as moderating factors. A supportive and innovative organizational culture, combined with visionary leadership, amplifies the positive impact of technology on employee productivity. For start-up companies, this

implies that efforts to foster a conducive culture and leadership style are essential for maximizing the benefits of technology.

REFERENCE

Akiyama, T., & Nakamura, T. (2008). *A Macroeconomic Theory of Technology Adoption: A Vintage Approach*. Graduate School of Economics, Kobe University.

Azmy, A., & Priyono, A. (2022). Leadership Roles For Improving Employee Productivity at Digital Start-Up Company. *Jurnal Manajemen Bisnis*, *13*(1), 16–27.

Cahyono, R., KUSWANDI, K., Sanggarwati, D. A., & SOPHAN, T. D. W. I. F. (2022). Effect of Hard Skill, Workload and Technology on Job Satisfaction and Work Productivity At Pt. Delta Jaya Mas Gresik. *The International Journal of Business & Management*, *10*(12), 31–38.

Chesley, N., & Johnson, B. E. (2015). Technology use and the new economy: Work extension, network connectivity, and employee distress and productivity. In *Work and family in the new economy* (pp. 61–99). Emerald Group Publishing Limited.

de Nigris, S., Craglia, M., Nepelski, D., Hradec, J., Gomez-Gonzales, E., Gomez Gutierrez, E., Vazquez-Prada Baillet, M., Righi, R., de Prato, G., & Lopez Cobo, M. (2020). *AI watch: AI uptake in health and healthcare, 2020*. Joint Research Centre (Seville site).

Dinh-Le, C., Chuang, R., Chokshi, S., & Mann, D. (2019). Wearable health technology and electronic health record integration: scoping review and future directions. *JMIR MHealth and UHealth*, *7*(9), e12861.

Elizabeth Robberts, M., Andrew van der Poll, J., & Engelbrecht, K. (2020). The impact of task-technology fit on the organisational commitment of mobile knowledge workers in South Africa. *Conference of the South African Institute of Computer Scientists and Information Technologists 2020*, 110–117.

Glowatz, M., Binderis, L., & Hopkins, M. (2013). *Social Media In Use: Assessing The Impact Of Social Media Use In Irish Technology Start-Ups*.

Juneja, D., & Matharu, S. K. (2021). A Valid and Reliable Scale Development for Measuring HR Strategies of Start-ups. *SEDME (Small Enterprises Development, Management & Extension Journal)*, *48*(4), 319–329.

Lombardi, M., Cammarota, A., & Refoyo, J. (2019). Development, applications and benefits of the network digital twin. *25th International Conference on Electricity Distribution*.

Manés, A., & Andreasson, A. (2018). *Profit vs user growth? A study of early strategies*

in start-ups, founder's motivation and strategy implementation.

Naringrekar, P., & Jain, D. R. (2020). Factors Affecting Productivity in Work Environment. *International Journal for Research in Applied Science and Engineering Technology*, *8*(7).

Noeh, A. S., Idris, P. R. P. H., & Anshari, M. (2022). Decision Model in the Development of Technopreneurship and the Adoption of IR4. 0 Technologies. *2022 International Conference on Decision Aid Sciences and Applications (DASA)*, 132–137.

Nordin, N., & Zainuddin, Z. (2023). A Review Of A Fintech Financing Platform: Potential And Challenges Of Islamic Crowdfunding To Entrepreneurs. *International Journal of Islamic Business*, *8*(1), 79–90.

OMOSEBI, P. A. (n.d.). *Web Based Housing Management System*.

Paspalakis, E. (2018). *The impact of digital technology on consumer behaviour and business operations· Case study*. Πανεπιστήμιο Πειραιώς.

Rajeswari, P., & Vijai, C. (2021). Fintech industry in India: the revolutionized finance sector. *Eur. J. Mol. Clin. Med*, *8*(11), 4300–4306.

Sengupta, S., Sharma, S., & Singh, A. (2021). Authentic leadership fostering creativity in start-ups: Mediating role of work engagement and employee task proactivity. *Business Perspectives and Research*, *9*(2), 235–251.

Sreenivasan, A., & Suresh, M. (2023). Start-up sustainability: does blockchain adoption drives sustainability in start-ups? A systematic literature reviews. *Management Research Review*.

Treiblmaier, H., Rejeb, A., van Hoek, R., & Lacity, M. (2021). Intra-and interorganizational barriers to Blockchain adoption: A general assessment and coping strategies in the agrifood industry. *Logistics*, *5*(4), 87.