Exploring the Effects of Remote-to-Hybrid Transition on Software Development Productivity

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Abstract

After the Covid-19 pandemic, the technology industry is widely adopting the hybrid work model. This study investigates the impact of hybrid work on software development productivity compared to the prevalent remote work during the pandemic. As this practice is emerging, the research aims to provide valuable insights to organizations and employees, aiding in future decisions regarding work models.

For this study, data on productivity and hybrid adoption were collected from developers in a product development organization in India, where the organization underwent a transition to hybrid work. The study examined software developers' productivity both before and after the transition, comparing those who adopted hybrid work with those who continued remote work. Additionally, the study evaluated how productivity varied with the extent of office work adopted by the employees.

Using difference-in-differences analysis, the study found a significant positive difference in the productivity of developers who embraced hybrid work compared to those who remained remote. Notably, the time spent in the office emerged as a catalyst, positively influencing the overall productivity of developers who adopted hybrid. In addition, through regression analysis, the study found that productivity was positively associated with the number of days worked from the office.

The study concludes that hybrid work positively impacts software developers' productivity, influenced by team and organizational factors. It recommends the adoption of the hybrid work model by organizations and employees, while also highlighting potential areas for future research that can further enhance and expand upon these findings.

This research makes a substantial contribution to both the technology industry and the understanding of this novel and emerging work model, providing valuable insights for informed decision-making and future exploration in the field.

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Chapter 1- Introduction

Background of the Study

In recent years, technological advancements in network infrastructure, bandwidth, laptops, and home office setups have enabled employees in the software industry to perform their duties remotely. However, the widespread adoption of remote work was limited, with employees working from home occasionally, often outside regular work hours.

For organizations, while remote work offered potential benefits such as real estate savings, talent accessibility, and increased flexibility, concerns about productivity and innovation persisted. Many companies were cautious about embracing permanent remote work due to apprehensions regarding engagement, collaboration, teamwork, creativity, and various interpersonal aspects.

The onset of the Covid-19 pandemic in March 2020 changed work arrangements globally, compelling the software industry to transition to remote work for all employees. Over the subsequent three years, software companies adapted to the constraints imposed by the pandemic and employee preferences. In the Microsoft Research paper (2020), Brodsky describes the global shift to remote work and how IT administrators are coping with the change.

By 2022, a hybrid workplace strategy emerged as a preferred model, typically requiring employees to work from the office for 2-3 days each week. This article in ETHRWorld.com (2022) captures the sentiment in the technology industry. This approach aimed to strike a balance between employee flexibility and organizational requirements.

Motivation for the Study

This study is motivated by the novelty of hybrid work in the industry-wide work model transformation.

While extensive research has explored software development productivity across a range of dimensions such as measurements, team factors, development processes, and distributed teams, a comparative study between remote and hybrid work models has been limited.

Previous research on remote work has primarily compared it to traditional office work, identifying factors affected by remote arrangements and their implications on specific roles and functions within organizations. This too has not been extensively studied regarding the software industry or software development productivity.

By comparing software development productivity between hastily adopted remote work during the pandemic and the intentional integration of hybrid work models, the study aims to

gain insights that would be valuable for software development organizations, their management teams, and employees. It will contribute crucial insights to inform future work arrangements, considering a diverse range of factors.

Aims and Objectives

The productivity of developers and testers in the software development process plays a pivotal role in shaping software functionalities, time-to-market, and, consequently, the realization of value for customers and the financial success of the organization. Therefore, understanding the impact of the hybrid work model on software development productivity is a critical focus of this study.

Creating commercial software requires multiple job functions coming together as a team to perform activities iteratively and repetitively throughout the product lifecycle. The steps involved include design, development, testing, release, and customer support. Developers make up majority of a team and their primary responsibility is writing code.

Requirements for a new software product or release ranges from introducing novel features to enhancing existing functionalities and making various improvements. The design phase serves as a crucial preparatory step, wherein developers meticulously determine the technical approach to bring these requirements to fruition.

Once the design is finalized, the coding phase commences, where developers translate the design into tangible, working software. Throughout the development process, developers and testers play a pivotal role in ensuring the quality of the software. Developers diligently address any defects that are discovered by testers or found in customer implementations of the released software.

Research Question

The study seeks to address the research questions:

1. Does hybrid work (relative to remote) impact software development productivity differently?
2. Does the number of days worked from the office impact software development productivity differently?

The examination will involve productivity measurements across two distinct time periods:

- When everyone worked remotely.
- When some transitioned to hybrid work and others continued to work remotely.

While the adoption of hybrid work is anticipated to yield overall long-term benefits, a crucial question persists: Will software development productivity experience an increase or decrease

upon transition to hybrid work model from remote? And as a follow up, in the hybrid work mode, does the number of days worked from office affect the productivity?

The study specifically aims to investigate whether the advantages of hybrid work model can effectively counterbalance associated concerns compared to remote work, ultimately leading to net productivity gains.

Industry Context

In March 2020, the entire software industry began transitioning to remote work. By the end of March, offices were closed, marking the onset of a three-month transition period for both organizations and employees from April to June 2020.

Organizations had to immediately address several factors to ensure continued employee productivity:

- Provision of laptops and other equipment for remote work.
- Establishment and enhancement of network infrastructure and VPN connectivity.
- Facilitation of suitable logistics such as furniture, internet to work from home.
- Implementation of collaboration tools and applications.
- Attention to employee and family welfare.
- Online training, enablement, and knowledge sharing.

Employees swiftly made arrangements at home to ensure the continuity of their day-to-day contributions without disruption. In India, major technology hubs such as Hyderabad and Bangalore attract talent from across the country. Approximately half of those employed in these locations opted to return to their hometowns, seeking a better support system and the opportunity to care for other family members during the pandemic.

From April 2020 until December 2021, the entire period was characterized by remote work, with offices remaining closed and in-person interactions non-existent. During this time, organizations across the industry and their employees adopted effective operational, people, and work practices to cater to the prevalent remote work arrangements.

Starting from January 2022, companies began to reopen their offices, ensuring safety and operational readiness. Offices became available for employees to use voluntarily for work, meetings, and interactions. Only a small number of employees were present in the office on any given day, and the office was primarily used when necessary for face-to-face meetings and collaboration. Some employees also found it convenient to work from the office and considered it as a way of breaking the monotony from remote work. This arrangement persisted until the end of 2022.

In 2023, as the pandemic wound down, companies began to consider bringing employees back to office. Over the course of the previous years of remote work, the makeup of many organizations had changed with significant proportions of their employees hired during the remote work period. Many of the new employees were remotely located and had not visited the offices or spent any in-person time with other team members. Moreover, many previously existing employees became part of different teams resulting in no prior in person working relationships. Organizations wanted to bring employees back to office to help in collaboration, teamwork, and relationship building.

At the same time, employees preferred a flexible work arrangement due to personal convenience and have proven they can be productive contributors while working remotely. As a balanced approach, many companies started embracing a hybrid model, expecting employees to work 2-3 days a week from the office.

The below views shared in the media by a few large employers in technology sector in India provides additional industry context.

- N. Ganapathy Subramaniam, Chief Operating Officer (COO) of TCS said, “There is a greater realisation that by coming to offices, more things get done, especially for people who have joined us in the last two years. When they come and see the offices, they see a different perspective of TCS, they see a different perspective of their own position vis-a-vis their peers”.

- K Krithivasan, CEO, TCS, had said during the earnings conference, “We believe working from the office is good for the associates, customers and TCS. You're talking only about work output in terms of how they deliver to customers, but how do they get mentored on culture? How do they get mentored on how they deal with customers and colleagues."

- A spokesperson for Capgemini told The Economic Times, "At Capgemini, we have established our hybrid work model to meet the evolved needs of our people and business. In accordance with this policy, which we launched two years back, we have advised our colleagues to adopt flexible work practices in line with business and client requirements."

- Business Today reported, “Indian IT services company Infosys has instructed employees to work from office at least three days a week, an internal email revealed. The email further noted that the company plans to soon make work from office mandatory for employees.”

- Rishad Premji, the Chairman of Wipro said, “You can't build that connectedness and intimacy no matter how advanced technology gets. We are human beings. I am a big believer that we should be coming back to offices in some shape and form.”

Research Context

The study centers on a software development organization in India, which is part of a large global enterprise software company. Headquartered in the USA, the company offers cloud-based software for its customers who are primarily located in North America. The company has been in existence for decades, with thousands of employees, and annual revenues over a billion dollars. The firm has most of its software development teams in USA and in India, with some presence in Philippines.

Globally, the organization's approach to work model since the onset of the pandemic aligns with the industry's typical experience. From all employees working from the office on every workday, the work arrangements shifted to remote work from March 2020 until the end of 2022. Starting in 2023, offices in India became open and operational, allowing employees to return voluntarily.

From July 2023, the India center embraced a hybrid work model, encouraging employees to work two days each week from the office. While not mandated, this approach was highly encouraged through communication about the benefits to both the organization and employees. Employees were afforded time to plan and transition from remote to hybrid work. To promote collaboration and teamwork, Wednesdays and Thursdays were designated as the preferred weekdays for the software development teams.

From July to September 2023, employees in India began transitioning to the hybrid work model. By October 2023, the organization began to see increased adoption of the hybrid work model. Below is a summary of the work arrangements in different locations during 2023.

Table 1 Work arrangements by location in 2023.

	India	**USA**	**Philippines**
Q2: Apr-Jun	Remote	Remote	Remote
Q3: Jul-Sep	Transition to Hybrid	Remote	Remote
Q4: Oct-Dec	Hybrid & Remote	Remote	Remote

Many organizations concluded 2023 with a similar mix of hybrid and remote work models, with variations across different geographic locations. The transition to hybrid work model from remote and the mix of hybrid and remote work models in the India organization is a representative of emerging industry practices in the software industry, particularly in India. Hence the organization is suitable for this study.

Chapter 2 – Literature Review

Scope and Objectives

The literature review is designed to underscore the significance of software development productivity, emphasizing established metrics while adopting a specific approach for measurement. Existing studies have delved into various factors influencing productivity, yet the impact of the hybrid work model remains a relatively unexplored territory. Given its industry relevance, the literature review serves to delineate the scope for further research and for discovering critical findings in this important area.

Key Concepts and Variables

Software Development

The software development process involves iteratively releasing to customers incremental software capabilities including new features and enhancements to existing functionality such as improvements in usability, quality, security, and performance. The scope for a release is first finalized and elaborated into detailed software requirements. Subsequently a technical design is created to realize the requirements and based on the design, working software is developed using suitable technologies. And before the software is released, it is tested to ensure it matches the requirements and of acceptable quality.

Large software development organizations with responsibility for multiple products and features are organized into small teams. Each team is made of small number of team members each of them with specialized roles that contribute to the software development process. Majority of a team is composed of software developers who are responsible for design, development and overall, for making any changes to the software code. A typical team includes developers with a range of skills and experience, so that the team can perform simple to complex development tasks. Agile Alliance provides a good overview of this software development process adopted widely in the industry.

Developer Productivity

Software development productivity directly impacts costs and time to market, thereby affecting competitive advantage and the success of the company. And productivity of software developers is of high importance, considering their costs and their high constitution in a team. Hence this research focuses on software developer productivity.

In general terms, productivity is defined as the ratio of the output units produced to the input units of effort. For a new software release, developers primarily contribute by writing new code or by modifying existing code. In Agile project management that is a widely adopted software development process, story points are used as a measure for the size or complexity of the output created by developers. And a software release is iteratively created through

incremental changes with each iteration lasting for a short duration such as one or two weeks. Considering these output and input parameters, average story points implemented by a developer per week during a product release cycle can be used as a measure for developer productivity.

Work Model

The work model adopted by an organization refers to the primary work environment used by employees for carrying out their regular tasks. For software development organizations, two historical models – work from office, remote - have been adopted, and in the post-pandemic period, a third alternative, hybrid, has widely emerged as the preferred model for the future.

Work from Office

In the work from office model, the office is the primary work environment for employees. Employees are expected to regularly work from the office, with occasional flexibility granted based on factors such as the employee's role, health, family situations, and other considerations at the discretion of management and policies. Equipment or other support for employees to enable them to permanently perform their job responsibilities from home are not provided.

Remote

In the remote work model (also called telework or work from Home), employees primarily work from home. They have a home setup that enables them to perform their regular work and entirely fulfil their responsibilities without the need for routine presence at the office. Employees are not provided a designated workspace or equipment at the office, and they are not required to be at the office on a regular basis. They may visit the office occasionally for special events or activities or voluntarily when they choose to do so.

Hybrid

In the hybrid work model, employees have the flexibility, suitable setup, workspaces, and equipment to perform their regular work and fulfil their responsibilities, both from office and from home. Employees live in the proximity of the office location, and routinely visit and work from the office. In this model, typically a weekly cadence is practiced such as two or three days a week in the office and the remaining days from home. Depending on the organization, and availability of seating, office workdays may have fixed weekdays, or flexibility is provided for employees and their teams to choose the days they work from office.

From its inception, the software industry had predominantly adopted a work from office model, viewing remote work as an exceptional arrangement. Organizations that embraced an entirely remote work model were rare. The pandemic imposed an immediate constraint on the industry to work remotely. Following the pandemic, the industry has now begun to adopt

a hybrid model of working, seen as a balanced option compared to work from office and remote work models.

Developer Productivity – Key Themes

The significance of comprehending the factors influencing developer productivity is underscored by the multitude of studies over many years that have explored this topic from diverse perspectives. Prior studies have focused on these major themes: metrics and measurements, team factors, development process, and distributed teams. Through references to a few example studies, some of the key findings across these areas are summarized below.

Metrics and Measurements

Below studies and their findings discuss software development productivity metrics and measurements.

- Sudhakar, Farooq, and Patnaik (2011) determined through literature review that software productivity can be measured using various metrics, including Source Lines of Code (SLOC), function points, use case points, object points, and feature points. They also identified that team size, response time, task complexity, team climate, and team cohesion have an impact on the productivity of software development teams.

- Wagner and Ruhe (2018) identified the main factors influencing productivity that have been investigated so far. They categorized these factors into technical factors, corresponding to product, process, and development environment, and soft factors, encompassing corporate culture, team culture, capabilities and experiences, environment, and project.

Team Factors

Below studies and their findings discuss how team factors affect software productivity.

- Krishnan (1998) found a significant association between the personnel capability of the team and a lower number of defects, that contributes to enhanced productivity. Additionally, teams with higher experience in the specific application domain of the product demonstrated fewer defects, resulting in lower maintenance costs.

- Krishnan, Kriebel, Kekre and Mukhopadhyay (2000) discovered that significant increases in software life-cycle productivity are achievable through improvements in conformance quality. Higher personnel capability, deployment of resources in the initial stages of development, and improvements in the software development process are associated with higher quality products.

- Lavazza, Morasca, and Tosi (2018) determined that the primary programming language significantly influences the productivity of new development projects, while the productivity of enhancement projects is less dependent on programming languages. The productivity of new development projects tends to be higher than that of enhancement projects. Both the business area and the architecture have a substantial impact on the productivity of both new development and enhancement projects. Their research found no evidence of the impact of CASE tools on productivity for either new development or enhancement projects.

- Pinkowska (2012) discovered that team cohesiveness is essential for achieving project goals. In the case of a highly cohesive team with high ethical standards, cohesiveness has a positive impact on team productivity. However, if this cohesive team is marked by unethical rules, the more they adhere to each other, the worse and more unpredictable their performances become.

Development Process

Below studies and their findings discuss how development processes affect software development productivity.

- Harter, Krishnan, and Slaughter (2000) found that higher levels of process maturity are associated with higher quality but also with increases in development effort. However, the reductions in cycle time and effort resulting from improved quality outweigh the increases from achieving higher levels of process maturity. The net effect of process maturity is a reduction in cycle time and development effort.

- Pai, Subramanian, and Pendharkar (2015) discovered that projects not adhering to the best practices of CMMI level 5 had significant potential for productivity improvements if they could emulate the best-in-class projects for process improvements.

- Blackburn, Scudder, and Wassenhove (1996) found that investing time and effort in the early stages of a software project yields faster cycle times and higher productivity. Rework is identified as the leading source of time delays; therefore, investing more time and effort upfront, particularly with specifications and prototyping, allows for time recoupment and increased productivity in later stages. Additionally, their research suggests that large teams tend to be less productive, and CASE tools have low importance in terms of reducing development time.

Distributed Teams

Below studies and their findings discuss how distribution of teams affect software development productivity.

- Ray and Samuel (2016) discovered that in the dispersed nature of global software development projects, communication, coordination, and control become more challenging, adversely affecting the effort estimation in software development. The key factors influencing the productivity of globally distributed projects include project delivery rate, team size, and communication complexity.

- Lim, Reis, and Reis (2015) found that, in the context of distributed software development projects, the productivity of testers was decisively influenced by knowledge expertise, communication, and the quality of products delivered by remote developers.

- Herbsleb, Finholt, and Grinter (2001) discovered that, compared to same-site work, cross-site work takes much longer and requires more people for work of equal size and complexity.

Work Models

The prominence and adoption of different work models are associated with distinct time periods delineated by the boundaries established by the Covid-19 pandemic. The three timeframes to be considered are pre-pandemic (the years before 2020), pandemic (the years 2020 to 2022), and post-pandemic (starting from 2023 and later).

Pre-pandemic period

During this period, the software industry predominantly operated from office spaces. While developer productivity remained a crucial topic, investigations were primarily centered around themes discussed in the preceding section. Work model related studies did not have an in-depth or exclusive focus on the software industry in a manner such as how other themes were investigated. Numerous studies explored remote work (telework) in a broader context, examining its consequences on performance outcomes, employees, teams, and organizations.

Martin and MacDonnell (2012) discovered through reviews and meta-analysis that there is a small but positive relationship between telework and organizational outcomes. They found telework is perceived to increase productivity, secure retention, strengthen organizational commitment, and to improve performance within the organization.

Pandemic period

The pandemic necessitated an abrupt shift in the software industry towards a remote working model for all employees. Organizations placed extensive focus on enabling developers to successfully carry out their responsibilities from home while also prioritizing their well-being. Virtual collaboration among team members for activities such as enablement, teamwork, and

knowledge sharing became crucial. Studies and reports delved into strategies for success in a highly stressful and dynamic environment.

Some example articles include Howard-Grenville (2020) discussion on how organizations can sustain their culture when everyone is remote, and Neeley (2020) guidance on how to work productively at home, manage virtual meetings, and lead through the time of crisis.

Post-pandemic period

After the pandemic, having experienced both the successes and limitations of the remote work model, organizations began exploring future work models that would best suit their needs. While a few companies chose either extreme, fully returning to the office or remaining completely remote, most of the industry opted for a hybrid model. This model involves a mix of workdays from the office and home each week, aiming to achieve organizational benefits while providing flexibility for employees.

Summary and Research Gaps

In examining the literature on software development productivity, the significance of this topic becomes evident based on extensive studies in this area, as productivity improvements result in cost savings and faster time to market. These studies consistently cover key themes, including metrics and measurements, team factors, development processes, and distributed teams. Though work models were studied substantially in the past, they were not focused extensively on the software industry or software development productivity.

Until the Covid-19 pandemic, when the industry primarily operated from office spaces, the impact of remote work on software development productivity was not extensively studied, as other important areas received most attention. During the pandemic, the industry's efforts focused on business dynamics, employee wellness, and support for remote work. Now, post-pandemic, the industry is embracing hybrid work on a large scale. However, insufficient research exists on the impact of work models, whether remote or hybrid, on software development productivity. Addressing this research gap not only contributes to academic knowledge but also holds the potential to significantly benefit the software industry.

Chapter 3 – Methodology

Research Design

This study adopts a quantitative approach to address the research questions and achieve the specified aims and objectives.

The research follows a longitudinal design, involving the collection of productivity data from software developers during two distinct time periods: first, during a three- month period of complete remote work before transition, and second, another three months immediately after a transition to a hybrid work model. The three-month duration is aligned with the quarterly software release cycle adopted by the organization.

In the realm of software development, when adopting Agile processes, story points are widely employed in the industry as a metric to quantify the effort required for task completion. Productivity is consequently measured quantitatively by the story points completed within a defined timeframe for each software developer. When the teams that participate in the study work on diverse products and use different technologies and tools, though story points have inherent subjectivity they bring standardization for making a study such as this possible.

To assess the impact of transitioning from remote to hybrid work models on software development productivity, the study employs the 'Difference in Differences' statistical technique. This method enables the comparison of productivity changes between the two time periods and offers insights into the specific effects of the transition.

Additionally, to understand the relationship between the extent of hybrid work model adoption and productivity, the study uses linear regression and correlation calculations. For this purpose, the impact of the number of days worked in the office after transitioning to hybrid work model on productivity is assessed.

Participants

The study involves developers from India who are part of a global software development organization, with presence in India, the USA, and the Philippines. While participants from the USA and the Philippines consistently adopted the remote work model throughout the study, participants in India transitioned from remote to a mix of remote and hybrid models after the transition period.

The study includes participants who remained with the organization throughout all study periods, encompassing the remote work model, the transition phase, and the eventual hybrid work model. Determined by a combination of experience and skills, participants exhibit a spectrum of expertise, ranging from entry to expert levels within their respective roles.

Contributions from participants extend across six different business units, each dedicated to a specific market or solution segment. While there are differences in the products and the technologies used, these factors did not change for the participants during the study. That is, specific participants assignments were not altered, and they continued their contributions in the same technologies and business units.

Data Collection

Productivity Data

The software development organization releases quarterly product increments encompassing new features, functional enhancements, customer requests, and quality improvements. Tasks within these releases are assigned story points based on the effort required. Individual contributors, subjects of this study, execute these tasks.

Productivity data is managed using Azure DevOps Server, a collaborative tool that tracks task-level details such as story points, completion time, and responsible individuals. This tool serves as the repository for all productivity data utilized in this study.

Relevant productivity data covers two quarters aligned with two releases.

- Q2 release (fourteen weeks starting March 29, 2023) representing remote work scenario immediately before transition to hybrid work model.

- Q4 release (twelve weeks starting September 27, 2023) incorporating a mix of remote and hybrid work models immediately after transition a transition period of one quarter. While the project timeline is 14 weeks, the last two weeks starting December 20th are during the holiday season and hence this period and any contributions during this period are not considered in this study.

Only participants present throughout this three-quarter period are considered. Productivity metrics for the releases are normalized to story points per week, as the quarters considered have different number of weeks. That is, contributions for a quarter, represented by the total story points completed in the release duration, is divided by the number of weeks in the quarter, to calculate average productivity as story points per week for the quarter.

Employee Data

Information was obtained from HR systems to identify the participants to those who joined before 2023 and are employees at the India location. Additionally, only those developers who remained employees throughout the study period were considered. The total number of developers who met these criteria was 161 and they were included in the study.

Hybrid Data

To gain access to office premises, employees utilize access cards, swiping them against control card readers. The access control system centrally records these swipes, associating them with respective employees. During the post-transition period (i.e., the twelve weeks in Q4), swipe data is used to determine the number of days each employee worked from the office.

For categorization into work models, an average of one day per week is established as a threshold for regularity and rhythm. Those employees who worked twelve or more days from the office during this period are considered as adopting the hybrid work model. Conversely, employees working fewer than twelve days from the office are categorized as continuing to work remotely. This aligns well with Agile software development process that adopts a two-week cycle for sprints that start with planning and conclude with creating a potentially shippable product increment by the end of the sprint. An average of at last one day a week in office fosters improved teamwork and collaboration through crucial stages in a sprint, along with strengthening relationships and creating broader alignment with the overall organization.

Data Collection Summary

In summary, through different systems the below information is gathered about productivity, employee information, and work model about the participants who are participating in the study.

Table 2 Data used in the analysis.

Productivity (Q2)	Average story points completed per week
Productivity (Q4)	Average story points completed per week
Role	Developer
Location	India
Hybrid days	Number of days worked from office in Q4
Hybrid model	Yes, if twelve or more days worked from office in Q4

Data Analysis

The Difference-In-Differences statistical technique is used for estimating the differential productivity impact of the hybrid work model compared to remote work. Additionally, linear regression is used to estimate the relationship between days worked in the office and productivity. The analysis is conducted using Excel and Stata tools.

Treatment and Control Groups

For the Difference-in-Differences analysis, the treatment group consists of those participants adopting the hybrid work model, selectively impacted by the transition. The control group comprises those who continued with remote work. All participants are categorized into either

the treatment or control group. During the study period, except the differences in work model, the participants experienced all other aspects of the organization in the same way.

Time Effect

The Difference-in-Differences model considers the effect of time by differentiating between pre-treatment and post-treatment periods. Measurements of participants productivity during these two periods are compared to understand the impact of adopting hybrid work model.

Response Variable

Productivity serves as the response variable, measured as the average story points completed per week during treatment period and post-treatment period. The productivity during post--treatment period is additionally used to assess how it is affected due to the number of days worked in the office.

Limitations

Though the study is robust when considering research design, data collection, and data analysis the below are known limitations of the investigation carried out by this research.

Other effects of work model

While the study focuses solely on software development productivity, a software development organization typically aims for quality and innovation as well. The impact of the hybrid work model could influence the holistic outcome, encompassing productivity, quality, and innovation. Consequently, the study's scope does not provide a comprehensive overview of all impacts of transitioning to a hybrid work model.

Duration of study

Following the transition to the hybrid model, the subsequent product release serves as the basis for assessing changes in productivity. However, compared to the over three years since 2020 when the organization operated remotely, one quarter provides a relatively small window to fully comprehend the impact of the hybrid work model. A more extended hybrid time frame may provide a comprehensive understanding of the effects of the intervention. However, a Difference-in-Differences study for extended time periods may constrain the ability to isolate the effects of the intervention due to other factors affecting the productivity of treatment and control groups.

Variables affecting productivity

Other considerations beyond the intervention that could affect productivity include individual and team factors such as participant and manager performance, team culture, the technology utilized, product lifecycle, team co-location, manager location, as well as timely scoping and prioritization that would affect utilization and productivity. For the time periods considered

for the study, these factors are not expected to change in a way that would affect the outcome of a Difference-in-Differences analysis.

Validity and Reliability

The data utilized in this study is regularly created and maintained through tools for managing software development, HR systems, and access to the office premises. These systems are integral to regular business operations, and therefore the tools and related processes ensure data validity and reliability.

Ethical Considerations

Productivity data, employee information, and office entry data are collected from respective systems without participants or their managers being aware. The data analysis is not utilized for managerial actions or assessments during or after the study period. To maintain privacy, participants' names are obfuscated during statistical analysis. These measures aim to protect participants from potential biases and consequences.

Chapter 4 – Results

Descriptive Statistics

Study Timing

The study is conducted during 2023 and the quarterly timeframes are shown below corresponding to the baseline, pre-treatment, treatment, and post-treatment periods.

Table 3 Quarter-wise study timeframes in 2023.

Q1	Q2	Q3	Q4
Baseline	Pre-treatment	Treatment	Post-treatment

The baseline period refers to the time before the study begins. While this period is not essentially part of the Difference-in-Differences analysis or linear regression model, data during this period is used to confirm the parallel trends requirement for Difference-in-Differences analysis. The pre-treatment quarter is utilized for productivity comparison with post-treatment and serves as the quarter immediately preceding the intervention. The treatment phase involves the implementation of the intervention, during which participants undergo a transition. Any effects of the intervention would be found in the post-treatment period, that would be compared with the pre-treatment phase.

Participants

The selection of participants for this study was guided by specific rationale and criteria, contributing to the research's validity. A total of 161 participants were identified based on the following considerations:

- The implementation of hybrid practices in India led to the inclusion of exclusively India-based employees in the study.

- Since the study's focus is on software development productivity, it includes only those employees with software developer roles who contributed to software releases. All such developers whose projects were managed through Azure DevOps Server are included in the study.

- To ensure consistency, the study includes only those developers who were already hired and enabled by Q2 2023, restricting the participant pool to individuals who joined the organization before Q1 2023.

- Since the study required comparison of productivity between Q2 and Q4, it only includes participants who remained with the organization throughout this entire period.

Productivity in 2022

While the study period is in 2023, productivity for the prior year (2022) was calculated for 107 of the 161 participants who were part of the organization throughout 2022, i.e., those who joined before 2022. Their average story points per week over the course of 52 weeks in 2022 was 1.73.

Preliminary Analysis

Treatment Group

Participants who have embraced the hybrid work model constitute the treatment group in this study. Specifically, individuals who worked from the office for at least 12 days during the 12-week product development cycle in Q4 are categorized as hybrid, while those who did not meet this criterion are classified as continuing with the remote work model. This distinction is based on an average of one day worked from the office per week, serving as a key differentiator between the treatment and control groups.

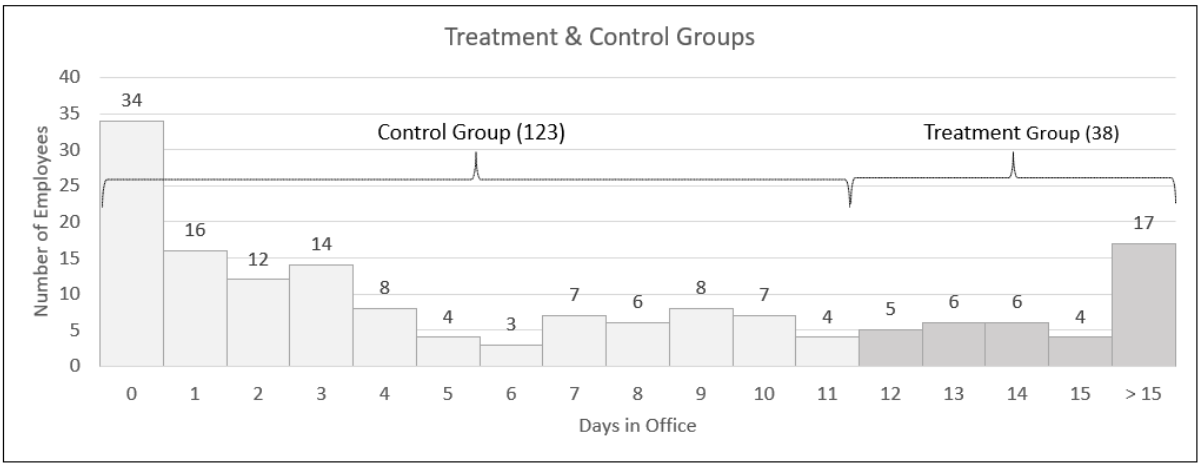

Figure 1 Distribution of employee days in office after hybrid adoption (post-treatment).

Control Group Count	123	Worked from office 12 or more days
Treatment Group Count	38	Worked from office less than 12 days

For the study, 38 participants who have adopted the hybrid model constitute the treatment group, while the remaining 123 form the control group as they continue with the remote model during the Q4 timeframe. Those who adopted the hybrid model worked a minimum of 12 days from the office during Q4, and they averaged 16 days in the office.

Pre-treatment Productivity

The study seeks to examine the impact of adopting the hybrid model (the treatment) on productivity, using developer productivity—defined as the number of story points completed by a developer in a week—as the primary outcome measure. The box plot below illustrates

the distribution of productivity among participants within the control and treatment groups during the pre-treatment period.

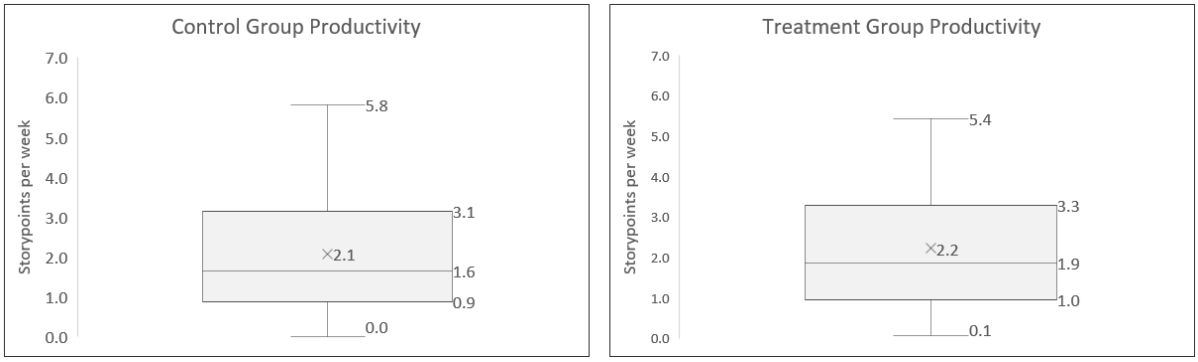

Figure 2 Productivity of treatment and control groups during remote work (pre-treatment).

Control Group Productivity (Story Points Per Week)	2.1
Treatment Group Productivity (Story Points Per Week)	2.2

A two-tailed t-test comparing the productivity of participants in the control and treatment groups during the pre-treatment period resulted in a p-value of 0.625. This indicates that the difference in productivity between the control and treatment groups during the pre-treatment period is statistically nonsignificant.

Baseline Productivity

For understanding productivity trends and to aid in validating equal trends assumption for Difference-in-Differences analysis, Q1 the quarter prior to pre-treatment is identified as baseline period. The box plot below illustrates the distribution of productivity among participants within the control and treatment groups during this time.

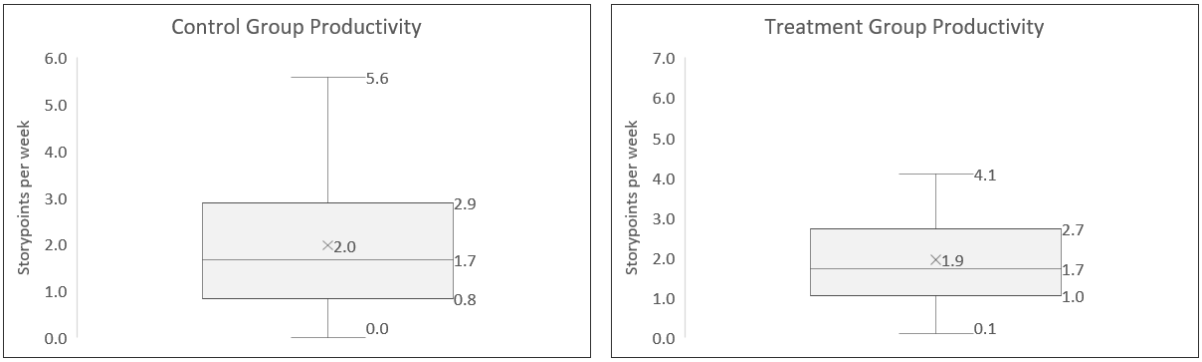

Figure 3 Productivity of treatment and control groups during remote work (baseline).

Control Group Productivity (Story Points Per Week)	2.0
Treatment Group Productivity (Story Points Per Week)	1.9

A two-tailed t-test comparing the productivity of participants in the control and treatment groups during the baseline period resulted in a p-value of 0.907. This indicates that the difference in productivity between the control and treatment groups during the baseline period is statistically nonsignificant.

Productivity Differences Between Treatment and Control Groups

Post-treatment Productivity

The box plot below illustrates the distribution of productivity among participants within the control and treatment groups during the post-treatment period.

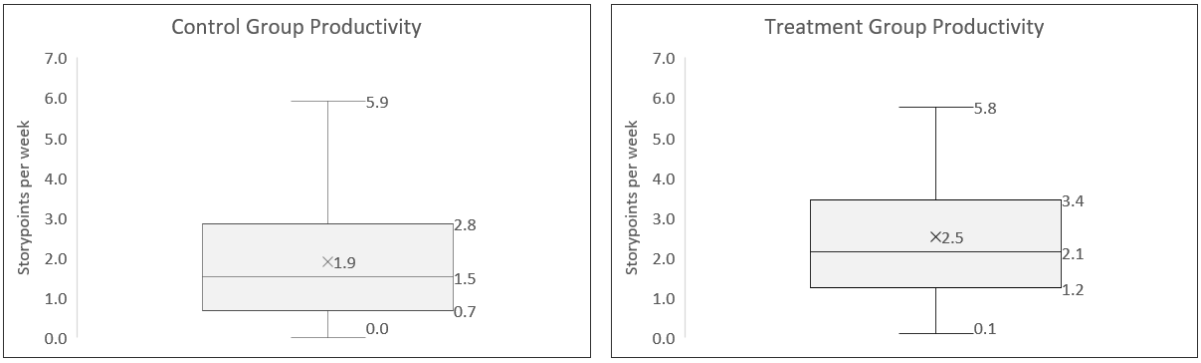

Figure 4 Productivity of treatment and control groups during hybrid work (post-treatment).

Control Group Productivity (Story Points Per Week)	1.9
Treatment Group Productivity (Story Points Per Week)	2.5

A two-tailed t-test comparing the productivity of participants in the control and treatment groups during the post-treatment period resulted in a p-value of 0.049. This indicates that the difference in productivity between the control and treatment groups during the post-treatment period is statistically significant. A t-test between treatment and control groups pre-treatment yielded a p-value of 0.625 indicating that after treatment the difference in productivity became statistically significant between treatment and control groups whereas before treatment that was not the case.

Productivity Trend

The chart below illustrates the productivity for treatment and control groups across baseline and pre-treatment periods.

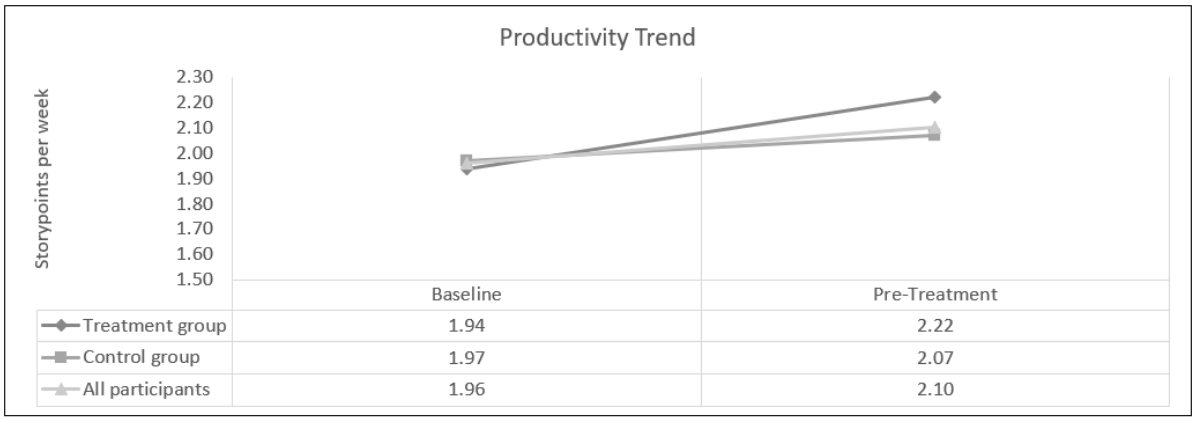

Figure 5 Productivity trend across baseline and pre-treatment periods, for treatment group, control group and all combined.

The chart reveals a similar trend in productivity between the treatment and control groups prior to the intervention, validating the application of the Difference-in-Differences analysis to examine the effects of the intervention during the treatment period.

Difference-in-Differences Estimator

The Difference-in-Differences estimator is the difference of the mean differences between the difference in the treatment group before and after the treatment (treatment effect) and the difference in the control group before and after the treatment (the trend over time).

Table 4 Difference-in-Differences estimator calculations summary.

	Pre-treatment	**Post-treatment**	**Difference**
Treatment group (38)	2.22	2.51	0.29
Control group (123)	2.07	1.88	-0.19
Difference	0.15	0.63	**0.48**

The Difference-in-Differences estimator value is 0.48. As the estimate in non-zero and positive, it indicates that the intervention has led to increased productivity in the post-treatment period.

The following graphic helps in visualizing the various estimated values. It shows that the hypothetical treatment group without treatment is estimated to have a productivity of 0.48 lower than what was observed with the same group, post-treatment.

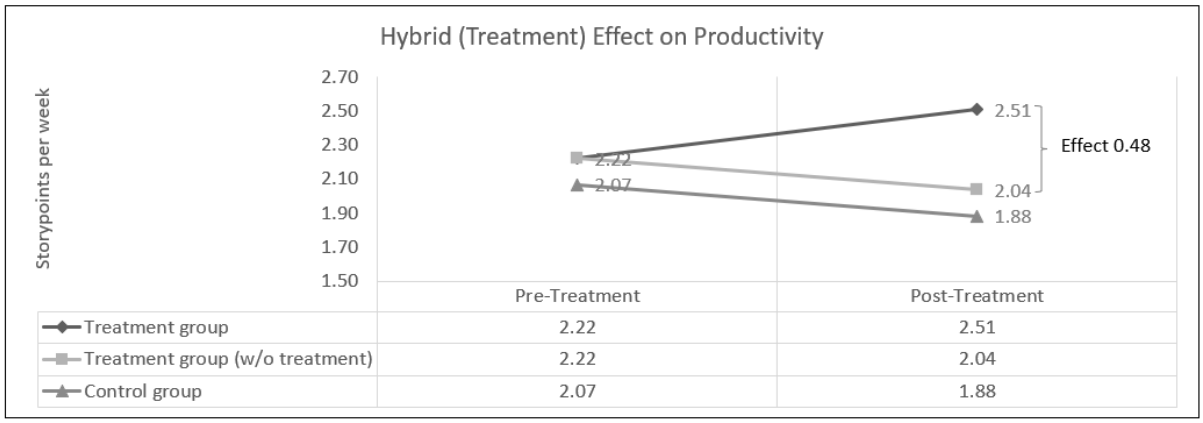

Figure 6 Estimated change in productivity between treatment and control groups before and after hybrid adoption (treatment).

Statistical Model

The equation for the Difference-in-Differences model is presented below, featuring four coefficients that need to be estimated:

$$\text{Productivity} = \beta 0 + \beta 1 \times \text{Hybrid} + \beta 2 \times \text{Period} + \beta 3 \times \text{Hybrid} \times \text{Period} + e$$

- Intercept: The intercept (β0) represents the baseline productivity level in the control group during the pre-treatment period. It is the expected productivity in story points per week for developers in the control group before the hybrid work intervention.

- Treatment effect: The treatment effect coefficient (β1) represents the average change in productivity for the treatment group compared to the control group. If β1 is positive and statistically significant, it suggests an increase in productivity for the group that adopted the hybrid work model.

- Time effect: The time effect coefficient (β2) captures the average change in productivity over time for the control group. If β2 is positive and statistically significant, it indicates that, on average, productivity in the control group increased over time during the study period.

- Interaction term: The interaction term coefficient (β3), or the Difference-in-Differences coefficient, quantifies the additional change in productivity for the treatment group compared to the control group during the post-treatment period. If β2 is positive and statistically significant, it suggests that the hybrid work intervention led to a significant additional increase in productivity.

The below table summarizes the variables included in the regression and it includes additional demographics that serve as control variables.

Table 5 Variables used in the regression for Difference-in-Differences model.

Variable	Description
productivity	Outcome variable (average story points per week during pre-treatment or post-treatment period).
period	Identifies if it is pre-treatment or post-treatment period (0 or 1 respectively).
hybrid	Indicates whether the participant is part of the treatment group (hybrid=1) or control group (hybrid=0), depending on whether the participant worked 12 or more days from the office or 0 days during the post-treatment period.
period_hybrid	Interaction term (period x hybrid), quantifies the additional change in productivity for the treatment group compared to the control group during the post-treatment period.
career_junior	Based on the role in the organization, indicates if the skills of the participant is at junior level (career_junior=1 and career_expert=0).
career_senior	Based on the role in the organization, indicates if the skills of the participant are at senior level (career_junior=0 and career_expert=0).
career_expert	Based on the role in the organization, indicates if the skills of the participant is at expert level (career_junior=0 and career_expert=1).
tenure	Number of years the participant worked in the organization at the beginning of study year (2023).
gender	Whether the participant is male or female (1 or 0 respectively).

Using Stata to run the linear regression yields the below results.

```
. regress productivity period hybrid period_hybrid tenure career_junior career_expert gender, robust

Linear regression                               Number of obs     =        322
                                                F(7, 314)         =       3.62
                                                Prob > F          =     0.0009
                                                R-squared         =     0.0627
                                                Root MSE          =     1.5558
```

productivity	Coefficient	Robust std. err.	t	P>|t|	[95% conf.	interval]
period	-.1852845	.1925776	-0.96	0.337	-.5641902	.1936211
hybrid	.1530079	.3114216	0.49	0.624	-.4597289	.7657448
period_hybrid	.4742319	.4338999	1.09	0.275	-.3794868	1.327951
tenure	-.0213369	.0311864	-0.68	0.494	-.0826976	.0400238
career_junior	-.6767891	.1926206	-3.51	0.001	-1.055779	-.2977989
career_expert	.2795325	.2437834	1.15	0.252	-.2001231	.759188
gender	.1075475	.2345699	0.46	0.647	-.3539799	.5690749
_cons	2.203853	.2721545	8.10	0.000	1.668376	2.73933

Figure 7 Results from Difference-in-Differences regression analysis.

The regression analysis supports the findings of the Difference-in-Differences analysis, indicating that the intervention, resulting in the transition to a hybrid work model, has led to increased productivity in the post-treatment period, but not statistically significant (p-value 0.275).

Productivity Variation with Days Worked in Office

The below chart shows a linear positive relationship between productivity per week and the number of days worked in the office during post-treatment period. Additionally, the two variables have a positive correlation of 0.13.

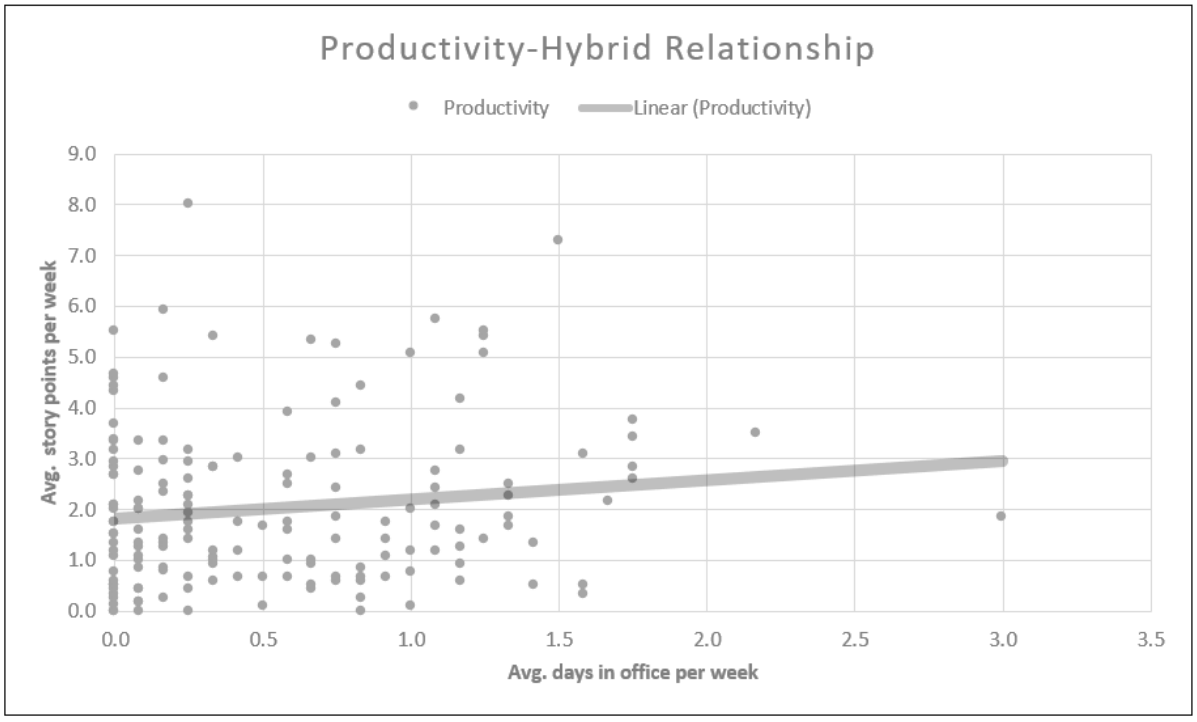

Figure 8 Scatter plot between story points and days worked in office.

Using Stata to run the linear regression between story points and days worked in office yields the below results.

```
. regress productivity hybrid_days, robust

Linear regression                               Number of obs     =        161
                                                F(1, 159)         =       2.95
                                                Prob > F          =     0.0877
                                                R-squared         =     0.0175
                                                Root MSE          =     1.5727

------------------------------------------------------------------------------
             |               Robust
productivity |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
hybrid_days  |   .3762318   .2189532     1.72   0.088      -.0562    .8086636
       _cons |   1.825158   .1664376    10.97   0.000     1.496444    2.153871
------------------------------------------------------------------------------
```

Figure 9 Results from regression analysis of days worked in office and productivity.

From the regression results, the equation for the linear relationship between productivity and days in office per week is:

Productivity = 1.82 + 0.38 x Hybrid_Days + e

The positive and statistically significant coefficient for hybrid days suggests that an increase in the number of days worked in the office positively impacts developer productivity.

To assess if the linear relationship changes after a threshold number of days worked in the office, the below regression adds square of days worked in the office.

```
. regress productivity hybrid_days hybrid_days_sq, robust

Linear regression                               Number of obs     =        161
                                                F(2, 158)         =       1.56
                                                Prob > F          =     0.2139
                                                R-squared         =     0.0175
                                                Root MSE          =     1.5776

------------------------------------------------------------------------------
             |               Robust
productivity |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
hybrid_days  |   .3423754   .5019955     0.68   0.496    -.6491119    1.333863
hybrid_days_sq|  .0196264   .2358052     0.08   0.934    -.4461106    .4853634
       _cons |   1.831778   .1911407     9.58   0.000     1.454258    2.209299
------------------------------------------------------------------------------
```

Figure 10 Results from regression analysis after including square of days worked from office.

From the above results, a declining (or increasing) trend is not observed as the number of days increases i.e., such a threshold has not been reached with the data used in the study.

Productivity Variation with Days Worked in Office and Additional Variables

In addition to days worked in the office, when additional variables are used in the regression, the below results are observed.

```
. regress productivity hybrid_days tenure career_junior career_expert gender, robust

Linear regression                               Number of obs     =        161
                                                F(5, 155)         =       2.85
                                                Prob > F          =     0.0172
                                                R-squared         =     0.0655
                                                Root MSE          =     1.5535
```

productivity	Coefficient	Robust std. err.	t	P>|t|	[95% conf.	interval]
hybrid_days	.3257875	.2144889	1.52	0.131	-.0979112	.7494862
tenure	-.0244007	.0456579	-0.53	0.594	-.1145926	.0657913
career_junior	-.6970791	.2640256	-2.64	0.009	-1.218632	-.1755263
career_expert	.2738925	.3567206	0.77	0.444	-.4307689	.9785538
gender	.0763592	.3515122	0.22	0.828	-.6180134	.7707318
_cons	2.031807	.3919618	5.18	0.000	1.257531	2.806083

Figure 11 Results from regression analysis of productivity and other independent variables.

Results Summary

The study results suggest that the adoption of a hybrid work model is associated with increased developer productivity, and there is a positive relationship between the number of days worked in the office and productivity.

- There is a substantial 0.63 difference in productivity between the control group and the treatment group in the post-treatment period following the hybrid work intervention, representing a 33% difference. This difference in means is statistically significant with a p-value of 0.049.

- The Difference-in-Differences effect, attributed to the impact of the hybrid work intervention on productivity, is +0.48, which is 23% higher than the baseline productivity level in the control group during the pre-treatment period. However, the regression model estimates the coefficient as statistically nonsignificant, with a p-value of 0.275.

- The impact on productivity for a day worked in the office is +0.38. The regression model estimates the coefficient as statistically significant with a p-value of 0.088.

Additionally, there is a positive correlation of 0.13 between productivity and the number of days worked in the office during the post-treatment period.

- When additional independent variables are used alongside days worked in the office to study their impact on productivity, junior career levels show a statistically significant lower productivity during the treatment period compared to senior and expert career levels. This aligns with the expectation that higher career levels are more productive than lower career levels.

In summary, the results obtained by using different techniques such as Difference-in-Differences analysis, regression models, correlation calculations, and visual graphics, indicate that the adoption of hybrid work model positively affects software developers' productivity.

Chapter 5- Additional Results and Analysis

Hybrid if any days worked from office, else Remote

The above analysis considered an average of one day a week in the office as the threshold for hybrid adoption and any lower number of days in office, including zero were considered as remote. This consideration is in alignment with Agile software development process that adopts a two-week cycle for sprints that starts with planning and concludes with creating a potentially shippable product increment. An average of at last one day a week in the office strengthens teamwork and collaboration that would benefit both individual and team performance. The statistically significant positive relationship between productivity and number of days worked in office, is additionally supportive of this consideration.

But a stricter interpretation of remote would include only those who did not work from office even for one day, and all those who worked from office any number of days can be considered hybrid. Such a categorization identifies 34 employees as remote and the remaining 127 as hybrid.

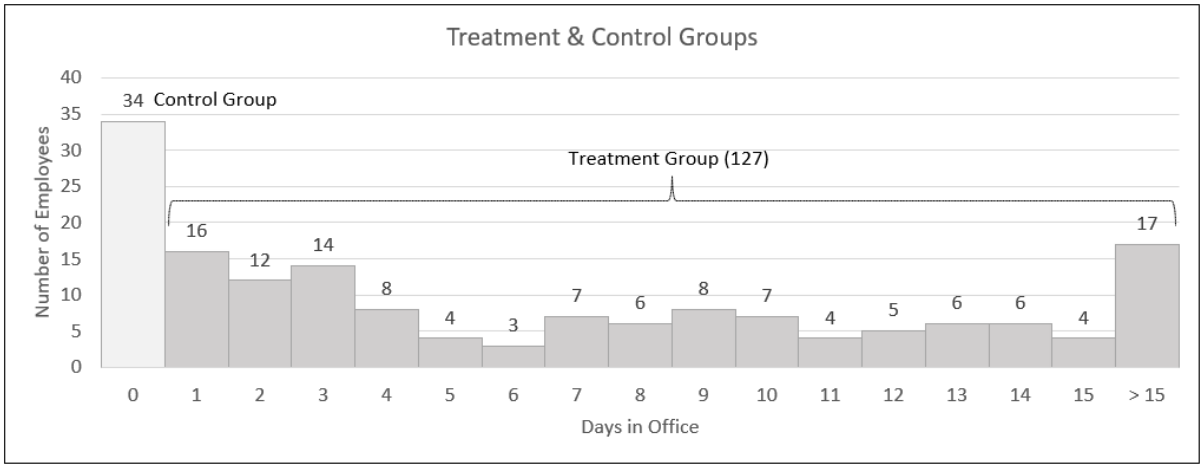

Figure 12 Categorization of treatment and control groups with only those who never worked from office identified as remote.

Control Group Count	34	Did not work from office on any days
Treatment Group Count	127	Worked from office one or more days

The chart below illustrates the productivity for treatment and control groups across baseline and pre-treatment periods. The chart reveals a similar trend in productivity between the treatment and control groups prior to the intervention, validating the application of the Difference-in-Differences analysis to examine the effects of the intervention during the treatment period.

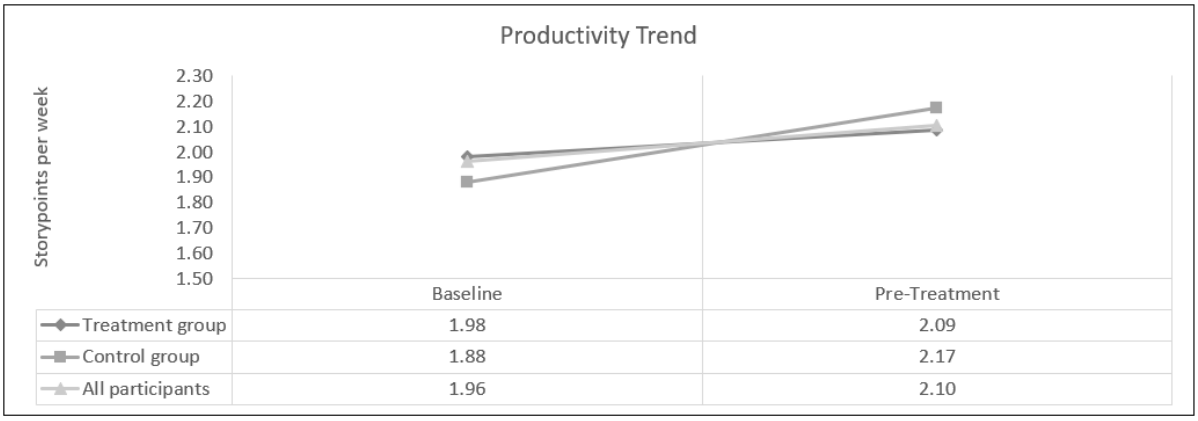

Figure 13 Productivity trend across baseline and pre-treatment periods, for treatment group, control group and all combined.

The Difference-in-Differences estimator value is 0.115. This indicates that the intervention has led to a small productivity change in the post-treatment period. These changes are not statistically significant because a t-test between treatment and control groups post-treatment yields a p-value of 0.931. A t-test between treatment and control groups pre-treatment yielded a p-value of 0.758 indicating there was no statistically significant difference between these groups either pre-treatment or post-treatment.

Table 6 Difference-in-Differences estimator calculations summary.

	Pre-treatment	**Post-treatment**	**Difference**
Treatment group (127)	2.09	2.04	-0.05
Control group (34)	2.17	2.01	-0.16
Difference	-0.09	0.03	**0.115**

The following graphic helps in visualizing the various estimated values.

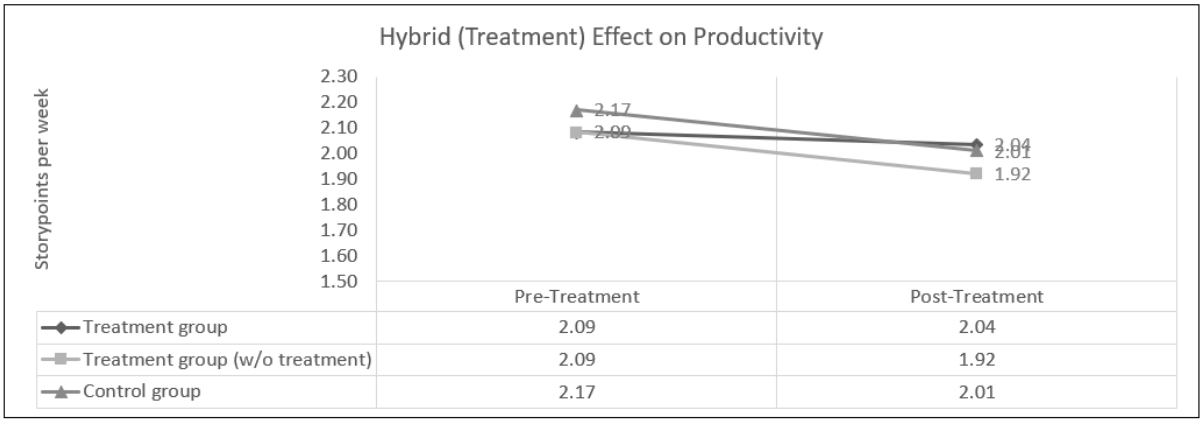

Figure 14 Estimated change in productivity between treatment and control groups before and after hybrid adoption (treatment).

Using Stata to run the linear regression yields the below results.

```
. regress productivity period hybrid period_hybrid tenure career_junior career_expert gender, robust

Linear regression                               Number of obs     =        322
                                                F(7, 314)         =       3.16
                                                Prob > F          =     0.0031
                                                R-squared         =     0.0487
                                                Root MSE          =     1.5674
```

productivity	Coefficient	Robust std. err.	t	P>|t|	[95% conf.	interval]
period	-.1638235	.3539845	-0.46	0.644	-.8603048	.5326578
hybrid	-.1481337	.2888505	-0.51	0.608	-.7164609	.4201934
period_hybrid	.1146897	.4066552	0.28	0.778	-.6854239	.9148032
tenure	-.0135934	.0321838	-0.42	0.673	-.0769165	.0497298
career_junior	-.6426494	.1961843	-3.28	0.001	-1.028651	-.2566474
career_expert	.2975167	.2431258	1.22	0.222	-.1808449	.7758783
gender	.1564227	.2431139	0.64	0.520	-.3219156	.634761
_cons	2.276782	.3234038	7.04	0.000	1.640469	2.913094

Figure 15 Results from Difference-in-Differences regression analysis.

The regression analysis supports the findings of the Difference-in-Differences analysis, indicating that the intervention, resulting in the transition to a hybrid work model, though statistically non-significant (p-value 0.778) has led to small productivity increase in the post-treatment period.

The below chart shows percentage of employees working from office corresponding to different number of days.

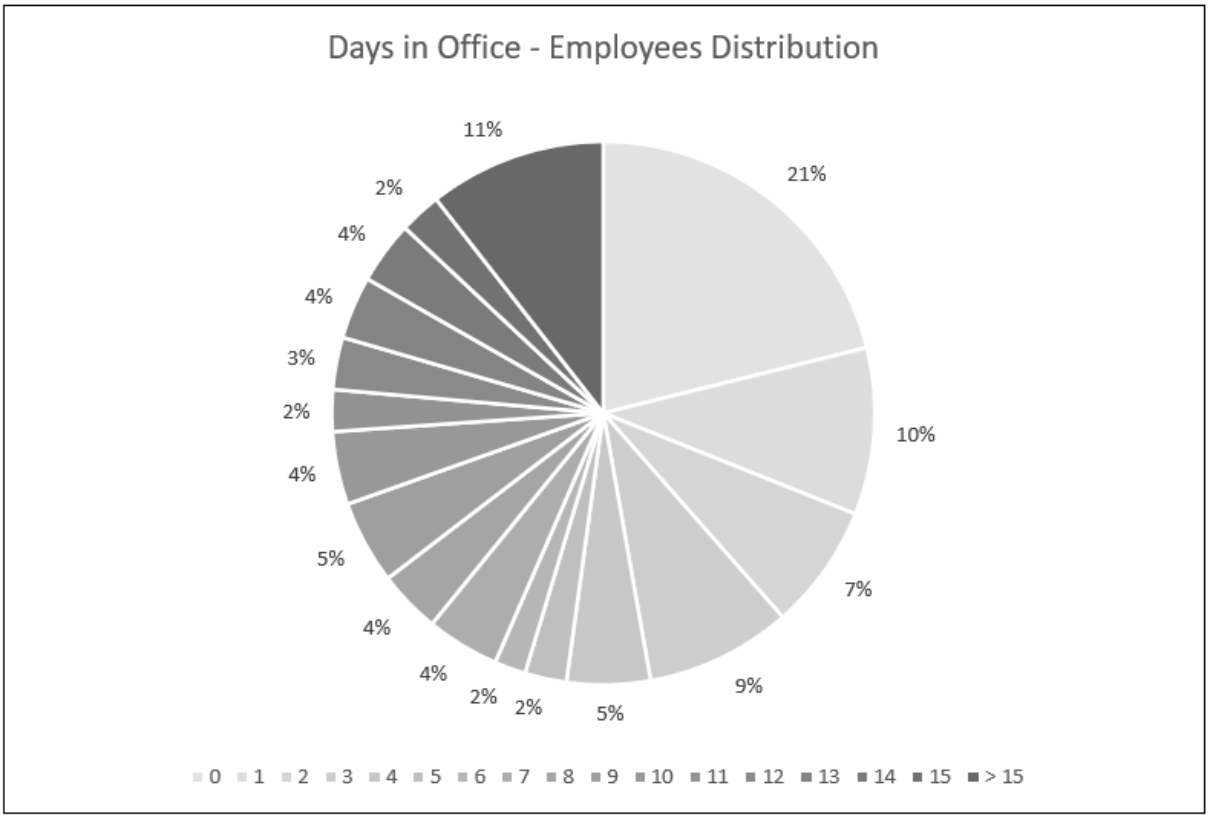

Figure 16 Percentage of employees working from office for different number of days.

From the chart, only 24% of the employees worked from office at least once a week on average. 55% of employees worked from office between 1 to 11 days during the 12-week period. When this group is collectively taken together, no productivity difference is observed from the group that was fully remote during this period and did not work from office even for one day.

However, as explained in previous analysis, if productivity of employees who worked from office on average at least one day a week is compared with rest of the employees, significant difference in productivity is observed. Additionally, based on the statistically significant finding about the effects of days worked from office on productivity, a threshold for number of days could be important to see differentiated results.

Hybrid if more than one day per week worked from office, Remote if no days, omit rest

The earlier analysis considered an average of one day a week in the office as the threshold for hybrid adoption and any lower number of days in office, including zero were considered as remote. And the above analysis considered as remote only those who did not work from office even for one day, and all those who worked from office any number of days were considered hybrid.

Another interpretation can consider as hybrid only those who worked from office on an average at least one day a week, and as remote those who did not work from office at all during the treatment period. Such a categorization identifies 34 employees as remote, 38 as hybrid and the remaining 89 are omitted.

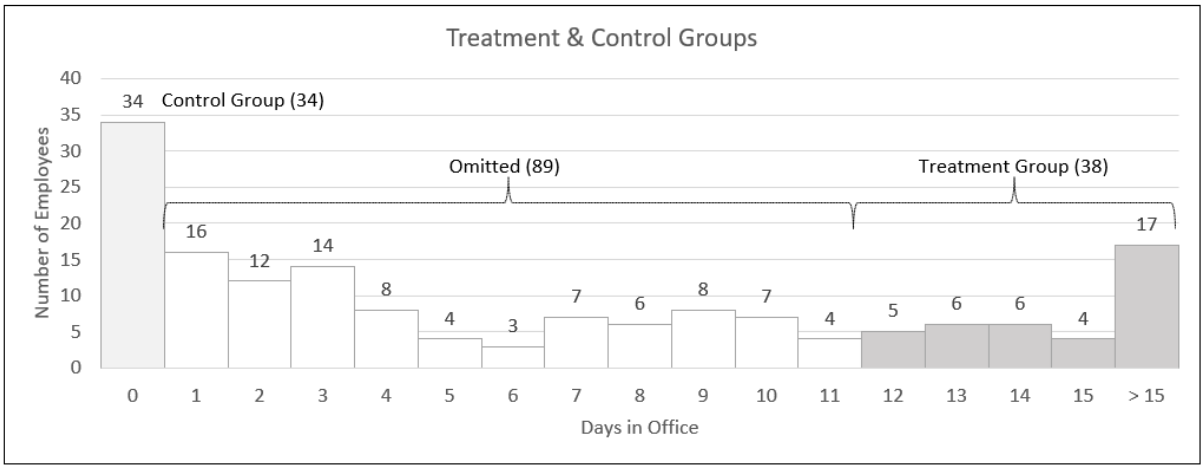

Figure 17 Categorization of treatment and control groups with those who never worked from office identified as remote and those who worked twelve or more days as hybrid.

Control Group Count	34	Did not work from office on any days

Treatment Group Count	38	Worked from office for 12 or more days

The chart below illustrates the productivity for treatment and control groups across baseline and pre-treatment periods. The chart reveals a similar trend in productivity between the treatment and control groups prior to the intervention, validating the application of the Difference-in-Differences analysis to examine the effects of the intervention during the treatment period.

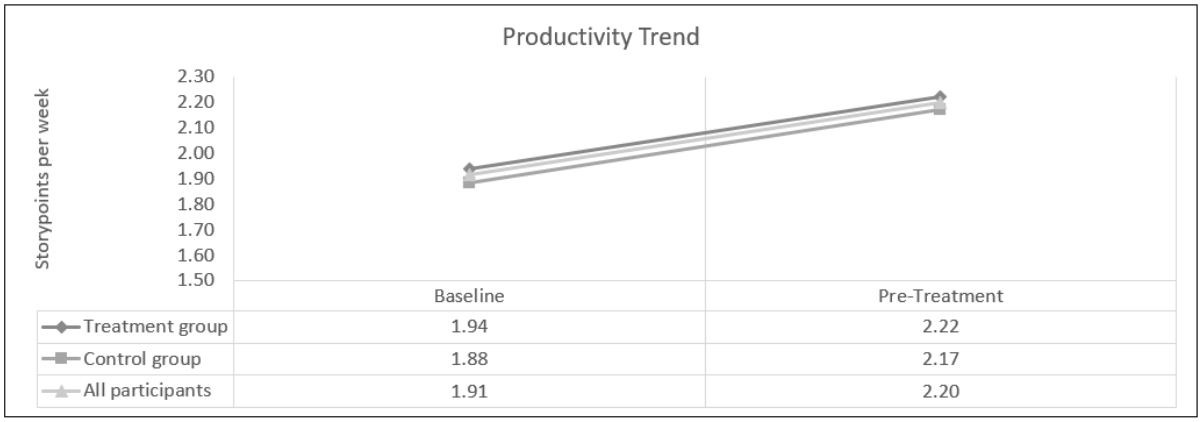

Figure 18 Productivity trend across baseline and periods, for treatment group, control group and all combined.

The Difference-in-Differences estimator value is 0.453. This indicates that the intervention has led to a productivity change in the post-treatment period. These changes are not statistically significant because a t-test between treatment and control groups post-treatment yields a p-value of 0.201. A t-test between treatment and control groups pre-treatment yielded a p-value of 0.899 indicating there was no statistically significant difference between these groups either pre-treatment or post-treatment.

Table 7 Difference-in-Differences estimator calculations summary.

	Pre-treatment	**Post-treatment**	**Difference**
Treatment group (38)	2.22	2.51	0.29
Control group (34)	2.17	2.01	-0.16
Difference	0.05	0.50	**0.453**

The following graphic helps in visualizing the various estimated values.

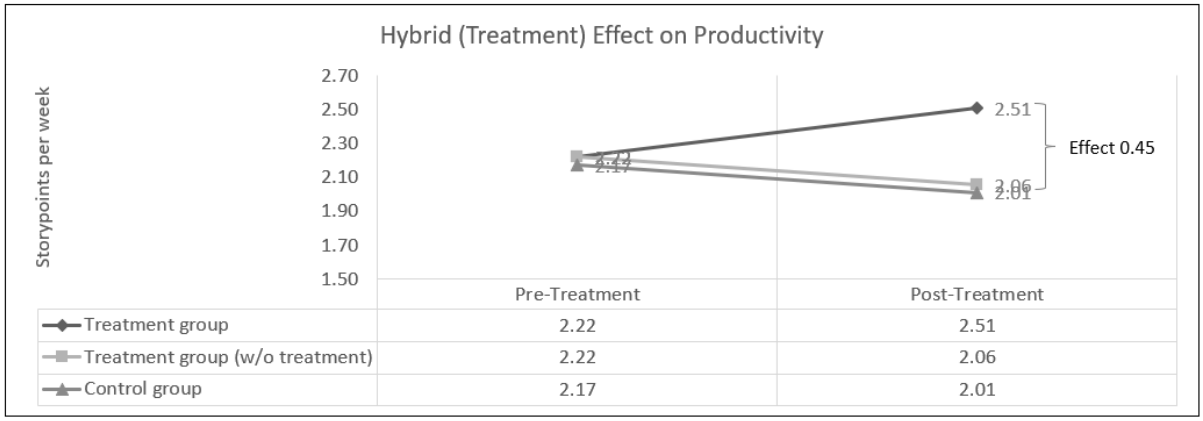

Figure 19 Estimated change in productivity between treatment and control groups before and after hybrid adoption (treatment).

Additionally, the below illustration shows the full picture, starting with the baseline period (Q1), pre- and then during treatment (Q2) and post-treatment (Q4).

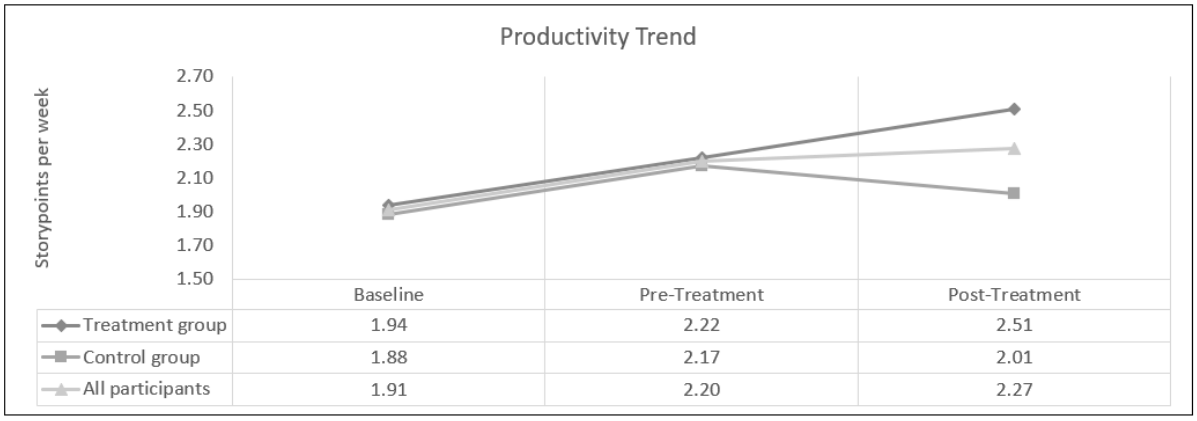

Figure 20 Estimated change in productivity between treatment and control groups through different periods of the study.

Using Stata to run the linear regression yields the below results.

```
. regress productivity period hybrid period_hybrid tenure career_junior career_expert gender, robust

Linear regression                               Number of obs     =        144
                                                F(7, 136)         =       1.19
                                                Prob > F          =     0.3102
                                                R-squared         =     0.0507
                                                Root MSE          =     1.6104
```

productivity	Coefficient	Robust std. err.	t	P>|t|	[95% conf.	interval]
period	-.1638235	.3567785	-0.46	0.647	-.8693747	.5417276
hybrid	.0459662	.404621	0.11	0.910	-.7541964	.8461288
period_hybrid	.4527709	.5329225	0.85	0.397	-.6011158	1.506658
tenure	-.0351077	.0545496	-0.64	0.521	-.1429828	.0727674
career_junior	-.5740728	.3343526	-1.72	0.088	-1.235276	.0871298
career_expert	.1645533	.3683212	0.45	0.656	-.5638242	.8929309
gender	.2053496	.3282512	0.63	0.533	-.4437871	.8544863
_cons	2.273648	.4357851	5.22	0.000	1.411856	3.135439

Figure 21 Results from Difference-in-Differences regression analysis.

The regression analysis supports the findings of the Difference-in-Differences analysis, indicating that the intervention, resulting in the transition to a hybrid work model, has led to increased productivity in the post-treatment period, but statistically non-significant (p-value 0.397).

Demographics of Hybrid and Remote Employees

During the post-treatment period (Q4), thirty-eight employees worked from office an average of one or more days in a week (hybrid) and thirty-four employees worked entirely from home (remote). The composition and differences between these groups across gender, tenure in the company, and career level are presented below.

Figure 22 Distribution by gender of those who adopted hybrid versus remote.

Figure 23 Distribution by tenure in the company of those who adopted hybrid versus remote.

Figure 24 Distribution by career level of those who adopted hybrid versus remote.

Junior career level is typically 0-5 years industry experience, Senior is 5-8 years, and Expert is 8+ years.

Table 8 Distribution of hybrid and remote employees corresponding to gender, tenure, and career level.

	Gender		Tenure				Career Level		
	Male	Female	0-1 Years	1-3 Years	3-5 Years	5+ Years	Junior	Senior	Expert
Hybrid	33	5	10	10	8	10	12	17	9
Remote	25	9	18	8	3	5	12	18	4

The key differences seen between hybrid and remote employees are as follows.

- Only a third of female employees chose to adopt hybrid whereas two-third chose to be remote, in contrast higher proportion of male employees adopted hybrid.

- Only a third of new employees who joined within the previous 12 months chose to adopt hybrid whereas two-third chose to be remote. This pattern is reversed for tenured employees with more than 3 years in the company.

- Proportion of Expert level resources who chose to adopt hybrid compared to remote is much higher than Senior or Junior level resources for whom the distribution is the same between hybrid and remote.

Interview Feedback from Hybrid Employees

During the post-treatment period (Q4), thirty-eight employees worked from office an average of one or more days in a week. Of these employees, thirty participated in two roundtable sessions and shared about their experiences in working from office.

Why they chose to work from office?

Productivity	• More productive when working from the office (less distractions). • Better infrastructure.
Structure	• Work-life separation and boundary. • Better work routine.
Relationships	• Overcome isolation and boredom when working from home. • Build relationships with new and tenured employees. • For interactions with others beyond team members they closely worked.
Organizational	• Because the organization expected to work from office (and now habituated). • To get informal organizational updates, to attend town halls in person.

What benefits they realized in working from the office?

Relationships	• Improved relationship with team members. • Employee engagement activities such as games and non-work discussions. • More connectivity and interactions with those beyond team members through organizational activities, and in cafeteria. • Increased professional network.
Collaboration	• Quicker clarifications, responses from team members, that continued during days worked from home (due to stronger personal relationships). • Collaboration with team, and ability to work things through collaboration. • Whiteboarding, brainstorming and complex problem solving.

	• Easily include others in discussions as they are available immediately. • Working with interns in-person and mentoring them.
Organizational	• Informal updates about organization, and non-work topics. • Better takeaways from town halls and other meetings since more focused.

What organizational benefits, practices positively assisted them in working from office?

Infrastructure	• Seating, meeting rooms. • Network connectivity.
Flexibility	• Two-days' work from the office. • Flexible schedule on days worked from the office. • Work-life balance not affected.
Complimentary food	• Breakfast, lunch, dinner, fresh juice, coffee, tea. • Convenience, reducing cooking time and stress.

Chapter 5 – Discussion

Interpretation

Expectation of the Study

The study anticipated that the adoption of a hybrid work model would result in more productive contributions from software development teams.

However, it remained unclear if such an outcome would be observed at the send of the study. The study covered only a transition period of one quarter, with impact measurements in the subsequent quarter, raising uncertainties about the likelihood of observing effects within such a short timeframe. Additionally, divergent opinions were prevalent, suggesting that working from home might offer fewer distractions, greater convenience, and more time for work, potentially creating a more productive environment for software developers.

Results from the Study

The developers who adopted hybrid work model demonstrated a significant increase in productivity after the transition to the hybrid model compared to those who continued with remote work. Notably, the group that embraced hybrid work not only achieved higher productivity during the post-transition period but also reversed a slight declining trend observed in their productivity before adopting the hybrid model. In contrast, both the overall productivity trend and that of the group who remained remote were observed to be slightly declining throughout the study.

Furthermore, upon adopting the hybrid work model, a positive correlation was noted between the number of days spent working in the office and developers' productivity.

Explanation of the Results

Considering the reasons below, the increase in productivity can be primarily attributed to contributions made when working from home, while the time spent in the office served as a catalyst for achieving higher overall productivity with the hybrid work model.

- The use of physical office space or office equipment may not significantly account for the observed increase in productivity. Those who adopted the hybrid model averaged just over one day a week in the office, constituting approximately 20% of their total work time. Notably, employees used the same laptop and had access to the same lab systems whether working from home or the office. Furthermore, the company consistently provided all necessary home equipment, including monitors, and reimbursed for a high-speed internet connection. This support continued for both hybrid and remote workers throughout the study period.

- Throughout the study period, flexibility was extended to all employees regarding work timings and daily hours. On days when employees worked from the office, there were no expectations regarding the number of hours spent in the office. This decision was left to the discretion of the employee and their respective team and managers to determine what worked best. As a result, the hours worked from the office on those days may not account for the observed increase in productivity.

- With hybrid, working from the office requires additional logistical and time commitments for commute and readiness, potentially impacting personal flexibility. Additionally, when in the office compared to working from home, a greater portion of time is used for collaboration rather than individual work. Despite these factors that might initially seem to affect productivity negatively, an overall increase in productivity is achieved.

Implications of the Study

The results validate and support the industry-wide steps taken in 2023 to adopt a hybrid model, emphasizing their importance and practical implications for various groups. It is crucial to optimize the effectiveness of time spent in the office to maximize overall performance impact.

The following sections delve into the key implications of the study for software developers, software development teams, software organizations, and the software industry.

To Software Developers

The productivity of developers adopting the hybrid model has increased, influencing how they are recognized, rewarded, and valued within the organization. This positive performance is anticipated to contribute to their career growth within the organization compared to those who remain remote.

In terms of professional development, hybrid work facilitates ease of learning from others through face-to-face knowledge sharing. Additionally, it enhances collaborative skills, which become increasingly important as one progresses to senior roles in their career. Software developers belonging to organizations that adopt a hybrid work model, as opposed to those that do not, will have an advantage in their long-term career growth.

Social isolation and mental wellness have been major concerns, particularly as the industry embraced remote work during the pandemic. Hybrid work helps establish trustworthy relationships with team members and managers, contributing to mental well-being through regular interactions. Additionally, the stronger relationships formed as a result of face-to-face interactions can help expand a trustworthy professional network that could be of assistance and advantage throughout one's career compared to those who work remotely.

In organizations that provide flexibility between remote and hybrid work, it becomes crucial for developers not to self-select out of hybrid work, as it holds implications for their performance, professional development, mental health, and long-term career success in the industry.

To Software Development Teams

The software development process involves teams comprising developers working together to realize desired functionality. The performance of software teams is a byproduct of the individual developers' productivity.

In the hybrid work model, team activities in the office have a broad impact on developers' overall productivity, combining their contributions whether working from home or the office. To maximize these benefits, it is crucial for team members and management to prudently leverage in-person time for collaborative problem-solving, knowledge sharing, and trainings, as well use the time together for activities that strengthen team relationships, teamwork, and commitment.

To Software Companies

In the hybrid work model, in-office activities and employee experience have a significant impact on overall productivity and performance. As the industry adopts hybrid work model widely, its degree of effectiveness becomes a competitive differentiator.

An organization can enhance the effectiveness of time in the office by providing a conducive work environment, including workspace, equipment, collaboration spaces, transport, cafeteria, and other logistical support.

Furthermore, the hybrid model presents an opportunity for an organization to establish a differentiated brand and strengthen its culture. These actions contribute to increased loyalty, retention, and engagement, ultimately impacting all facets of performance in the long term.

To Software industry

While the software industry in India has been cautious in transitioning from remote to a hybrid model, 2023 witnessed consistent and broad-based steps from both large and small companies requiring employees to work from the office a few days a week.

Based on the results of this study, the industry is anticipated to experience similar increased productivity through the hybrid work model, thereby contributing to improved organizational performance. Organizations that optimally consider the employee and team factors discussed above are expected to realize maximum benefits, placing them at a competitive advantage.

For the industry, the productivity gains could lead to a combination of an upward trend in profitability and a downward trend in the growth of the technology workforce. This scenario would likely result in moderate to low voluntary employee attrition, stability in salary ranges, and moderate salary increases. Additionally, companies that are not growing could experience both workforce downsizing and stagnation in salaries, and still realize the same productivity.

Limitations of the Study

While the study is robust and has generated important findings, created new knowledge, and offered crucial implications, the discussion below outlines some potential shortcomings or constraints associated with the study.

Statistical Limitations

The study employed a Difference-in-Differences analysis, revealing a positive treatment effect after the intervention. A t-test between the treatment and control groups in the post-treatment period confirmed the statistically significant increase in productivity. While the regression analysis showed a positive coefficient for the interaction term, it was statistically nonsignificant. Despite this, the observed large and practically meaningful impact in the treatment group is noteworthy, aligning with the goals of the intervention. It is important to note that the groups were not distinguished by any other means, emphasizing the significance of the observed effect from both participants and data collection perspective.

Causal Factors

The study identified a statistically significant difference between the treatment and control groups in the post-treatment period. The adoption of the hybrid work model led to substantially higher productivity; however, it is important to note that the observed impact is influenced by a mix of factors related to individual, team, or organizational dynamics. These specific factors are not investigated in the study.

External Factors

The study did not consider any external factors as these would apply equally to the treatment and the control group in the Difference-in-Differences analysis. One such external factor non-working days due to vacation days and holidays. These are assumed to have equivalent impact to both groups as they are governed by the same policies and regional characteristics. However, taking the workdays into consideration would enhance precision in assessing productivity trends and in calculating differences.

Generalizability

The study examines a hybrid model that involves the treatment group adopting a mixed workspace strategy involving both work from the office and work from home. This approach is commonly considered in the industry, enhancing the generalizability of the findings. However, it's crucial to note that the actions and activities during work done from the office

have a significant impact on the overall outcome of the intervention. Individual, team, and organizational factors during office work could contribute to variations in results observed in different study settings, potentially influencing the generalizability of the study.

Timeframe

The study spanned the year 2023, with equal durations for the pre-treatment, transition, and treatment periods, each lasting one quarter. The baseline period used to ascertain parallel trends for Difference-in-Differences was also a quarter in duration. This meets the design requirements of the Difference-in-Differences analysis. However, considering an extended post-treatment period, such as a year, can further help ascertain the sustainability of the observed change and identify longer-term trends.

Chapter 6 – Conclusion

The study aimed to investigate the influence of developers transitioning from fully remote work to a hybrid work model on software development productivity. Hybrid work, characterized by a combination of office and remote workdays within a week, has become a prevalent practice in the software industry post-pandemic. The primary objective of the study was to provide valuable insights into the impact of this transition.

Key Findings

Summarizing the outcomes of the study, the following are the principal findings.

1. Through the application of Difference-in-Differences analysis, the study revealed a statistically significant positive difference in the productivity of developers who adopted the hybrid model compared to those who continued with fully remote work.

2. Additionally, the study discovered a positive correlation between productivity and the number of days worked in the office as part of the hybrid model. A regression analysis found this impact to be statistically significant.

3. The disparity in productivity is theorized to be due to higher contributions while working from home, given that the majority of weekdays in the hybrid work model continued to be remote. The time spent in the office served as a catalyst, positively influencing the overall productivity of developers who adopted the hybrid model.

Plausible Explanations

Illegems and Verbeke (2004) summarized the effects of remote work in the below diagram.

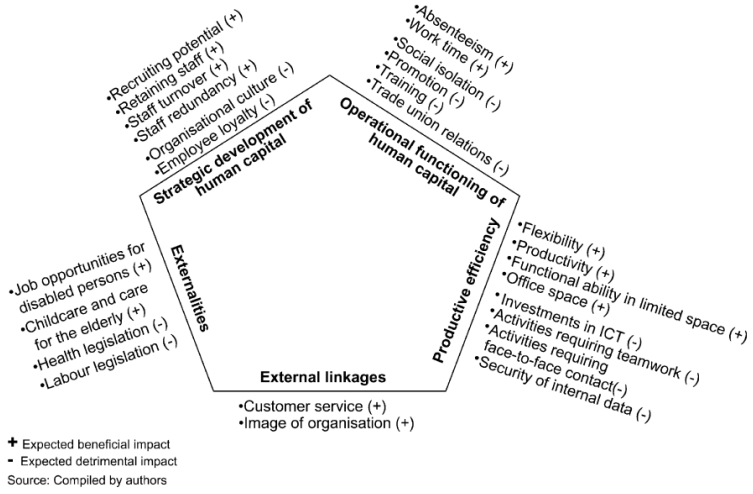

Figure 2. The resource-based impacts of telework: overview of prior studies

Figure 25 The resource-based impacts of telework: overview of prior studies.

1. Considering the flexibility provided by hybrid work, these factors that are seen as positives of remote work are not adversely affected due to working from the office for some days in a week: absenteeism, work time, flexibility.

2. The factors that are positively influenced by hybrid work include: organizational culture, employee loyalty, overcoming social isolation, training, activities requiring teamwork and fact-to-face contact.

3. Based on this, hybrid work could overcome some of the limitations of remote work, without significantly compromising its benefits thereby resulting in a net positive impact. Though these factors need to be studied further in the context of hybrid work in software development, this prior research serves as a plausible explanation for the results seen in this study.

Implications

On exploring practical applications of the research, the findings are significant when considering the following broader implications.

1. The study serves as a crucial validation of the industry's steps toward transitioning to a hybrid work model. The anticipated increase in productivity aligns with the observed results. Moreover, the study offers objective, research-based confirmation of the policies and practices increasingly adopted by industry.

2. To capitalize on increased productivity, the industry is likely to persist in the rigorous adoption of the hybrid work model. These productivity gains may exert pressure on the workforce, influencing aspects such as salaries and opportunities for growth.

3. The IT industry would expect employees who relocated from their office locations during the pandemic to return. This would place increased demands on the infrastructure of the major technology hubs in the country.

Recommendations

Building upon the implications of this research, the following recommendations emerge as crucial considerations.

1. Employees in the software industry should embrace hybrid work to enhance their performance and professional development. Doing so will positively influence how they are valued by organizations, ultimately contributing to the cultivation of stronger and more sustainable careers in the industry.

2. Teams and organizations should carefully plan activities and create positive employee experiences during in-office days as part of the hybrid work model. This strategic approach can serve as a catalyst, positively influencing employees' contributions, especially during their remote workdays, ultimately leading to higher overall organizational performance.

3. The industry should continue embracing hybrid work, considering both team and organizational factors during its adoption. With over three years of remote work and substantial changes occurring at both the organizational and personal levels during this period, careful change management is essential to ensure the outcome results in engaged and loyal employees.

Limitations

While the study contributes valuable insights, it is important to acknowledge its limitations, encompassing factors such as those identified below.

1. While the regression analysis indicated a significant positive effect during hybrid work, it was not statistically significant. This may be attributed to the omission of additional control variables, which could have enhanced the explanatory power of the response variable.

2. The observed positive productivity associated with adopting the hybrid model is influenced by a combination of factors related to individuals, teams, and organizational dynamics. Unfortunately, the study did not delve into the specific exploration of these factors.

3. External factors except the holiday season were not considered in the study. Potential seasonality issues could impact the overall productivity trend during the study period, although such issues are unlikely to alter the study's outcomes.

4. Variations in individual, team, and organizational factors during office work might contribute to differences in results observed across various study settings, potentially affecting the generalizability of the findings.

5. Furthermore, the study's limited timeframe may restrict its ability to capture sustained changes. Extending the post-treatment period, perhaps to a year, could provide insights into the sustainability of the observed changes and help identify longer-term trends.

Suggestions for Future Research

Building on the findings of this study, several avenues for future research emerge as promising directions.

1. While the study concentrated on the developer role within product development organizations, investigating its potential extension to various roles within the technology industry or other domains adopting the hybrid work model could yield valuable insights.

2. While the study centered on the influence of the hybrid work model on productivity, there exists an opportunity to explore additional performance measures, such as quality and innovation, to develop a comprehensive understanding of their impact.

3. While the study delved into a hybrid approach with approximately one day in the office and the remaining time working from home, exploring alternative combinations of remote and office work is worthwhile to discern their impact on performance outcomes. The positive correlation between the number of days worked in the office and productivity also points to the potential for further insights.

4. The study revealed that actions and activities on days worked in the office significantly influence overall productivity. Investigating corresponding team and organizational factors could offer insights into how these elements shape performance outcomes.

5. While the study focused on productivity that is a performance objective, understanding the effects of hybrid work model on organizational factors, including employee retention and engagement, would be valuable.

In conclusion, this study makes a significant contribution to the technology industry by affirming that a transition to a hybrid work model enhances productivity, a key performance metric. This finding gains particular importance considering the recent prominence of the hybrid work model, due to the post-pandemic environment. The absence of sufficient research on this emerging practice until now underscores the novelty of the study.

The industry has witnessed ongoing debates surrounding the adoption of the hybrid work model, and the research provides crucial insights into its positive impact on performance. This confirmation holds particular relevance given the perspectives and arguments for and against its widespread implementation.

Moreover, the study not only validates the benefits of the hybrid model but also identifies potential areas for future research. These avenues for exploration can offer additional insights into the most effective adoption strategies, aligning with the diverse needs of both

organizations and employees. As the industry continues to navigate this transformative shift, further research in these identified areas can contribute valuable knowledge, guiding organizations towards optimal hybrid work practices.

In essence, the research not only addresses a critical gap in the current understanding of the hybrid work model but also lays the groundwork for future investigations that can contribute to strategic decisions in the dynamic landscape of the software industry.

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Recent Studies about Hybrid Work Adoption in Software Industry

Authors	Title	Findings
Santos, R. d. S., Magalhes, C., Santons, R., & Correia-Neto, J.	Hybrid Work Well-being: Software Professionals Finding Equilibrium	Hybrid work offers primarily positive effects on the overall well-being of software professionals
Choudhury, P., Khanna, T., Makridis, C. A., & Schirmann, K.	Is Hybrid Work the Best of Both Worlds? Evidence from a Field Experiment	Workers who spent around two days in the office each week on average self-reported greater work-life balance, more job satisfaction, and lower isolation from colleagues compared to workers who spent more or fewer days in the office.
Souza, M., & Silva, A.	The migration from forced remote work to hybrid work and its impacts on software quality: The case of a multinational company	Need for context-specific solutions to maintain project quality while facilitating team collaboration in hybrid work environments.
Neumann, M., Habibpour D., Eichhorn, D., John, A., Steinmann, S., Farajian, L., & Mötefindt, D.	What Remains from Covid-19? Agile Software Development in Hybrid Work Organization: A Single Case Study.	Heterogeneous preferences of the workplace will lead to hybrid work organization and thus, to new challenges and advantages for agile software development team members.
Masood, Z., Damian, D., Blincoe, K.	How New Zealand Software Companies Are Adapting Work Settings With Changing Times	After the restrictions were eased, most companies adopted a hybrid work setting combining work from home and office
Santos, R. E. d. S., Ralph, P.	A Grounded Theory of Coordination in Remote-First and Hybrid Software Teams	Software organizations with many remote employees can improve performance by encouraging greater engagement within teams and supporting employees with family and childcare responsibilities.
Zarate, P., Dolls, M., Davis, S. J., Bloom, N., Barrero, J. M., & Aksoy, C. G.	Why Does Working from Home Vary Across Countries and People?	Multiple factors influence WFH rates, and technological feasibility is only one of them.
Pillai, S.V., Prasad, J.	Investigating the key success metrics for WFH/remote work models	Work-life balance and lower stress were the highlights of work from home, and women employees benefit from flexibility of work as the major highlighted success factor.

Souza Santos, R.D., Adisaputri, G., Ralph, P.	Post-pandemic Resilience of Hybrid Software Teams	Software professionals strongly value hybrid work; therefore, team resilience is a key factor to be considered in the software industry.
Smite, D., Moe, N.B.	Defining a Remote Work Policy: Aligning Actions and Intentions	Need to resolve the inherent conflicts of interest between the individual employees (flexibility, individual productivity, and well-being) and the companies (profitability, quality of products and services, employee retention, attractiveness in the job market).
De Souza Santos, R.E., Ralph, P.	A Grounded Theory of Coordination in Remote-First and Hybrid Software Teams	Software organizations with many remote employees can improve performance by encouraging greater engagement within teams and supporting employees with family and childcare responsibilities.
Rizmaldi, M.A., Jayadi, R.	How remote working can affect employee performance using scrum in software development companies	Team influence has a more significant effect than individual influence on employee performance with the most significant effect is communication and teamwork in scrum teams.

Key Research Themes & Prior Findings (Software Development Productivity)

Themes	Title & Author(s)	Findings
Metrics and Measurements	Sudhakar, Goparaju, Farooq, Ayesha, & Patnaik, Sanghamitra. (2012). Measuring Productivity of Software Development Teams.	Software productivity can be measured using various metrics, including Source Lines of Code (SLOC), function points, use case points, object points, and feature points
	Wagner, S., & Ruhe, M. (2018). A Systematic Review of Productivity Factors in Software Development.	Categorized the main factors influencing productivity into technical factors, corresponding to product, process, and development environment, and soft factors.
Team Factors	Krishnan, M.S. (1998). The role of team factors in software cost and quality: An empirical analysis.	Significant association between the personnel capability of the team and a lower number of defects, that contributes to enhanced productivity.
	Krishnan, M. S., Kriebel, C. H., Kekre, S., & Mukhopadhyay, T. (1999). An empirical analysis of productivity and quality in software products.	Significant increases in software life-cycle productivity are achievable through improvements in conformance quality.
	Lavazza, L., Morasca, S., & Tosi, D. (2018). An Empirical Study on the Factors Affecting Software Development Productivity.	The primary programming language significantly influences the productivity of new development projects, while the productivity of enhancement projects is less dependent on programming languages.
	Pinkowska, M. (2010). IT Software Project Management: Impact of Team Cohesiveness on Productivity and Performance.	For a highly cohesive team with high ethical standards, cohesiveness has a positive impact on team productivity.
Development Process	Harter, D. E., Krishnan, M. S., & Slaughter, S. A. (2000). Effects of process maturity on quality, cycle time, and effort in software product development.	The net effect of process maturity is a reduction in cycle time and development effort.
	Pai, D. R., Subramanian, G. H., & Pendharkar, P. C. (2015). Benchmarking software development productivity of CMMI level 5 projects.	Projects not adhering to the best practices of CMMI level 5 had significant potential for productivity improvements if they could emulate the best-in-class projects for process improvements.
	Blackburn, J., Scudder, G., & Van Wassenhove, L. N. (1996). Improving speed and productivity of software development: a global survey of software developers.	Investing time and effort in the early stages of a software project yields faster cycle times and higher productivity. Rework is identified as the leading source of time delays.
Distributed Teams	Ray, D. M., & Samuel, P. (2016). Improving the Productivity in Global Software Development.	The dispersed nature of global software development projects, communication, coordination, and control become more challenging, adversely affecting the effort estimation in software development.

	Herbsleb, J. D., & Cataldo, M. (2001). An Empirical Study of Global Software Development: Distance and Speed.	Compared to same-site work, cross-site work takes much longer and requires more people for work of equal size and complexity.

Key Research Themes & Prior Findings (Hybrid Work Model)

Themes	Title & Author(s)	Findings
Hybrid Adoption	M. Neumann et al., (2022). What Remains from Covid-19? Agile Software Development in Hybrid Work Organization: A Single Case Study.	Heterogeneous preferences of the workplace will lead to hybrid work organization and thus, to new challenges and advantages for agile software development team members.
	Z. Masood, D. Damian and K. Blincoe. (2022). How New Zealand Software Companies Are Adapting Work Settings With Changing Times.	After the restrictions were eased, most companies adopted a hybrid work setting combining work from home and office.
	Pablo Zarate, Mathias Dolls, Steven J. Davis, Nicholas Bloom, Jose Maria Barrero & Cevat Giray Aksoy. (2024). Why Does Working from Home Vary Across Countries and People?	Multiple factors influence WFH rates, and technological feasibility is only one of them.
	Darja Smite and Nils Brede Moe. (2024). Defining a Remote Work Policy: Aligning Actions and Intentions.	Need to resolve the inherent conflicts of interest between the individual employees (flexibility, individual productivity, and well-being) and the companies (profitability, quality of products and services, employee retention, attractiveness in the job market).
Employee Wellness	R. de Souza Santos, C. Magalhaes and C. Franca. (2024). Hybrid Work Well-being: Software Professionals Finding Equilibrium.	Hybrid work offers primarily positive effects on the overall well-being of software professionals
	Prithwiraj Choudhury, Tarun Khanna, Christos A. Makridis, Kyle Schirmann. (2024). Is Hybrid Work the Best of Both Worlds? Evidence from a Field Experiment.	Workers who spent around two days in the office each week on average self-reported greater work-life balance more job satisfaction, and lower isolation from colleagues.
	Sini V. Pillai, Jayasankar Prasad. (2022). Investigating the key success metrics for WFH/remote work models.	Work-life balance and lower stress were the highlights of work from home, and women employees benefit from flexibility of work as the major highlighted success factor.
Teamwork and Collaboration	Everton Luis Luz De Quadros, Anielle Severo Lisboa, Marilaine Quadros Becker Souza, Rafael Prikladnicki, Marcirio Silveira Chaves. (2022). The migration from forced remote work to hybrid work and its impacts on software quality: The case of a multinational company.	Need for context-specific solutions to maintain project quality while facilitating team collaboration in hybrid work environments.
	R. E. de Souza Santos and P. Ralph. (2022). A Grounded Theory of Coordination in Remote-First and Hybrid Software Teams.	Software organizations with many remote employees can improve performance by encouraging greater engagement within teams and supporting employees with family and childcare responsibilities.

	R. d. Souza Santos, G. Adisaputri and P. Ralph. (2023). Post-pandemic Resilience of Hybrid Software Teams.	Software professionals strongly value hybrid work; therefore, team resilience is a key factor to be considered in the software industry.
	Rizmaldi, Muhammad Ardi and Riyanto Jayadi. How remote working can affect employee performance using scrum in software development companies.	Team influence has a more significant effect than individual influence on employee performance with the most significant effect is communication and teamwork in scrum teams.

Employee Office Experience

The study concludes that the adoption of a hybrid work model positively influences the productivity of software developers. However, within the twelve-week hybrid timeframe, developers who worked from office at least one day per week were categorized as adopting the hybrid model. On average, this group spent only 1.4 days per week working from the office, accounting for just 28% of their work week. Much of their work time was spent remotely, from home. Consequently, the expectation that time spent in the office alone contributed to a significant overall productivity improvement of over 24% seems unlikely. To achieve such an impact, they would need to be nearly twice as productive in the office, which appears implausible. Therefore, the time in the office is more likely to act as a catalyst for increased productivity overall, rather than being a place where someone is significantly more productive.

This section provides details about employees' experiences when working from the office, as the inclusion of this information will contribute to a more comprehensive understanding of the study.

Office Location

The office was in a popular campus that hosted many other technology firms, most of them multi-national organizations similar to the company that is part of this study. The office was in one of the multi-tenant buildings that was easily accessible within the campus. The location had all around good infrastructure, and it was safe throughout the day.

Commute to Office

Several means of transportation were available for employees. For those who chose to use the metro that had a nearby station, the company provided timely and exclusive shuttle services for employees to and from the office. Employees who decided to use their personal vehicles, either a car or a motorcycle, sufficient parking was available in the office building. But traffic remained a concern in the city, and employees spent between 30 to 60 minutes time each way in commute.

Seat Allocation

Since the organization grew substantially during the pandemic, when hybrid work model started, the office space did not have enough dedicated seating for all employees. Software development was a part of much larger India organization that included other functions. The company adopted a hybrid practice of two designated weekdays for each group. On these days, dedicated seats were provided for each employee. Should an employee choose to work from office on a non-designated weekday, hot seating was available to choose from, as their dedicated seat would be assigned to a different employee from a different group.

Weekdays in Office

In accordance with the seat allocation practices, the software development organization was assigned Wednesdays and Thursdays for working from office. On these days, all roles, all levels of management across all the software development teams were provided dedicated seats that were all located in one large floor in the building. This approach was simple and naturally made it possible to meet and interact face to face with other team members who were in the office, without requiring individual or team level coordination or scheduling of days in the office and did not require an ongoing seat reservation, allocation process.

Workspace and Equipment

The office was modern and had open seating that was suitable for software development teams. Only senior leaders were assigned private offices and all software developers who were part of this study were assigned open seating. The workspaces were equipped with dual monitors, docking station, and keyboard. The employees brought their laptop with them and connected to the office equipment seamlessly to perform their work. The equipment in the office was same as employees' home setup that was provided by the company to everyone who requested.

Meeting Rooms

The office had sufficient meeting rooms in different configurations ranging from small discussion rooms to a large training room that can accommodate up to 100 persons. These rooms were equipped with whiteboards for collaborative discussions, and video equipment to include in meetings those employees working from home. These rooms were bookable resources open for all employees to make use of whenever required.

Food and Cafeteria

The office had a cafeteria within its space, that was managed by the company and meant exclusively for its employees. The cafeteria had a lively atmosphere where employees could spend informal time together in conversations. A variety of food options were available for employees throughout the day starting with breakfast until dinner. Additionally, the cafeteria had a counter for coffee, tea, and fresh fruit juices. All the food and beverages were at no cost to employees and made complimentary. Employee feedback was regularly solicited to ensure quality of both food and service were catered to attentively.

Core Office Work Hours

Though a typical work week is 40 hours, employees were provided flexibility to decide on their work hours on each day of the week. Since software developers worked in teams, their schedule had to cater to team collaboration needs, and for any interactions with other locations during evening or night on select days. Beyond that, their individual level work

timings were left for them to decide. On the days when they worked from office, the core hours in the office were typically between 11am and 5pm, with individual level variances for start and end times at the office.

Employee Engagement Activities

The office was a place of high engagement, positive energy, and informal interactions across groups and functions. Religious and regional festivals were enthusiastically celebrated, a very active fun committee periodically conducted in-person games and entertaining activities, teams were provided budgets to go on a team outing, and many teams chose to use the cafeteria for team lunches, celebrations, and recognitions. Those in the office also attended in-person a monthly India-level townhall that was followed by snacks and informal interactions. Many employees also participated in select community work that was supported by the company.

Other Services

To cater to any emergencies, a paramedic from a reputed nearby hospital was deployed at the office throughout the office hours. The office was also equipped with a game room that employees used during break time. Rooms were available for employees to take short rest in privacy should that be a requirement.