Hypersonic ReEntry Deployable Glider Experiment (HEDGE)
(Technical Paper)

The Effect of Remote Applications on Program Management Effectiveness
(STS Paper)

A Thesis Prospectus
In STS 4500
Presented to
The Faculty of the
School of Engineering and Applied Science
University of Virginia
In Partial Fulfillment of the Requirements for the Degree
Bachelor of Science in Mechanical Engineering

By
Najarie Williams

December 1st, 2023

Technical Team Members:

Griffin Dewey
Brett Schriever
Owen Soloman

On my honor as a University student, I have neither given nor received unauthorized aid on this assignment as defined by the Honor Guidelines for Thesis-Related Assignments.

ADVISORS

Joshua Earle, Department of Engineering and Society

Christopher Goyne, Department of Mechanical and Aerospace Engineering

Prospectus

Introduction

With the widespread adoption of remote work, there has been a shift in workplace dynamics. For many, this offers a better work-life balance and global job opportunities, despite geographical location. However, it also means increased surveillance from employers through tracking software and an invasion of the work-life boundary as homes become offices. The remote switch during the pandemic "enabled technology companies to play an important role in increasing the ability of employers to surveil their employees... a part of Microsoft's widely used Office 365 package, allowed—by default—managers to look at who participated in chats and how many emails different workers were sending" (Sandy J. J. Gould et al., 2023). Additionally, there is a cultural and political aspect to consider. Remote work can be used as a way to exploit labor by hiring from regions with lower wage standards, thus bypassing local labor and protection laws. Tools meant to facilitate communication can be areas where office politics play out, inclusion and exclusion can manifest more subtly, and where the line between personal and professional gets blurry. The rise of digital communication tools and cloud-based software represents a shift in work and collaboration, and it is crucial to critically analyze both their inherent and use-driven politics (Winner, page 122, 1980). Hence, my proposed STS will explore the effect of digital communication tools, cloud-based project management software, and the widespread adoption of remote work on how teams collaborate and manage projects.

My STS research is inspired by my most recent internship as a Systems/Mechanical Engineering intern for the Department of Defense (DOD). As a SE and ME lead on a project, frequent communication was required throughout the team. The DOD allows for 2 days out of the work week to engage in working-from home. This caused the frequent use of Microsoft

teams for meetings and teamwork. However, the convenience of the remote option was not always satisfactory to project success. For instance, if you were not actively moving your mouse, your screen status would read “inactive,” and show everyone you are away from your laptop. Ultimately, remote options made it harder to get tasks done and posed the threat of inadequate work. By the end of the internship, the project had various delays due to remote conflicts over the course of the 12-week internship.

Technical Project: HEDGE

This technical project deploys a glider to perform a hypersonic reentry experiment. The deployable glider, CubeSat, is a small satellite that is flown in earth’s orbit for a lower cost than a rocket, and more accurately than a wind tunnel. The mission of this project is to “assess the feasibility of using CubeSats in hypersonic flight experiments for sustained flight applications” (HEDGE, 2022, page 3).

To achieve this mission, HEDGE is broken up into six functional teams, each with its own specific responsibilities. The first team is Program Management, which oversees the project's overall progress and ensures that all teams work together cohesively to improve organizational performance throughout the design process.. The second team, Communications, handles both the ground and space segments of the project, ensuring that all communication channels remain open and clear. The third team, Software and Avionics, is responsible for developing and testing the software used to control the CubeSat's systems and avionics. The fourth team is Power, Thermal, and Environment which focuses on developing the CubeSat's energy systems and ensuring that it has enough power to function properly, while maintaining the CubeSat's internal temperature and ensuring that it can function in harsh environments. The sixth team, Attitude Determination and Control System (ADACS) and Orbits, is responsible for

determining the CubeSat's attitude and controlling its orbit. Finally, the sixth team, Structures and Integration, is responsible for designing and building the CubeSat's physical structure. These teams work in conjunction with an Electrical Capstone Design Team to create a functional prototype.

As the Program Manager for HEDGE, communication between the functional groups are more than important. In previous years, scheduling meetings between program management and the rest of the class were not effective. However, this year, with the help of advanced communication technology, like Zoom and Microsoft, the project management team will enable a continuous streamline of communication. HEDGE is a complex and ambitious project that requires the collaboration of many different teams. The potential benefits of communication technology is incredibly important to its success, and the teams involved working tirelessly to ensure it.

STS Topic: The Effect of Remote Applications on Program Management Effectiveness

Advancements in technology have led to the widespread adoption of remote applications, especially in the domain of program management. These applications, ranging from collaborative tools to project management platforms, have had profound implications on how programs are managed, the effectiveness of management techniques, and the nature of teamwork in the digital age.

There are various benefits of technological applications for remote working. Remote applications allow program management to access their work and communicate with their respective teams from virtually anywhere. Increased accessibility and flexibility have the "potential to enable some types of work to be done anywhere and/or anytime" (Harrison & Moseley, 2019, page 247). This allows for teams to spread all over the world and still collaborate

effectively. Additionally, applications like Microsoft Teams offer methods for constant communication to benefit remote working. Channels can be specifically tailored to projects or tasks, allowing for focused and streamlined discussions. Enhanced transparency between managers and team members is another example. Remote software tools enable managers to see the progress of various tasks and projects in real-time, leading to better accountability and understanding of performance (Conforto et al., 2014, page 27). Despite the various benefits, there are also multiple concerns with these technological applications for remote work. With the blur between personal and workspaces, there exists potential for overwork from increased surveillance from employers through remote tracking software and an invasion of the work-life boundary as homes become offices. The increase of working from home causes managers "to change their strategies for monitoring employees from behavior-based to output-based controls" (Gajendran & Harrison, 2007, page 1527).

Remote applications have significantly impacted program management effectiveness, with both positive outcomes like increased flexibility and improved communication and challenges such as potential overwork and data security concerns. As the use of these tools continue to evolve, so will the ways in which they influence the dynamics and outcomes of program management.

Research Question and Methods -

My proposed STS research topic will use a Social Construction of Technology (SCOT) framework to analyze the relationship between the remote technological application of Microsoft's Office 365 package and relevant social groups, which include employees, task-related teams, and program management. My use of the SCOT framework examines the

interaction between relationships and technology. The emphasis on the human influence of technology will, uniquely, entail how the different social groups interact with and impact the development and use of remote project management tools. This framework is beneficial for the topic of remote technological applications in program management because the tools are relatively new software, and the flexibility of all parties could poorly shape the future of program management and remote applications. This will allow for research to be focused on the effectiveness of the program in all aspects instead of solely statistical standards.

The research I will conduct for the STS section, in conjunction with the STS framework, has the goal of investigating the impact of remote technological applications on program management. To accomplish this, I will utilize documentary research methods, which will involve gathering scholarly articles and journals. In order to provide a foundation of knowledge, I will compile papers that examine the comparison of in-person work to remote work. These articles will include conducted experiments with valuable data, as well as statistics. For instance, I will use Science and Technology Studies to address the history of societal impact to avoid possible setbacks in digital communication tools (Sismondo, page 204, 2009). Following this, I will also gather papers that present individual cases of how remote working has affected program management. Finally, I will explore the impact of COVID-19 and remote work options on workplace effectiveness by noting project success between the various applications used. This will enable me to understand how remote work has impacted program management, and how it has adapted to the changing circumstances brought by the pandemic. In unison, the multi-step approach to documentary research, from collecting background information to individual case studies, provides a blueprint for comprehensive exploration. Keywords include "remote"

"communication tools" "effectiveness" "working-from-home" and "Microsoft" will guide my research and help me to focus on the most relevant materials.

Conclusion

My proposed STS topic explores the effect of remote applications, like Microsoft's Office 365 Package, on program management effectiveness. It is crucial to examine this in detail to ensure an equitable and efficient work environment exists moving forward. The HEDGE project serves as an example of how advanced communication technology can enable a continuous stream of communication, leading to improved program management effectiveness. My project also highlights the importance of effective communication between functional groups for the success of the project. As remote work and digital communication tools continue to be a part of the new normal, it is important to consider their impact on the global workforce. Therefore, it is essential to approach these issues with a critical and thoughtful lens to ensure that a work environment is both efficient and equitable.

The COVID-19 pandemic has accelerated the adoption of remote work and digital communication tools, which has fundamentally changed collaboration and the way projects are managed. While these tools offer many benefits, such as increased flexibility and global job opportunities, they also come with their own set of challenges, such as increased surveillance and blurred work-life boundaries. The widespread adoption of these technologies has led to a need to critically analyze both their inherent politics and their impact on program management effectiveness. The adoption of remote work and digital communication tools has led to a shift. My proposed STS topic is an important step towards understanding the impact of these technologies on program management effectiveness, and their implications on the workforce at large. As society navigates the changing dynamics of the workplace, it is crucial to approach

these issues with a critical lens to ensure that we are creating a work environment that is only beneficial, but non-detrimental.

Key Texts

Conforto and coauthors conducted exploratory research on the presence of agile program management (APM) practices in large and medium-sized companies. The survey concluded that companies, in general, are struggling to use their current program management applications throughout their projects despite their supposed benefits. As the source presents, these applications enable managers and team members to see the progress of their tasks in real-time. This source examines how technological applications are trying to improve enhanced transparency throughout their work environment, the good and the bad, which is beneficial to this research.

Golden & Veiga researched the positive and negative effects of telecommuting on a person's satisfaction with their job. Program management hints that working from home increases the amount a person likes their job; however, the two researchers found varied results. Their findings entail the effects of blurring the line between the office and home. This knowledge will allow further examination into how remote program management technological applications may cause the potential overwork of employees.

Harrison & Mosley examined the positive and negative effects of a flexible work environment with an emphasis on communication. Collaboration in a work environment is directly affected by remote technological applications. Hence, this book looks not only at program management but the impact of unified communication through cooperation. This source will help to create the foundation of knowledge surrounding how communication between program management and employees is being hindered and improved.

Gould and coauthors analyze the shift from the small population of people who worked from home to the mass population shift ignited by the Covid-19 pandemic. As society shifts towards a more digital workplace, the pandemic changed the trend from progressing to immediate. This special issue paper looks at the effect of remote work on a population who was, and still is, not ready for it. The document will provide a basis for how society can use remote technological applications in future settings to be beneficial and not an additional concern.

Resources

Christopher Goyne (2022) *Hypersonic ReEntry Deployable Glider Experiment Critical Design*

Conforto, E. C., Salum, F., Amaral, D. C., da Silva, S. L., & de Almeida, L. F. M. (2014). *Can a agile project management be adopted by industries other than software development?* Project Management Journal

Gajendran, R. S., & Harrison, D. A. (2007). *The good, the bad, and the unknown about telecommuting: Meta-analysis of psychological mediators and individual consequences.* Journal of Applied Psychology

Golden, T. D., & Veiga, J. F. (2005). *The impact of extent of telecommuting on job satisfaction: Resolving inconsistent findings.* Journal of Management

Harison, E., & Moseley, A. (2019). *Remote work and collaboration: Breakthroughs in research and practice.* IGI Global

Sandy J. J. Gould 1, Rudnicka A., Cook D., Cecchinato M. E., Newbold J. W. &. Cox A. L. (2023) *Remote Work, Work Measurement and the State of Work Research in Human-Centered Computing.* Special Issue Paper.

Sismondo, Sergio. 2010. *An Introduction to Science and Technology Studies*. 2nd ed. Wiley-Blackwell.

Winner, L. W. (1980). *Do artifacts have politics? - JSTOR*. Do Artifacts Have Politics? https://www.jstor.org/stable/20024652