Adoption of Communication Channels During COVID-19

Trends among NSF Major Facilities in the US

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Abstract

With the COVID-19 pandemic, came changes that have lasting implications on businesses and jobs. An example of such is the pivoting from face to face to virtual communication/operations. Based on a thematic analysis of 56 interviews with the National Science Foundation (NSF) major facilities ranging from data managers, scientists, professors, across different complex scientific organizations including oceanography, astronomy, atmospheric science, geosciences, astrophysics, artic and cyberinfrastructure, we identified four overarching factors - information richness, complexity, speed, and politics that guided the adoption of computer mediated communication channels (CMCs) during the COVID-19 pandemic. These factors echo information richness theory principle, while revising the idea behind adoption of communication channels. Crisis may add a little nuance to it. This article serves as strategic information for big tech companies on how to best support complex scientific organizations.

Keywords: COVID-19; Zoom, Slack, facet-to-face, and NSF

Introduction

NSF major facilities are complex scientific organizations including oceanography, astronomy, atmospheric science, geosciences, astrophysics, artic and cyberinfrastructure, with each comprising of data managers, scientists, and university professors. Their daily work involves discussions, meetings, budgeting, communication with funders (NSF) building software, cloud computing, running codes, and programming. Some of their workflows are particularly time consuming and require maximum concentration. Like many other jobs (e.g., teaching and lab work), workflows have been altered due to the pandemic and as such, it becomes necessary to strategically identify computer mediated communication (CMCs) channels that are or almost facsimile of face to face communication, and that support their daily operations.

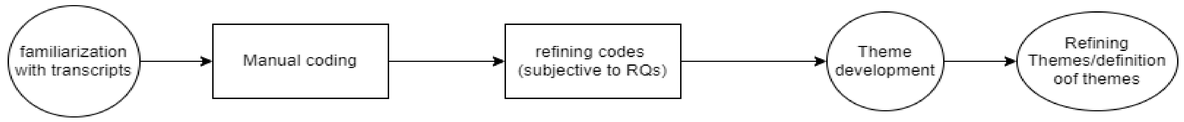
Theoretical Framework

The diffusion of innovation theory describes a communication process through which an innovation becomes accepted as a norm within a social system. It sees adoption as a decision to accept or discontinue the use of an innovation. Empirical research has used the diffusion of innovation theory to explain and understand the acceptance of innovations (including technologies, behaviors, practices) in different industries (Glanz et al., 2008). In principle, this theory further sees adoption as being determined by the perceived characteristics of the innovation (Kee, 2017). Specifically, as a technology adoption/diffusion are determined by how much potential users perceive the technology as relatively better than previous option; compatible with existing values and needs of a community; less complex to use, testable, and observable (Rogers, 2003; Gilson et al., 2015). With the emergence of newer technologies, the list of attributes that determine the successful adoption of a technology has become a burgeon of discovery, making the list (of attributes) longer. For example, Chen et al., (2020) found that ten attributes including technology compatibility, its relative advantage, simplicity of use, managerial support, technical capability, government involvement, market uncertainty, competitive pressure, and vendor partnership were predictive of adoption of AI among Chinese Telecommunication managers and engineers.

The media richness theory, developed by Daft and lengel (1986), describes the process involved in the adoption of evolving communication channels as being connected to the media's capacity to engender quick feedback, vocal, and visual cues. The theory was employed in understanding the adoption of three communication channels including video conferencing (VC) (e.g., Zoom), email and instant messaging. Tucker et al., (2023) further promoted and proposed an expansion of the media richness to mean that media's capacity to support trust and commitment among virtual teams.

Research Questions

1. What CMCs enabled NSF major facilities to continue operations during the COVID-19 pandemic?
2. In what ways did the features/ attributes of the CMCs promote their adoption?



Reflexive thematic analysis process (Braun & Clark, 2023)

Table1: Adoption Strategies and Raw Excerpts from Interviews Illustrating Themes

Themes/Subthemes	Excerpts (Raw quotes)
Facsimile of face to face Sub- theme: Enhance Speed and continuous communication (to block out more time for actual work)	And I would say for the team of folks that I worked with at the UW Madison campus you know, some other things that we had to do differently, because we weren't able to just walk down the hallway, we had to go out of our way to find opportunities to have conversations, you know, of ideation, I would say, you know, it, it was easy to Slack, somebody when you needed a quick answer to something, and easy to, you know, schedule a meeting about work that needed to get done.… Hey, I've got a quick question. So, all of that went into Slack, which meant that we were using slack for more types of communication. (Facilitator for Cyberinfrastructure) Sometimes phone calls, it was usually a zoom, I think, you know, being able to see someone's face, I think, creates a facsimile of being in a room with someone. It's not the same by any stretch of the imagination. But I think it helped give a better sense of connection than it would be during just using a phone. You actually well see, when you're in person, you can read people better. (Manager, Data Management and Computer Technology) And so the concept of like one of our sailors on the ship can have a private Zoom meeting from their state room with someone from HR back at the office, that's more feasible than it ever has been. And it's not perfect. But it is possible (Marine Technical Support)
Multi-tasking (communicating, sharing documents, collaborating)	Yeah. So I think if we're going to just do the RC RV project, the construction project? Yeah, I think that we're using using the technologies that are available to us pretty pretty well, because it's a it's a very, the project that we're meant, you know, it's a construction project we're not. So we use Slack we use, you know, we use Microsoft, SharePoint at the shipyard between the shipyard in our shipyard staff, and we just box kind of as a project. We use a wiki. Well, we've really migrated away from that, and it's basically document wiki got over, overwhelmed by it couldn't really manage documents the way we needed to, but so I think we do okay, like, I don't think there's a huge need in just our small component of the facility (Data Presence Systems Engineer) Okay, yeah. So, um, so many organization, mainly, that the university type personnel uses teams. So we have some project pages there. In our organization, we use Slack a lot. Okay, um, email, SharePoint are part of our workflow, we have some shared servers, drop folders, large file transfer functionality -
Universally user-Friendly	PMO wanted something a little bit more social. And they and I did some research and zoom was just easier to run conference calls, whereas I find WebEx is easier to do document shares. And a little bit more robust. As we became comfortable with zoom, and I think changed a little bit. Even document shares are pretty good. But for the non-technical folks, I think there was a little bit of the feeling that zoom was more user friendly to video conferencing. Got it. Before then you know a lot of our WebEx is people didn't show themselves we know we all look like so there really wasn't a lot of a lot to gain from the video side of it. But then, you know, isolation and also we started to have zoom meetings with people we didn't normally have zoom meetings with, like the PMO almost always met in person. So it was just a nice touch (Manger Cyberinfrastructure)
Having a personal touch.	Meeting face to face, while not necessarily every day is still really, really valuable. So that was definitely one lesson. Adopting Slack as a less formal way to communicate compared to email was really, really important. You need to be able to have small conversations, not replacing the watercooler but getting kind of close to that, that are not as formal as email (Architect) …Before we could meet in person with somebody, and even show them some of our computing resources, so that they felt something concrete and tangible, and also felt the relationship with us, we have to go out of our way, not really out of our way, but just do more in our email communications to add a personal touch and to make people feel seen and heard (Facilitator for Cyberinfrastructure)
More Organizational Entrenched	That transition was fairly painless and smooth, moving to a zoom environment when a lot of our discussions already and a lot of our tasks at the PMO level, were already being conducted on Zoom and over the phone.... (Senior Program manager for Oceanography organization)

Method Design & Procedure

This study is an analysis of a subset interviews (N = 30) derived from an interview for a larger study. We aim to do a further analyzing the remaining interviews in the future. We employed a reflexive thematic analysis of Braun & Clark (2021) to extract themes and patterns related to the research questions. The larger study employed purposive and snowball sampling in interviewing staff of NSF major facilities (N = 56) across the 50 states of the US. Participants included, senior managers, data managers, scientists, and professors. The study sought to examine how to design NSF scientists/researchers (MF) organizations to be resilient to future crises and major disasters and to inform future cyberinfrastructure innovations that can support the MFs' science missions during major disruptions such as COVID-19. The interview protocol covered questions on how these major facilities pivoted during the pandemic, strategies that were useful in keeping their organizations resilient against the disruptions accompanied by COVID-19, the information sources that helped to make pivoting decisions, challenges faced, and what the new normal looks like for individuals and their organization

Findings/ Theme Definition

Findings: 6 Attributes That Guided Adoption of CMCs among NSF major facilities

Facsimile of face to face-to-face communication. After the COVID-19 pandemic, NSF major facilities turned to remote teams that made them feel seen or heard. CMCs that were mentioned and associated with these attributes were Zoom, MS Teams, and Slack.

Enhancing Speed and continuous Communication. The need for communication to be instant, generate feedback, and create was a requirement for NSF major facilities. Hence, they favored communication channels that supported almost instant feedback. CMCs that were identified to have this feature include Slack and email

Universally Friendly. Teams adopted communication channels based on being user friendly. This was demonstrated in the decision to adopt Zoom over Web-ex. Web Ex was seen as being complex to use for virtual teams in the organization

Multi-tasking friendly. Multi-tasking became the order of the day at NSF major facilities. Many of the data programmers appreciated and adopted CMCs that allowed them to multi-task. e.g., running a code or program me while meeting on Zoom, or sharing documents while communicating. Again, Slack was preferred for this feature

Having a personal touch. This described the feature that CMCs would have some personal touch to it. This eliminated the feelings of isolation that some members of the organization felt. CMCs attributed this feature to telephone calls, Mandated camera-on during meetings over Zoom, and Slack.

More Organizational Entrenched. Teams adopted only CMCs that were provided, recommended from the top management and administration. This was the natural trend for many organizations across multi-disciplines

Discussion

Findings that emerged echoes diffusion attributes of complexity and compatibility with existing need while also showing the NSF major facilities, regardless of their heavy desk work, valued any communication channel that created a facsimile of face-to face communication, personal touch, and speedy feedback. Such findings collapse the role of information richness and organizational compatibility as attributes that evolving communication channels must possess in order to be adopted in any organization.

Also, for NSF major facilities, where the concern is time, feelings of isolation, and lot of meetings, there is need to create a working environment that is near to face-to-face communication, and that is universally friendly for complex science organizations to achieve their goals effectively while staying resilient during crises

Finally, Zoom and Slack seem to be the most effective CMCs in these complex science organizations. Hence, Big tech companies may consider improving these apps to enable wider adoption

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