Team Communication Platforms and Emergent Social Collaboration Practices

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Abram Anders[1]

Abstract

Team communication platforms (TCPs), including the Slack software service, are an emergent class of social collaboration technology that combine features of multiple enterprise social media including social networking platforms and instant messaging. The media capabilities of these platforms, including integrations for diverse information and communication technologies, enable affordances for both highly adaptable and centralized team communication practices. In order to understand emergent practices in TCPs, this study offers a quantitative and qualitative content analysis of the reflective practice of early adopter organizations and individuals based on a sample of self-published blog posts. Results indicate that TCPs enable affordances for communication visibility that support situated knowledge sharing and collaborative workflows. TCPs also enable affordances for multicommunication and attention allocation including flexible scaling of media modality and synchronicity. This latter affordance is conceptualized as polysynchronicity, a term that describes the dynamic synchronicity characteristic of communication practices in TCPs.

Keywords

communication visibility, content analysis, multicommunication, polysynchronicity, social collaboration, team communication, team communication platforms, TCPs

Across diverse disciplines and industries, the way professionals get things done is increasingly social, collaborative, and virtual. Supporting these trends, research has noted the growing use and importance of enterprise social media (ESM) for many types of organizations. Definitions of ESM have included diverse types of software

[1]University of Minnesota Duluth, Duluth, MN, USA

Corresponding Author:
Abram Anders, Labovitz School of Business and Economics, University of Minnesota Duluth, 1318 Kirby Drive, Duluth, MN 55812, USA.
Email: adanders@d.umn.edu

and media applications: audio and video broadcasts, blogs and microblogs, instant messaging (IM), social networking platforms (SNPs), social tagging, and wikis (El Ouirdi, El Ouirdi, Segers, & Henderickx, 2014; Gibbs, Rozaidi, & Eisenberg, 2013; Leonardi, Huysman, & Steinfield, 2013; Treem & Leonardi, 2012). The unifying principle of these media is support for social interaction and collaboration in virtual environments (Vernuccio, 2014). Boyd (2015) has emphasized the way ESM, and SNPs in particular, promote the development of a "social graph" that becomes the means of connecting "information, people, and ideas." In many organizations, ESM have been used to support cross-functional collaboration and virtual communities of practices (Bourhis & Dube, 2010; Brzozowski, Sandholm, & Hogg, 2009; DiMicco et al., 2008). At the same time, ESM, especially IM, have enabled more social and connected approaches to routine communication and collaboration for virtual teams (Darics, 2014; Gilson, Maynard, Jones Young, Vartiainen, & Hakonen, 2015).

Recent research has reported that SNP use is expected to surpass e-mail for internal organizational communication in the next 10 years (Cardon & Marshall, 2015). The adoption of IM is moving even more quickly with industry forecasts suggesting that IM may have already become "the primary source for real-time communication" for workers in "leading global organizations" (Pazos, Chung, & Micari, 2012, p. 69). Yet even while these established ESM technologies have matured and gained wider adoption, new technologies and software platforms are introduced daily. For example, in the rapidly evolving field of software and web development, a recent article cites seven different classes of specialized information and communication technologies (ICTs) including version control systems, trackers, build tools, modelers, knowledge centers, communication tools, and web 2.0 applications (Lanubile, Ebert, Prikladnicki, & Vizcaíno, 2010). These tools both enable collaboration and make it more challenging: "All engineering tools will provide collaboration features, but they're implemented differently on different tools and so don't allow data integration across tools" (Lanubile et al., p. 55). Similar technologies have been developed for a wide range of disciplines and industries including, most prominently, customer relationship management, project management, sales management, and social media marketing applications. Yet these new technologies, while enabling increasingly sophisticated and specialized collaborative functions and workflows, may also produce fragmentation of communication and knowledge, potentially impeding cross-functional collaboration and overall organizational productivity and innovation.

These three types of technology—SNPs, IM, and specialized ICTs—frame three essential functions of social collaboration. SNPs offer unique capabilities for highly visible communication supporting knowledge sharing, social networking, and social cohesion. IM, with its emphasis on highly synchronous, brief communication, supports efficient routine coordination and collaboration between team members. Specialized ICTs enable highly situated communication for complex, technology-enhanced workflows in virtual environments. Ideally, there would be a way to combine or coordinate these functions and to integrate their distinct affordances—to make routine communication visible and shareable, to allow highly synchronous communication with individuals and groups, and to include integration across collaboration

platforms. All signs point to the need for new approaches to ESM that combine the most useful capabilities of existing media.

Team Communication Platforms

Team communication platforms (TCPs) are an emergent class of software designed to support the increasingly collaborative nature of 21st-century business communication. The most prominent and widely cited examples of TCPs are the dedicated software as a service offerings Flowdock, Hipchat, and Slack. Slack, in particular, has generated intense media and practitioner interest based on its exponential growth. By February 2015, just a year from its official release, Slack had reached 500,000 users; by mid-April, it reached 750,000 users; and, by June, it eclipsed the 1 million user mark (McCracken, 2015; Newton, 2015; Rosenberg, 2015). Slack promotional materials and media coverage have positioned the service as the "fastest growing business app ever" and as a rival successor to e-mail for organizational and team communication.

Most simply, TCPs can be described as messaging services that support collaborative discussions organized into groups or topics. Yet these platforms integrate features of multiple media: the accessibility and immediacy of IM; the flexibility of group conversations organized into dedicated channels or rooms as in Internet chat relay; and, the social connectivity and media sharing capabilities of SNPs. Most significantly, TCPs support integrations for a growing collection of third-party technologies including diverse types of specialized ICTs. Integrations may enable additional functionality—such as screensharing and videoconferencing—or enable inputs/outputs that automate workflows across tools.

The core messaging functionality of TCPs is similar to IM in its use of temporally organized conversation threads. The difference is that conversations are hosted in a shared environment and organized into public groups and channels, also called rooms or flows by some services (see Figure 1). Groups are used for specific teams and projects, while channels are typically reserved for knowledge sharing and topic-based communication. Though TCPs also support private groups and direct messaging to individuals, as in traditional IM applications, the interface is designed to make communication collaborative and shared by default. Most services also support guest access for adding external partners to specific groups and channels. A second essential component of the messaging functionality is a robust notification system. Though specific features vary across services, in general, TCPs offer both notifications and mentions. Notifications are user managed and can provide alerts for new messages in specific groups or channels or provide alerts for the use of keywords. Mentions allow team members to send alerts to each other simply by using the team members' name in a message. The value of mentions is that it allows team members to request on-demand participation from individuals, including those who may not normally monitor or receive notifications for a particular group or channel. Finally, TCPs provide search functions that fully integrate public and private messages and provide both desktop and mobile applications to maximize flexibility and accessibility.

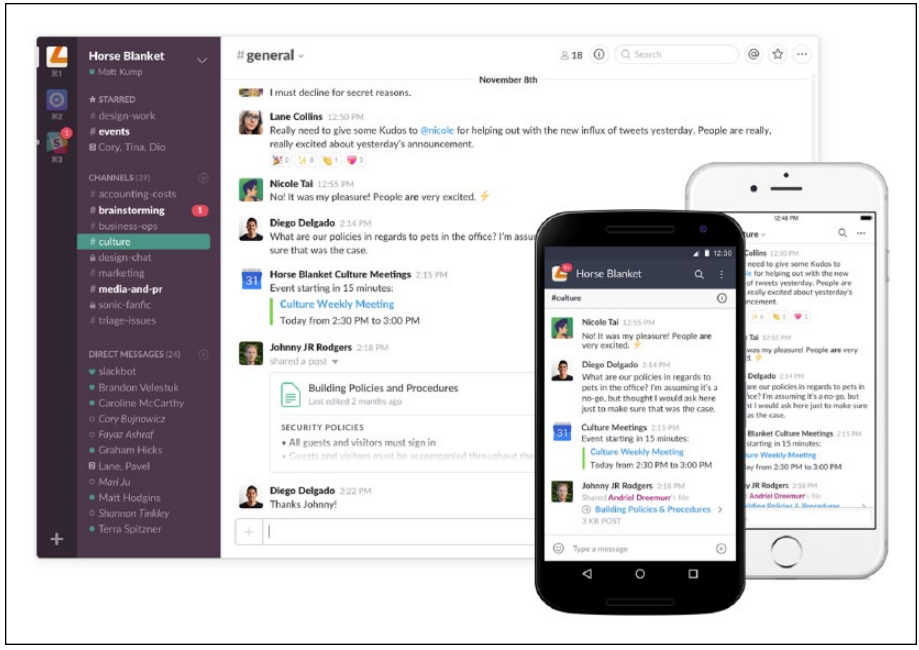

Figure 1. Slack desktop and mobile application user interfaces.

In addition to messaging functionality, TCP offer integrations with other widely used productivity, file sharing, social media, and videoconferencing tools and services. Many of these services are integrated in ways that extend the functionality of TCPs. For example, in Slack, integrations for file-sharing services like Dropbox and Google Drive not only allow easy sharing of files but also integrate full-text indexing of the file contents. This means that the TCP search function retrieves information from both communication and shared files. TCPs also offer well-designed integrations with a number of videoconferencing and screensharing services. For example, in Slack, videoconferencing with external services can be initiated by a simple text command that autoinvites all members of particular group or channel to a new videoconference meeting. Integrations can also be used to receive notifications from external ICTs as a message to specific groups and channels. Additionally, TCP application program interfaces (APIs) enable the creation of advanced functionality in the form of automations and bots. These capabilities allow users and organizations to create custom workflows and flexible routines that leverage the core functionality of the service in unique ways.

The promise of TCPs is that these technologies will help organizations centralize both team communication and information from external services and ICTs. Based on a strategy of flexibility and open integration, TCPs are designed to make the full scope of internal communication visible, searchable, and available for social

collaboration across organizational boundaries. Founder and CEO of Slack, Stewart Butterfield, has argued that Slack is not just a group chat service, but a technology that will change human behavior: "What we're selling is organizational transformation" (Butterfield, 2014, para. 12). Clients, investors, industry leaders, and the media have largely agreed with this assessment. Not only has Slack's user base grown at exponential rate, but in April 2015, as barely a year-old company, it received a venture capital valuation of $2.8 billion (Manjoo, 2015). The media have called Slack an "e-mail killer" (Stevenson, 2015) and a survey of "tech insiders" named Slack one of the top three answers to the question: "Which start-up will change the world?" ("The View from the Valley," p. 76). Though media and industry experts have championed the potential impact of TCPs such as Slack, to date, there have been no formal studies of these services and their users. The study of emergent technologies and communication practices, especially those that develop at the speed of services like Slack, poses unique challenges. Yet it also offers unique opportunities. The early adopters and enthusiasts who have propelled the growth of Slack and TCPs are both highly reflective and communicative about their technology use and collaboration practices. Numerous users have written blog posts sharing descriptions of TCP capabilities, benefits, and best practices for getting the most out of these tools. They have shared recipes for automations and integrations and have discussed strategies for overcoming emergent challenges created by adopting these tools. This body of reflective literature is precisely the type of public data set that Jackson (2007) described as essential to a new generation of business and professional communication scholarship that will address computer-mediated communication.

In order to understand the theoretical and practical implications of these tools and to evaluate their impact, this study offers a quantitative and qualitative content analysis of self-published organization and user case stories. This analysis is supported by a review and synthesis of relevant research addressing social collaboration and ESM affordances. Findings address motivations for adopting TCPs, the most significant media capabilities and affordances of TCPs, and the types of emergent practices that characterize collaboration and communication in TCPs. Ultimately, this study finds that TCPs promote innovative collaborative work routines and significant behavioral changes in communication practice.

Social Collaboration and Team Communication

Researchers and practitioners have long recognized that the diffusion of information through networks is an essential aspect of productivity and innovation in knowledge-intensive organizations. One empirical study established a strong positive relationship between the timely communication of new or novel information, knowledge worker productivity, and organizational revenue generation. Specifically, the study found that for knowledge workers communicating through e-mail, "encountering ten novel words beyond the average predicts roughly 1% more of one project completion and $700 in incremental revenues" (Aral, Brynjolfsson, & Van Alstyne, 2007, p. 22). For all types of organizations, productivity and innovation depend on "getting the right information

to the right person at the right time" (Chatti, Jarke, & Wilke, 2007, p. 409). Social collaboration and communication—whether through formal and informal social networks or through dedicated teams—is essential for the transmission, coordination, and application of information resources in the service of solving problems, developing new ideas, and completing projects. Yet, as Simon (1971) famously argued, organizations must also account for the fact that information consumes attention: "A wealth of information creates a poverty of attention and a need to allocate that attention efficiently among the overabundance of information sources that might consume it" (p. 40-41). Hence, social collaboration requires both high levels of knowledge sharing and effective processes for managing the allocation of individual and organizational attention.

Productivity and innovation are thus predicated on the essential and interdependent functions of knowledge sharing, social collaboration, and attention allocation. A recent econometric study illustrates the interdependence these factors quite clearly. It found that the productivity of knowledge workers was correlated with increased use of knowledge databases, communication with diverse social contacts, and multitasking across multiple projects. Additionally, the use of asynchronous communication channels enabled all three factors. However, the study also found that though "more multitasking is associated with more project output," there were "diminishing marginal returns"—beyond an optimum, increased multitasking becomes counterproductive (Aral, Brynjolfsson, & Van Alstyne, 2012, p. 849). Taken together, the results of this study establish a positive and mutually reinforcing relationship between knowledge sharing, social collaboration, and multitasking with the synchronicity of media channels as a mediating factor. These results also emphasize the necessity of a managed approach to multitasking and attention allocation across multiple teams, tasks, projects, and media channels.

Numerous additional studies corroborate and extend these findings. The role of social networks and value of communication with diverse social contacts has been repeatedly demonstrated as crucial to knowledge diffusion, innovation, and productivity of both organizations and teams (Powell & Grodal, 2005). Complementarily, organizations have come to rely on cross-functional teams to solve difficult problems and complete complex projects. Yet the increasingly global and virtual nature of social networks, teams, and collaborative partnerships also creates new challenges for information sharing, social collaboration, and attention allocation (Gardner & Mortensen, 2015). For virtual teams and remote workers, information symmetry across team members is essential not only for collaboration and productivity but also for developing social cohesion, building individual relationships, and overcoming conflicts (Chiu & Staples, 2013; Gardner & Mortensen, 2015; Gratton & Erickson, 2007). For individual workers, participation in diverse teams and collaborative contexts offers the potential to develop their social networks and learn new skills: "Who you know has a significant impact on what you come to know" (Cross, Parker, & Borgatti, 2000, p. 2). However, just as reported for multitasking, multiple team membership offers greater levels of learning and productivity only up to a point. After reaching a peak, productivity starts to decline due to the "switching costs" of moving between teams and information overload (O'Leary, Mortensen, & Woolley, 2011). Similarly, multiple studies

have shown that usage of emergent media facilitating variable levels of synchronicity and multiple, overlapping conversations also have a curvilinear relationship with productivity (Reinsch, Turner, & Tinsley, 2008; Turner & Reinsch, 2007).

The importance of balanced approaches to social collaboration is also apparent in research on internal team dynamics. A recent sociometric study found that high-performing teams can be identified by three interrelated characteristics: energy, engagement, and exploration (Pentland, 2012). Effective teams not only displayed both high overall energy and activity but also energy equality across individuals with each team member making significant contributions. In terms of engagement, the study that the communication of high-performing teams was distributed and diverse with each member engaging every other member. Finally, high-performing teams also communicated externally to "explore" and discover relevant information from other teams and larger social networks. Corroborating this finding, another study found that the single greatest predictor of innovation and performance in collaborative problem solving was the diversity and strength of social ties among team members (de Montjoye, Stopczynski, Shmueli, Pentland, & Lehmann, 2014). These findings emphasize the complementary role of social engagement and social cohesion for the productivity of teams and organizations.

Ultimately, social collaboration and communication will be best supported by media technologies that support a balanced approach across four essential functions and performance factors:

- Knowledge sharing from diverse sources and knowledge diffusion across organizational boundaries
- Social engagement and social cohesion as enabled by information symmetry and individual relationships—especially for virtual teams
- Collaboration practices that maximize the contributions and interconnectivity of all team members
- Attention allocation across multiple tasks, projects, and conversations

In order to understand which media capabilities can best support these goals, it is necessary to review the literature on media capabilities and affordances.

Media Technologies and Affordances

Media theorists have recognized that media technologies and computer-mediated communication practices have an increasingly dynamic and recursive relationship. Dennis, Fuller, and Valacich (2008) argued "In this age of digital convergence, specific media tools acquire new capabilities rapidly so that it is no longer appropriate to refer to a specific digital medium but rather the set of features that medium offers" (p. 576). While new tools and platforms often incorporate and build on aspects of previous technologies, unique combinations of media capabilities and subtle differences in enabled workflows can lead to significantly different individual and organizational affordances. Technological affordances describe the potentiality for action that arises from the imbrication of social

contexts, human capacities, and technological capabilities (Majchrzak, Faraj, Kane, & Azad, 2013). Individual affordances become aggregated, combined, and coordinated in ways that lead to collective capacities at the level of teams or organizations (Ellison, Gibbs, & Weber, 2015). Furthermore, the introduction of new affordances has been shown to drive change and innovation in collaboration and communication practices including the development of new work routines (Leonardi, 2011).

Communication Visibility and Enterprise Social Media

Recent studies have shown that ESM technologies enable and intensify affordances for knowledge sharing and social collaboration. The most important difference from previous media is that "rather than functioning as a channel through which communication travels, enterprise social media operate as a platform upon which social interaction occurs" (Leonardi et al., 2013, p. 2). Treem and Leonardi (2012) described visibility, persistence, editability, and association as essential affordances that enable the diffusion of information through social networks in ESM environments. The persistent and virtual nature of ESM communication leads to "increased opportunities for social learning" (Leonardi et al., 2013, p. 3). Collaboration is improved by greater context awareness—the temporal, topical organization of ESM communication and its availability for association with diverse networks of content and people, enables cross-function contributions, allowing people to "focus their attention in ways that allow them to enter conversations more easily at meaningful times" (Leonardi et al., 2013, p. 6). Subsequently, Leonardi (2014) developed a theory of communication visibility in which he argued that ESM technologies both lower the threshold for knowledge sharing and enhance its value for collaboration. Rather than asking workers to document their processes and knowledge, ESM-based collaboration makes communication directly visible and discoverable. The theory of communication visibility proposes that this enables affordances for knowledge workers to develop metaknowledge about "who knows what and who knows who," avoid duplicating work, combine existing ideas into new ideas for innovation, proactively aggregate information to solve problems, and engage in vicarious learning by observing others.

Similarly, Majchrzak et al. (2013) argued that the interactive, participatory, and social nature of ESM communication leads to a "shift from online knowledge sharing to continuous online communal knowledge conversations" (p. 40). In this view, a primary advantage of ESM is that knowledge sharing is more directly integrated into collaborative work practices. This study addresses four essential affordances. Metavoicing describes the type of reflective dialogue and community discussion that can enable timely feedback and answers to questions, group decision making, and collaborative exploration of challenging topics. Network-informed associating refers to the principle of metaknowledge and the additional value generated by knowledge conversations that are "informed by relational and content ties" (Majchrzak et al., 2013, p. 44). Generative role taking is related to the enhanced opportunities for self-initiative and self-organization enabled by ESM environments. Communication visibility empowers individuals to facilitate group processes and move projects forward; it also enables shared responsibility in which any

individual in a team may step forward to contribute to a conversation or task based on availability and expertise. Finally, triggered attending describes "remaining uninvolved in content production or the conversation until a timely automated alert informs the individual of a change to the specific content of interest" (Majchrzak et al., 2013, pp. 42-43). The significance of triggered attending is that it allows individuals to manage attention allocation by delegating real-time monitoring to technology, while still responding immediately to important events and conversations.

This combination of knowledge sharing and integrated social collaboration has positive impacts on social cohesion in teams and organizations as well. In fact, studies have shown that cocreation rather than formalized deep-knowledge sharing is a more effective approach for bridging boundaries in cross-functional and mixed expertise collaborations (Majchrzak, More, & Faraj, 2012). Additionally, communication visibility promotes information symmetry, which is a key driver of social cohesion and productivity for cross-functional and virtual teams (Gardner & Mortensen, 2015). Ellison et al. (2015) also emphasized the social benefits created by ESM and SNP affordances for developing social capital, developing metaknowledge and relationships, and strengthening communication across traditional boundaries in organizational networks. However, Ellison et al. (2015) also cited the potential problem of context collapse in which communication visibility may introduce tensions and conflicts between the different identities and social contexts inhabited by individuals. Identity management and the demands of switching between different discourse communities and social roles may contribute to cognitive overload in ESM environments.

Research has also addressed additional ways that ESM affordances introduce challenges and tensions for workers. Gibbs et al. (2013) have described the way that knowledge workers may strategically manage sharing of knowledge assets and allocation of attention including their availability, virtual presence, and levels of engagement with ESM communications. In terms of knowledge sharing, Gibbs et al. (2013) found that workplace politics and power differentials influenced some workers to guard knowledge and protect social capital. In terms of attention allocation, Gibbs et al. (2013) reported that many users were found to hide their visibility—presence and availability for communication on the platform—in order to prevent interruptive communication from coworkers. Some participants also managed attention allocation and engagement with ESM communications by closing the application or hiding the communication interface while working on important projects or tasks. This study illustrates the way that users develop adaptive practices not only to both take advantage of new affordances but also to manage and work around challenges and tensions introduced by new technologies and media. Most significantly, it underlines the crucial importance of managing attention and task focus in an environment of increased communication visibility and social network connectivity.

Multicommunication and Instant Messaging

Research of routine and virtual team communication has largely focused on IM, which is one of the most commonly used team communication technologies other

than e-mail (Bertolotti, Mattarelli, Vignoli, & Macrì, 2015; Darics, 2014). Studies report a wide range of communication uses including routine coordination, intensive collaboration, and intermittent knowledge conversations (Pazos et al., 2012). IM offers unique affordances that distinguish it from other ESM technologies including SNPs. Dennis, Rennecker, and Hansen (2010) cited "silent interactivity, presence awareness, polychronic communication, and ephemeral content" as the primary affordances of IM (p. 849). In many ESM technologies, communication takes place on a common platform that enables third-party observers to access and view public conversations. However, in traditional IM and chat applications, communication is private to the specific individuals invited to a channel or conversation thread. This leads to a more informal communication style in which individual messages can be treated as ephemeral and traditional social norms may be suspended. For example, Dennis et al. (2010) cited the practice of using IM to support "silent whispering" during meetings to support team presentations, back-channel discussions, and multitasking on external projects.

Research on IM offers unique perspectives on the issues of attention allocation and team communication. Across several studies, the theory of multicommunication has been developed to account for IM-supported practices of engaging in multiple simultaneous, overlapping conversations (Reinsch et al., 2008; Reinsch & Turner, 2006; Turner & Reinsch, 2007). While multicommunication enables collaboration and multitasking, it can also lead to distraction and cognitive overload. Congruent with themes already discussed, Reinsch et al. (2008) found a curvilinear relationship between multicommunication practices and productivity—beyond optimal intensity levels, multicommunication practices have diminishing returns. The key factors that contribute to multicommunication intensity include the total number of conversations, topics, and social roles and the pace of each conversation. In order to manage demands on attention, Reinsch et al. (2008) argued that multicommunicators must exercise two key capacities: compartmentalization and flexibility of tempo. Compartmentalization refers to strategies that allow communicators to effectively divide attention across multiple conversations, topics, and social roles. Flexibility of tempo refers to the need for responsiveness to changes in conversational pace and social acceptance of gaps in communication that allow focus switching between conversations. Variable communication synchronicity is necessary both to accommodate focus switching between communication partners and to prioritize the relative urgency of multiple conversations. In fact, Darics (2014) has noted that a primary affordance of IM is the way that it supports a productive blurring of synchronous and asynchronous communication practices in which teams negotiate unique cultural norms for communication levels of engagement, presence, and responsiveness to communication requests in IM environments.

The theory of multicommunication and research on IM affordances strongly emphasize the practical challenges of routine communication in virtual, interactive environments. It suggests that the knowledge-sharing benefits of communication visibility may be complicated by the challenges of managing information overload and attention allocation in ESM contexts.

Social Collaboration and Team Communication Platforms

As a review of the research literature has shown, ESM technologies including both SNPs and IM offer important benefits for social collaboration. However, each of these technologies has limitations. SNP interfaces with their emphasis on social networking and individualized news feeds can be cumbersome for routine team communication. Though IM excels at efficient routine messaging, it shares a major liability with e-mail—organizational and team knowledge can remain hidden in individual users' conversation threads and inboxes. A lack of communication visibility not only inhibits knowledge sharing and social collaboration but also affects individual attention allocation as finding and retrieving information can be more difficult. Similarly, collaborative workflows employing specialized ICTs can offer unique capabilities, but risk-making cross-functional collaboration and managerial oversight difficult or even impossible. TCP services like Slack have positioned themselves as a solution to these limitations by effectively integrating the media capabilities and affordances of multiple ESM technologies including SNPs and IM. Furthermore, TCPs have added additional capabilities in the form of integrations and automations that enable collaborative workflows and information sharing across diverse external ICTs. This combination of capabilities has the potential to amplify the benefits of communication visibility for the essential functions of effective social collaboration: knowledge sharing, social engagement, collaboration and team communication, and attention allocation (see Table 1). Knowledge sharing is enhanced by the highly situated and context-rich details of routine team communication. Collaborative work benefits from greater context awareness and increased opportunities for boundary work. Workflows and information sharing based on integrations allow the TCP environment to become a central dashboard for diverse ICT-based activities; and, these activities become available for collaborative discussion and benefit from cross-functional contributions. Finally, TCPs support a host of affordances for attention allocation: compartmentalization and focus switching is simplified by project and topic-based organization of communication; triggered attending can be used for all activities centralized by the platform; generative role taking enables distributed communication responsibility; and, variable synchronicity supports flexible approaches to different communication and collaborative activities.

Yet, as prior research has indicated, media affordances often include both strengths and weaknesses. By making the majority of internal and team communication centralized and visible, TCPs may simply produce overwhelming amounts of information—knowledge-sharing and collaborative activities may be impeded by excess information awareness. In terms of multicommunication, TCPs may contribute to communication intensity levels that create cognitive overload and lead to declining productivity. Coping behaviors may lead to "tunnel vision" in which individuals choose to filter out and ignore communication that is not immediately related to their responsibilities. Finally, the more informal communication and distributed leadership styles promoted by TCPs may lead to social distraction and prove counterproductive for role clarity and decision

Table 1. Classification of Social Collaboration Factors and Affordances.

Category	Operationalization
Knowledge sharing	
Controlling knowledge	Managing knowledge sharing to maintain control, guard social capital, or protect relationships (Ellison et al., 2015)
Metaknowledge	Awareness of who "knows what" and who "knows whom" to support networking and information discovery (Leonardi, 2014)
Proactive knowledge aggregation	Aggregation of knowledge to proactively prepare for future challenges and to support problem solving (Leonardi, 2014)
Recombinant innovation	Novel solutions to problems or improvements to products and processes that arise through the recombination of existing organizational knowledge from difference sources (Leonardi, 2014)
Vicarious learning	Learning through observing the work and communication of others (Leonardi, 2014)
Social	
Context collapse	Challenges of managing social identities and social norms in "flattened" online contexts that merge organizational cultures, hierarchies, and social groups (Ellison et al., 2015)
Social cohesion	Developing a sense of belonging and community, as affected by information symmetry and social sharing (Chiu & Staples, 2013; Gardner & Mortensen, 2015; Gratton & Erickson, 2007)
Social engagement	Social activity including levels of overall energy and engagement between members (Pentland, 2012)
Collaboration	
Avoiding redundant work	Avoiding duplicating work across the organization, preventing mistakes or failures in coordination, as supported by better knowledge sharing (Leonardi, 2014)
Boundary work	Collaboration and/or contributions across disciplinary or organizational boundaries that provide external perspectives and expertise (Leonardi et al., 2013)
Context awareness	Awareness of information beyond an individual's primary activities and/or responsibilities, as supported by communication visibility: visibility, persistence, editability, and associability of information (Ellison et al., 2015; Leonardi, 2014)
Generative role taking	Exercising self-initiative and/or self-organizing to fulfill team responsibilities and meet project goals (Majchrzak et al., 2013)
Metavoicing	Group discussion for decision making, answering questions, and giving feedback (Majchrzak et al., 2013)
Attention allocation	
Engagement and presence	Managing engagement and/or presence ("visibility") with communication channels and platforms (Dennis et al., 2010; Gibbs et al., 2013)
Cognitive overload	Becoming overwhelmed by amounts of information and/or multicommunication intensity (Dennis et al., 2008; Reinsch et al., 2008)

(continued)

Table 1. (continued)

Category	Operationalization
Compartmentalization	Strategies for multitasking and dividing attention among different conversations, topics, social roles, and tasks (Reinsch et al., 2008)
Synchronicity	Degree to which communication behavior is shared and coordinated (at the same time and same rate) through communication medium and social practices (Dennis et al., 2008; Reinsch et al., 2008)

Table 2. Classification of Supplemental Categories for Research Questions.

Category	Operationalization
Adoption rationale	Reasons for adopting team communication platforms (TCPs), especially in comparison with other media and technologies
Media capabilities	Accessibility: desktop and mobile applications, application program interfaces (APIs) and custom automations, bots, code snippets, commands, emoji and animated GIFs, file sharing, guest accounts, integrations, notifications and mentions, private groups and direct messages, public groups and channels, reminders, search, user interface, videoconferencing and screensharing
Flexible routines and collaborative workflows	Examples of flexible routines, collaborative workflows, and social activities developed to leverage TCP affordances to meet unique organizational and team goals

making. Just as TCPs have the potential to introduce benefits for social collaboration, there are also a number of possible drawbacks or challenges for early adopters.

The goal of the present study is to explore these issues through a qualitative analysis of the perceptions and emergent practices of individual users and organizations that have adopted TCPs. The analysis is grounded in a conceptual model and classification of affordances that synthesizes relevant research on social collaboration. It will also be supported by supplemental themes (see Table 2) that help address the following research questions:

Research Question 1: Why have users and organization adopted TCPs?
Research Question 2: Which TCP capabilities and affordances are most valued by early adopter organizations and individual users?
Research Question 3: How have communication and collaboration behaviors changed to maximize the benefits and/or minimize the challenges of TCP-based workflows?

Addressing these questions will provide a baseline examination of TCP practices for future research and contribute to understanding the relevance and fit of prior ESM media affordances research and for this new media technology.

Methodology

Researchers of business and professional communication have employed a mixture of quantitative and qualitative methods to address the unique opportunities created by emergent technologies and computer-mediated communication (Coviello, 2005; Hale, Dulek, & Hale, 2005; Hastings & Payne, 2013). In particular, Andersen (2013) emphasized both the value and necessity of studying early adopters and thought leaders to benefit from their reflective practice and unique perspectives. Jackson (2007) cited the opportunity created by the public availability of Internet and social media communication including "the creation of ready-made data sets on a scale we have never before experienced" (p. 6). Though analyzing these large data sets can present unique challenges, Jackson (2007) has argued that search engines, such as Google, also offer "new rationales for sampling, such as centrality and impact" (p. 7). Rapidly changing practices and increasingly sophisticated professional users both enable and necessitate qualitative study of emergent technologies.

Data Collection and Sample

A combination of web and social media searches were used to identify blog posts discussing user experiences with the Slack service. Slack was selected for two primary reasons. First, although many ESM technologies have begun to integrate more robust team messaging capabilities, Slack is among a smaller group of services, including Hipchat and Flowdock, that are exclusively dedicated and marketed as TCPs. Second, the recent creation, rapid growth, and extreme popularity of Slack has generated a large number of practitioner-written blog posts reviewing the service and sharing user experiences. Only posts that reported on specific organizational uses and/or personal experiences were included in the sample. Posts that could be specifically identified as promotional in nature, including case stories hosted on the official Slack website or posts marketing third-party integrations for the Slack service, were excluded from the sample.

The search obtained 100 blog posts written by individuals and self-published on personal or organizational blogs between September 2014 and September 2015. Additional searches were used to cross-reference posts in the sample with organization profiles on LinkedIN and/or official organization websites to identify industry and organization size by number of workers (members or employees). Gender data for post authors were not collected due to the lack of accurate sources.

The organizations and individuals in the sample included representatives of diverse industries and at least 18 different nationalities (see Table 3). The sample is characterized by a strong proportion of small- to medium-sized organizations in information and technology–intensive fields including media, software development, and information technology organizations. There were also a significant number of posts written by individuals who were either freelancers or members of informal teams and communities.

Table 3. Characteristics of Sample.

	N		*N*
Organization size (workers)		Industry	
1-10	35	Airlines/aviation	1
11-50	27	Computer software	9
51-200	10	Construction	1
201-500	5	Consumer electronics	2
501-1,000	4	Design	2
1,001-5,000	1	E-learning	1
10,001+	1	Education	2
Individual/team	15	Event services	1
Not available	2	Financial services	2
Total	100	Higher education	1
		Industrial automation	1
Nationality		Information technology and services	17
Australia	3	Internet	25
Austria	1	Management consulting	1
Canada	5	Marketing and advertising	10
Denmark	1	Newspaper	1
France	1	Newspapers	5
Germany	1	Online media	14
India	2	Public relations and communications	2
Ireland	1	Publishing	1
Israel	1	Retail	1
Italy	1	Total	100
Netherlands	2		
New Zealand	3		
Poland	1		
South Africa	1		
Spain	2		
Switzerland	3		
United Kingdom	14		
United States	51		
Not available	6		
Total	100		

Content Analysis

Recent studies in business and professional communication have applied quantitative and qualitative content analysis to the study of emergent communication practices and open data sets available on the Internet (Gallagher & Savage, 2015; Graham & Wright, 2014; Hastings & Payne, 2013; Vaast & Kaganer, 2013). Content analysis is a flexible method for analyzing textual or visual data; it is characterized by a systematic approach to condensing data into observable concepts, categories, or themes (Hsieh & Shannon,

Table 4. Inductive Categories for Social Collaboration Practices.

Category	Operationalization
Reasons for adoption	
Virtual collaboration	Communication and collaboration in virtual environment to support teams, flexible working, and asynchronous participation
Openness and transparency	Promotion of organizational values of openness and transparency to support a culture of trust and shared responsibility
Interoperability with external services	Requirements for integrations with specific technologies and/or preference for working with "ecosystems" or "constellations" of technologies and services
Centralizing communication and information	Consolidating communication and information flows in a central dashboard including internal communication and essential external sources
Recommendations and/or popularity	Recommendations early adopters and internal or external colleagues or interest based on popularity and media exposure
Media preferences	
E-mail	Comparisons of e-mail and team communication platforms (TCPs)
Internet chat relay (IRC)	Comparisons of IRC and TCPs
Instant messaging (IM)	Comparisons of IM and TCPs
Collaboration	
Leadership awareness	Addressing the benefits of enhanced context awareness for leadership and management functions

2005). In deductive content analysis, existing literature is used to define a preliminary structure and set of analytical codes for analysis. These codes may be supplemented by additional inductive codes developed through the analysis process (Elo & Kyngäs, 2008). Content analysis may include both quantitative and qualitative results.

In this study, blog posts were collected, organized, and coded with both deductive and inductive codes using the Dedoose qualitative and mixed-methods research application. Basic quantitative data on coding frequency were collected to establish the comparative relevance and importance of the coding categories. However, codes were primarily used to establish sensitizing categories that enabled qualitative analysis of the sample. Individual posts were divided into excerpts based on topical coherence and an inclusive coding strategy meant each excerpt could receive multiple codes. In the first stage of the analysis, the data were coded based on the deductive codes established in the literature review of social collaboration and media affordances (see Table 1) and based on the themes identified as relevant to the research questions (see Table 2). During this initial analysis, additional inductive codes were developed based on patterns and themes discovered in the data. In the second stage, these inductive codes were operationalized and organized into a supplementary coding framework and the entire sample was recoded (see Table 4). Finally, a third complete review of all codes

Table 5. Most Frequently Cited Rationales for Adopting Team Communication Platforms.

	N
Reasons for adoption	
Virtual collaboration	34
Openness and transparency	19
Interoperability with external services	17
Centralizing communication and information	13
Recommendations and/or popularity	4
Preferred to other media	
E-mail	43
Internet chat relay	5
Instant messaging	4

was used to ensure consistency and accuracy of the coding. During this final review, code co-occurrence data were also reviewed to ensure the conceptual and operational distinctness of the codes.

Results

There were a total of 1,227 coding references and 452 excerpts across the 100 individual blog posts in the sample. Though individual posts in the sample may have included multiple references of an individual code, the summary quantitative data are presented in terms of references per blog post in the sample. Additionally, because the total sample was 100, the number of posts and percentage of the sample are the same. The quantitative summary includes data addressing the most frequently discussed rationales for adoption (see Table 5), media capabilities (see Table 6), and media affordances (see Table 7). The quantitative data illustrate the applicability and fit between the sample and the conceptual model of social collaboration affordances. In the following sections, the significance of these results is interpreted in light of the qualitative analysis and contextualized by full-text excerpts.

Rationales for Adoption

The analysis revealed that a number of factors play a role in the adoption and use of TCPs. One of the most significant themes, cited by 34% of posts in the sample, was that organizations and users adopted TCPs to better support virtual collaboration for both virtual teams and flexible working styles. In general, the communication visibility enabled by TCPs was argued to bridge gaps between virtual teams and create a stronger sense of social engagement. Perceived benefits and specific practices for virtual collaboration are discussed in more depth in the upcoming Social Engagement section. Additional rationales cited for adopting TCPs included the desire to promote organizational openness and transparency (19%), the need for interoperability with

Table 6. Most Frequently Mentioned Media Capabilities.

Media capabilities	*N*
Integrations	61
Public groups and channels	40
Notifications and mentions	37
Private groups and direct messages	36
Search	24
Accessibility: desktop and mobile applications	21
File sharing	19
Bots: Slackbot and custom designed	15
Application program interfaces and custom automations	14
User interface	14
Emoji and animated GIFs	11
Guest accounts	11
Commands	7
Videoconferencing and screensharing	7
Code snippets	6
Reminders	2

specific external services (17%), the benefits of centralizing internal communication and information (13%), and interest based on recommendations from others or the popularity of the service (4%).

Yet the most cited reason for adopting TCPs was dissatisfaction with other media options, especially e-mail (see Table 8). In fact, 43% of the posts in the sample discussed the advantages of replacing e-mail with TCPs for organizational and team communication. The common theme was that TCPs supported greater productivity based on several key differences. First, e-mail was seen as impeding knowledge sharing and timely discovery of information. Multiple posts suggested that important organizational information is often hidden in individual users' inboxes and that group conversations often include too many or too few participants. Users also described e-mail as an inefficient medium for the type of brief, synchronous messages that characterize routine team communication. E-mail messaging structures were argued to add extraneous information with group discussions in e-mail chains becoming unwieldy and difficult to follow. These factors exacerbate the challenges of collaboration, especially for new team members who do not have access to the original messages. Furthermore, it was noted that the volume of routine internal e-mail is a distraction from important e-mails with external communication partners including clients, customers, and business partners. Several users argued that compartmentalizing communication—by reserving e-mail for external communication—enhanced focus for internal work tasks and performance in communication with external partners.

Several other media were discussed as potential alternatives. Users described IM as too ephemeral and noted that important information is left hidden in communication

Table 7. Most Frequently Discussed Media Affordances.

Media affordances	*N*
Knowledge sharing	
Proactive knowledge aggregation	17
Recombinant innovation	15
Vicarious learning	12
Metaknowledge	6
Controlling knowledge	3
Social	
Social cohesion	26
Social engagement	17
Context collapse	3
Collaboration	
Contextual awareness	37
Metavoicing	34
Flexible routines and collaborative workflows	31
Avoid redundant work	28
Generative role taking	18
Leadership awareness	17
Boundary work	11
Attention allocation	
Compartmentalization	38
Engagement and presence	29
Synchronicity	26
Triggered attending	15
Cognitive overload	7

between individuals. Internet chat relay was described as too technical for many users and lacking in media-sharing features. Interestingly, SNPs were not cited as an alternative or point of comparison by any of the practitioners in the sample. This suggests that for many professionals SNPs are not seen as an appropriate ESM for routine team and internal organizational communication.

Media Capabilities

Beyond the core messaging functionality, the most frequently mentioned capabilities were integrations (61%), automations (14%), and bots (15%; see Table 6). Most prominently, users valued integrations for established third-party file sharing, productivity, project management, and videoconferencing services. Organizations also used integrations to receive notifications from external ICTs. For example, media teams integrated web and social media feeds to receive notifications for new publications and social media mentions; and web developers integrated notifications from external

Table 8. Examples of Frustrations With E-Mail.

Knowledge management	"We made a conscious effort for email not to become a repository for threads of 'CC conversations' and historic information that we'd experienced in previous businesses, so needed a solution."
	"I've spent so many hours trailing through old messages looking for telephone numbers, small details or important dates. Moving my volunteers to Slack means searching for any detail quickly and easily."
Social collaboration	"One of the biggest problems I've had with email is [large teams]. . . . Every email from the team gets diluted with every response. Then if someone throws in a different subject or emails a new subject line, the whole email goes into a tail spin."
	"The problem with email is that at the very core—it can only benefit the people who it's sent to. Services like Slack create streams of conversation that team members can dip into and read to stay informed."
	"And that new guy who just started? He doesn't have access to those vital email chains so he has no idea what's going on. Ramping up new hires takes weeks or sometimes months because of this problem."
Attention allocation	"If you're like me you probably receive hundreds of emails a day. . . . It's easy to miss something."
	"With Slack, your inbox will shed itself of clutter—making important emails from clients and colleagues pop."
	"Internal and external communication often have a materially different cognitive workload per email. Internal communication should have quick turn arounds, and flow freely. External communication should be polished and thorough. Teams shouldn't handle quick 1-line responses to their team in the same email session as paragraph responses to 3rd parties."
	"It is quicker to scan through a feed then scan through emails. A chat stream enables quick scrolling through a discussion. Email threading requires processing each message and has a lot of meta text that clutters the UI. This makes catching up much faster."

Note. UI = user interface; CC = carbon copy.

ICTs for new software releases, customer service requests, bug reports, and server or system errors.

Many organizations in the sample also used TCPs' built-in bots—a simple interface for performing repetitive tasks—and open APIs to develop complex automations. One of the benefits of this extensibility is that organizations have self-developed and shared recipes for bots and automations and have contributed to the open development of tools, extensions, and plug-ins for TCPs. For example, one organization programmed a bot to request a status update from each team member every morning and then report the response to a shared channel. Another organization used a combination of bots and APIs to create a "Foodbot" that requests lunch orders from team members though the TCP and then submits them through a custom-coded interface with a food service mobile application for delivery. Although automations and bots require technical

Table 9. Examples of Knowledge Benefits of Team Communication Platforms.

Proactive knowledge aggregation	"Everyone posts links to this great content in the shared . . . channel. This authentically curated channel is our highest-quality source of content. Slack keeps this content deluge organized. Even better, Slack gives us a place to discuss this content internally."
	"Slack is an almost perfect platform to find out what a team is reading, valuing and sharing. It's the best way I know to curate the curiosity and intelligence of a team."
	"For instance. . . . Marketing can create "websites" and "social media" channels and invite people from other departments who are on the "websites" or "social media" team to join. . . . The channel can remain public with activities available to everyone in the marketing department or the entire firm: a new level of transparency and domain knowledge."
Recombinant idea generation	"One of my favorite channels is a group called #Headlines-and-Framing. Any editor or writer can pop into the channel, offer the headline ideas they're working through, and ask who has feedback. There are always people who have a few moments to hang out and workshop a line."
	"Let's not bury the lede [*sic*]: this was 100% a side project for all involved, and came together because our teams have easy and open communication with each other constantly."
Vicarious learning	"Whether we realize it or not, we learn and retain information by overhearing conversations. . . . Public channels within a Slack team allow for anyone who is relevant to the conversation to listen and observe communication being exchanged even if it doesn't directly apply to them. When people overhear conversations they're able to catalog insights and apply them in many beneficial ways."
	"I hear it all the time in the room, that traders have learned more in a month there then they have in years, trading by themselves."

knowledge to develop, they can be used to support nontechnical users. For example, the Slack service has created a "Slackbot" that engages new users in interactive dialogue to provide an orientation and support setting up initial account details and service integrations.

Knowledge Sharing

In discussing the media capabilities and productivity benefits of using TCPs, users emphasized the knowledge-sharing affordances of centralized, integrated communication visibility (see Table 9). Knowledge sharing and management is supported by both the search feature and groups and channels functionality. Users praised the utility of the search function including the full indexing of shared files on the Slack platform. The ability to organize conversation threads into public groups and channels that could serve different functions was also cited as a key to knowledge management. The typical approach employed by organizations in the study included dedicated channels for knowledge conversations, specific projects and teams, and social engagement. In addition to

directing attention to organizational priorities, users noted that compartmentalization made it easier to contribute and to find useful information. Furthermore, whether posted manually by team members or automatically through integrations, any piece of information is more likely to be encountered, discussed, and used effectively when integrated into the flow of routine team and organizational communication.

In particular, organizations were described as using knowledge-specific channels to further proactive knowledge aggregation (17%) and collaborative learning. Many created channels to host strategic conversations. For example, one organization created a channel that integrated news feeds about their primary competitors. Through this channel, members of the organization contributed to discussion, analysis, and strategic planning based on industry trends. Similar channels used by other organizations addressed a range of topics: developing ideas for new products, services, or for promoting organizational growth; evaluating a new logo or advertising campaign; and, providing employee feedback and input for the CEO or leadership team. Channels were also used to support collaborative learning activities similar to those that would occur in a virtual community of practice including sharing and discussion of information related to specific disciplines, expertise, or methods. In web development teams, channels could be used to monitor and discuss news and changes in important industry specifications and/or partner platforms and APIs. In fact, a significant number of posts described using TCPs to support informal and formal learning communities for professionals in higher education, secondary education, journalism, and web development. In several cases, TCPs were used to support cross-organizational collaborations such as a research project developed by a team of scientists at different institutions or an open source software project that included contributors from multiple organizations and the public.

There was also support for the argument that communication visibility supports both recombinant idea generation (15%) and vicarious learning (12%). Recombinant idea generation was supported both by knowledge discussions and collaborative processes. Several media organizations reported creating channels that hosted combinations of web and social media feeds and manually shared stories to serve as inspiration for new articles and projects. Journalists described using channels for impromptu brainstorming sessions with available colleagues. Web development professionals shared difficult problems and received help in generating programming solutions. In terms of vicarious learning, users cited diverse examples of highly contextualized learning that depended on observations of team communication and collaborative workflows. In particular, vicarious learning was correlated with collaboration affordances including context awareness and boundary work that will be discussed shortly. Finally, users reported that observation of situated work practices and collaboration led to the development of metaknowledge about "who knows what and who knows who" (6%).

Social Engagement

Although previous research has emphasized the social networking benefits of ESM and communication visibility, there has been limited discussion of the positive role of play

Table 10. Examples of Social Benefits of Team Communication Platforms.

Social engagement	"Being able to share fun, funny moments and things of interest on Slack fosters a company-wide sense of community throughout the day. It can be hard to form one-on-one relationships in an open-layout office where group conversation prevails, especially at a startup where everyone is totally engrossed in their work."
	"From #Cat Channels to #Music and #inspiration, we have an outlet to share ideas and inspiration. Sometimes you've got to take a break and have a good laugh."
Social cohesion	"Slack is one of the threads that holds our internationally distributed teams together. We use it to be incredibly productive and transparent, but also to foster team-building and camaraderie with remote colleagues."
Virtual collaboration	"We have a remote and global team. Slack helps shrink the time zones and give us a productive, family-like feel most startups can only hope to achieve. We'll even force ourselves to use it even if we're sitting right next to each other so everyone on the team (regardless of location) feels included in conversations."
	"Communicating across 12 hours of time zones is challenging. But with Slack these distances seem shorter due to the immediacy of communications, the ability for all relevant team members to huddle and collaborate instantly. . . . An additional benefit is that employees across multiple sites feel part of a larger company and 'in the game' as opposed to an outpost team on their own."

and fun in virtual environments (Huy & Shipilov, 2012). This theme was prominent in user discussions of social engagement in TCPs (17%). In particular, users discussed their appreciation for the engaging and "fun" elements of the Slack interface including the use of emoji, animated GIFs, and the humorous and lighthearted tone of interactions with the "Slackbot" (see Table 10). Several organizations reported creating dedicated channels for social engagement. These channels could be used for casual conversation, posting funny pictures, sharing music, or sharing picture of families and pets. Additionally, these types of social engagement were seen as crucial to maintaining energy and morale, developing personal relationships, and building team commitment.

As already mentioned, users cited the value of TCPs for addressing the challenges of virtual teams (34%). In particular, users emphasized that the communication visibility of TCPs enabled information symmetry across team members in different locations. Multiple users discussed developing an organizational commitment to using TCPs for even collocated interactions in order to document the discussion for remote collaborators. Another unexpected finding was that multiple users described the benefits of TCPs for communication in open office environments. One user noted that even though his teams were located in the same office, they frequently held meetings via chat in the TCP environment to avoid ambient noise and to ensure that meeting notes would be fully captured and available for future reference. Other users also

described the benefits for flexible working in which employees may spend significant amounts for time working from outside the office, whether at home or from public spaces like coffee shops. Overall, analysis of the sample revealed patterns of behavior based on cultivating a balance of informal intimacy and disciplined communication visibility to enable social cohesion and productivity for virtual and flexible working teams, respectively.

In addition to enhancing social engagement and enabling virtual collaboration, users argued that the increased openness and transparency of communication in TCP environments fostered social cohesion for the entire organization (26%).

Collaboration

The communication visibility afforded by TCPs also had direct impacts on collaboration processes. Users noted that communication visibility—especially when supported by compartmentalization of groups, projects, and topics—enabled more distributed and self-organized styles of collaboration (see Table 11). For example, an owner of a construction company reported that creating an independent channel for each job site drastically reduced the amount of time his workers spent on communication for coordination among its various teams. This enabled a greater focus on collaboration and problem solving. Across the posts in the sample, there was a consistent correlation of greater context awareness (37%) leading to reduced levels of communication for coordination and increased levels of collaborative communication. The documentation of routine communication and decision making for all team members meant that it was less necessary to "push" information updates and the routine information requests could often be replaced with information searches and "pulled" directly from the TCP. Routine communication for coordination could be avoided as redundant work (28%), which created space for a greater emphasis on collaborative discussion and metavoicing (34%). Users frequently described the benefits of receiving not just timely responses to questions but direct and detailed feedback and team support for decision making.

TCPs amplified the mutually reinforcing effects of context awareness for boundary work (11%) and generative role taking (18%) to support greater levels of self-initiative and to make it easier and more likely for individuals to contribute to the work of others. In terms of boundary awareness, many organizations developed workflows and channels to create overlap between different functions or disciplines. These shared collaborative spaces included both knowledge conversations and routine workflows. One user noted that this type of boundary work led to both knowledge effects—including vicarious learning that helped develop greater empathy and more holistic perspectives across functions—and to the creation of numerous highly specific improvements to their products and services.

Within teams, context awareness facilitated distributed work and shared responsibility. Multiple users described the advantages of shared awareness of communication with clients and partners. Typically, a single individual may be the primary liaison for an account, client, or business partner to ensure continuity and

Table 11. Examples of Collaboration Benefits of Team Communication Platforms.

Boundary work	"We have a Slack room connected directly to WordPress VIP, so every time we make a change . . . the staff is notified. This has been a real boon for us because writers and producers . . . start to think about how technology can simplify their workflow, or make the site better for readers. Features like this came directly from our editorial team, and so have hundreds of micro changes."
Context awareness	"It helps our team if everyone is made aware of what's going on in all sides of the business in order to either interject, ask a question, or for individuals to plan their own work around what was being done elsewhere."
	"Thanks to Slack now all of our staff can easily share client and internal updates and feel involved. When clients contact us it's easy for team members to be aware of any updates that affect them."
	"I work remotely and now have access to conversations I was not previously privy to. I'm also aware of important decisions being made in the company via project-based channels I'm not directly involved with but that may impact what I'm doing."
	"This is great especially when you're 'on boarding' a new team member. Everything and anything that has to do with the project is in-line and it's easier to get the new member up to speed."
Generative role taking	"What makes Slack so powerful is that it allows for individual initiative while at the same time providing the user with constant collaborative feedback and support."
	"But the messiness is mostly an advantage. It helps people figure out, over time, the way in which they want to organize themselves."
Flexible routines and collaborative workflows	"What sets Slack apart from other chat and IM tools, though, is the integration between it and other services. For example, we pipe in all the responses to our Twitter posts, so that instead of having to constantly keep an eye on TweetDeck, we can see what people are saying to us in Slack. Sometimes, we will then discuss what the right kind of response will be to a post—and whether we should retweet it to our followers."
	"Each time we deploy code to either staging or production servers, developers and clients are notified. . . . This saves us ages! As long as everything goes smoothly, developers don't have to wait to check a build state. . . . If something fails, the notification is pushed as a Slack chat message with a direct link to the build."
Leadership awareness	"It has opened up the communications between senior management and the rest of the company. I immediately got much more visibility into the pulse of the company—who's doing what, employee sentiment, operational issues that previously were hidden, etc. And my employees have much more visibility into what I'm up to, what I care about, and what's happening with the company."
	"Check-in meetings are great, email updates are helpful, but nothing provides a clearer window into the progress toward a goal than reading through a project discussion on Slack. . . . Very quickly, you'll see what's challenging the team, what the products (documents, designs, whatever) they're creating look like, and how the team feels about the work. And, wherever necessary, you can jump in to provide guidance and help."

responsiveness. Yet, if that individual is unavailable, communication with the client and advocacy for their needs can be compromised. Context awareness allows all team members to share responsibility and to respond to needs more quickly while maintaining continuity and consistency. In fact, in-depth context awareness supported generative role taking for a wide range of activities including responding to communication, solving problems, and completing tasks. Communication visibility and context awareness also supported training or "on boarding" new team members or cross-functional collaborators. Since all recent activity and team materials are available in a shared channel, even newcomers are able to contribute more readily. This affordance was described as especially crucial by leaders of organizations that employed freelance workers, needed to scale to meet the demands of specific projects, or were experiencing rapid growth.

In TCP-based working environments, generative role taking can also extend to the self-organization of groups, channels, and collaborative workflows. Many user posts described the way their organization gradually discovered and refined an optimal organization of channels, groups, and integrations to support flexible routines and collaborative workflows (31%). In a typical example, a software company created a channel that integrated notifications from an external customer relationship management service. The team for this channel comprised both customer service representatives and software programmers with shared responsibility for using their combined expertise to discuss problems, making decisions, and respond to these customer messages. Collaborative discussion and decision making with shared responsibility ensured thoughtful and rapid responses even if specific individuals were unavailable. The user noted that this process was a dramatic improvement over previous practices in which customer issues were shared with a single programming team representative in individual e-mails. Another software development team developed a process in which Slack supported automated code deployment, reporting, and error notifications including routing of notifications to appropriate team members and clients. In another example, an online media organization developed workflows and integrations for channels dedicated to breaking news, real-time site analytics, and the editorial process. In one news organization, Slack was used to support a fast-paced collaborative workflow for "live tweeting" a news event that included integrated social media feeds and contributions of multiple writers, editors, and web programmers. These examples illustrate the essential characteristics of TCP supported workflows including: integrated information flows from external sources and ICTs; reduced coordination and increased collaboration communication; context awareness and boundary work; and shared responsibility and generative role taking.

Several organizations extended this style of open collaboration even further by adding clients or other external business partners as guests to specific groups or channels. One leader for a software development team noted that despite some initial concerns, providing guest access to clients led to very positive outcomes. His team found that through shared communication visibility, clients developed greater empathy and understanding for the feasibility of their requests and were able to contribute valuable and timely feedback. Multiple organizations described building stronger and more

productive partnerships with clients and external partners through collaboration in TCP environments.

Even while TCPs support more decentralized and self-organized workflows, these environments also offered enhanced leadership awareness (17%) for managers and organizational leaders. One manager noted that context awareness can largely replace the "check-in" or status update meeting that is a regular feature of many organizations. He argued that the rich detail and context awareness of TCPs provide managers with unparalleled access and perspective on work processes, products, and employee morale. Several leaders noted the TCPs allowed them to observe team progress and offer targeted interventions to solve problems and improve processes without "micromanaging" or inhibiting individual team members' self-initiative. Leaders of larger organizations also appreciated the benefits of communication visibility. Channels dedicated to strategic knowledge development promoted employee feedback, supported greater awareness of organizational morale, and vertical communication. Finally, the centralization of communication and visual organization of organizational activities enables a macro view of how human resources and attention are being allocated.

Attention Allocation

Enhanced productivity due to shifting routine internal and team communication from e-mail to TCPs was one of the most consistent themes across all posts in the sample; this theme was raised in references to e-mail (43%), context awareness (37%), and avoiding redundant work (28%). Users noted that communication visibility, group and channel organization, search function, and streamlined messaging interface all contributed to quicker and more efficient routine communication. Additionally, users found greater levels of context awareness helped reduce the need and overall volume of communication for coordination. Similarly, multiple organizations described 80% to 90% reductions in the volume of internal e-mails. Organizations also used TCPs to replace traditional meetings, including face-to-face and teleconferencing modalities. Meetings were both less necessary—with context awareness replacing "check-in" meetings—and were more frequently held via synchronous, collaborative chat discussions. As noted previously, many teams prioritized the communication visibility offered by TCP-based discussions. A particularly interesting finding is that several users discussed the benefits of mixed synchronicity for team meetings and discussions. These users described scenarios in which several team members would engage in a synchronous chat meeting, and then later in the day other team members, who had not been available, would not only review the discussion but also contribute to it after the fact. This example illustrates the way that TCP use led to emergent work routines and communication behaviors that prioritized communication visibility and flexibility for asynchronous participation that even replaced entrenched communication genres such as team e-mail and face-to-face meetings.

The increased communication visibility and context awareness created by shifting organizational and team communication from e-mail and meetings into the groups and

channels of a TCP promoted and necessitated the development of strategies for managing attention allocation (see Table 12). In seeking to balance the demands of multitasking and multicommunication in TCP environments, three affordances proved especially crucial for managing attention: compartmentalization (38%), engagement and presence (29%), and synchronicity (26%). At the most basic level, effective compartmentalization was based on the effective division of communication into groups, projects, and topics to enable focus switching and facilitate referencing organizational knowledge. Several posts noted that whereas teams tended to discuss "everything all at once" in e-mail chains, most users and teams quickly adapted to directing questions, sharing ideas, and conducting discussion in appropriate groups or channels in TCPs. This helped streamline activity and maintain focus in individual groups and channels. Prioritization and focus were also enabled by the flexibility of public, private, and individual messaging options. Many organizations developed informal guidelines and best practices for which activities to conduct publicly versus privately. Multiple posts also reported frequently creating new groups or channels to support ad hoc groups and special projects without distracting a larger team. Prioritization and focus were also supported by the ability to archive channels and groups that were no longer active.

Self-organization and generative role taking were especially crucial to effective compartmentalization. Users of TCPs can take initiative for creating or revising groups and channels structures and can self-subscribe or follow groups and channels. This was important because it allowed individual users and teams to negotiate and "right-size" group membership and allowed variable levels of participation. Flexible participation and group membership were also highly correlated with affordances for managing engagement and presence. TCPs offer highly flexible options for managing attention allocation based on capabilities for triggered attending (15%). Individual users are able to manage notifications for groups and channels in order to prioritize communication central to their responsibilities. A typical user may regularly monitor and receive notifications for several important groups and channels, while occasionally browsing secondary groups and channels that are of less operational importance, but still valuable for context awareness and boundary work. Additional flexibility is supported by TCP capabilities for mentions. Mentions allow a user to be sent a notification by including their username in a message. This way individuals can manage their own levels of engagement and presence in particular channels, but can also be sent a request for "on-demand" participation by others through mentions. The extreme flexibility and customization of engagement and triggered attending means that usage patterns of these media capabilities are subject to social negotiation and norming and may vary widely across organizations. For example, one organization encouraged employees to disable notifications entirely. Another organization found that its employees were so responsive to notifications and mentions that it had to recommend deleting the TCP application from their mobile devices while on vacation.

The final key affordance for TCPs for attention allocation relates to media synchronicity and multimodality. TCP-based work routines and communication behaviors consistently prioritized a blended approach to synchronous and asynchronous communication. In fact, users reported highly flexible and variable uses of media

Table 12. Examples of Attention Allocation Benefits of Team Communication Platforms.

Engagement and presence	"Slack is much better for controlling noise, especially in high volume accounts. You can control notification on a per-channel basis, and even disable notifications entirely for a channel."
	"We encourage the staff to disable Slack notifications, particularly for groups. . . . Concealing notifications also adds a nice asynchronous feel to the Slack workflow, which helps us slow down and make more deliberate decisions. . . . People can click into it when they want to check it, instead of it being this constant presence."
Compartmentalization	"A way we've overcome . . . [overload]—and become more organized—is by being more granular with our channels. . . . The more specific our rooms are, the easier it is to make conversations productive and reference previous discussions."
	"The ability to create invite only groups on the fly between the team has also proved a useful asset in preparing for events or knowledge sharing between locations without disrupting the wider team."
	"Slack enables users to archive channels and private groups. This allows teams to keep communication clear of clutter while still having the content available for later reference."
Synchronicity	"The cool thing about Slack is that it's simultaneously synchronous and asynchronous. You can get immediate feedback on something, but if someone comes into the room later, they might be able to add something, whereas if you didn't go to a [physical] meeting, you're not going to be able to contribute later."
	"It compresses a lot of the stuff you might otherwise do in meetings into a Slack channel, so that information is visible to everyone it should be visible to, and it saves people time: They don't necessarily have to meet but can stay updated on a project's status."

synchronicity. A full spectrum would include not only asynchronous and synchronous messaging but also videoconferencing, screensharing, and collaborative work in virtual documents or other ICTs via integrations. As previously discussed, the persistence of synchronous messaging and recorded teleconferences enables subsequent asynchronous contributions and ongoing group discussion over time.

A very interesting feature of emergent user practices is the way the synchronicity levels are flexibly scaled as needed by the team. In a typical example, an event might trigger an asynchronous discussion between two members, then escalate to a synchronous discussion with multiple team members, and then further escalate to a videoconferencing meeting as necessary. Multiple posts described relying on asynchronous messaging to support routine activity and multitasking, and shifting to synchronous messaging and/or teleconferencing to solve urgent problems and to make important decisions. It is worth noting that this practitioner behavior correlates with previously

discussed research showing that low media synchronicity supports multitasking, while high synchronicity supports timely completion of individual projects and tasks.

Flexible synchronicity is especially useful for supporting rapid team responses to crisis events. For example, one media organization reported facing a crisis when an article hosted on their website went viral. This was discovered when, after normal working hours, a programmer received a notification via integration that their server was experiencing increased demand. He communicated this to a team leader who cross-referenced this activity with social media mentions of the story as reported in another TCP channel. Through the TCP environment, other team members were quickly mobilized: Programmers monitored Internet traffic and adjusted server capacity to meet demand; media specialists engaged story commenters and social media discussions in real time, and writers developed a follow-up story to capitalize on the public attention. Across all of this activity, the TCP environment was crucial to rapid and flexible coordination including a full range of synchronous and multimedia communication. While this level of rapid response may not be typical, flexible scaling of media synchronicity was one of the most significant and unique aspects of emergent communication and collaboration behaviors described across all organizations and users in the sample.

Challenges and Adaptive Behaviors

Though posts in the sample focused primarily on the benefits and affordances of TCPs, a number of significant challenges and examples of drawbacks were discussed as well. One extremely crucial issue is the importance of uniform adoption of the TCP across the organization. The benefits of communication visibility and capabilities for highly synchronous communication depend on the participation and engagement of all members of the organization. Furthermore, one user noted that a lack of complete adoption would inhibit productivity by making it necessary to manage internal communication across both TCPs and e-mail or other media. Most posts in this sample described nearly immediate and complete adoption of the platform with high levels of organizational support overall. In large organizations, TCPs were often adopted initially by specific teams and departments and then gradually spread to additional groups. Several posts also discussed concerns about controlling information (3%) and managing confidential information through the appropriate use of private versus public channels. As TCP use spreads beyond early adopters and enthusiasts, the issues of adoption, engagement, and management of confidential or proprietary information may prove even more significant.

The other most frequently cited challenge was information overload (7%). Multiple users noted that the sheer volume of messages, groups, and channels could be intimidating and even overwhelming. Demographics and generational dynamics could contribute to this issue. One user noted that as an older manager of younger “millennials,” he found it difficult to keep up with his teams’ levels of communication. He noted that important information could become “buried” by subsequent discussion. This concern was echoed by a user who noted that important decisions could be “lost in the shuffle”

of ongoing conversations. Demands on attention were also concern of some users. One user described closing his TCP application for focused work sessions. Others described becoming "addicted" to engaging in TCP communication even after work hours or while on vacation. The always-on demands of TCPs could have negative impacts on employee work-life balance. Furthermore, while many posts cited the value of TCPs for social engagement and as a source of productivity-enhancing fun, others noted that social content could become a distraction from work activity. Similarly, one post reported example of context collapse (3%) in which social conflict was created by a teams' use of inappropriate humor in public channel.

Overall, most posts in the sample discussed overcoming these challenges through effective use of the positive affordances of TCPs. For example, information overload was typically addressed through the affordances of compartmentalization, triggered attending, and flexible synchronicity. Multiple organizations supplemented TPCs by integrating a project management service in order to ensure clear documentation and accountability for decision making and project deliverables. Time management and social conflicts were addressed through a combination of adaptive work routines and social norming. Finally, several users also noted that most of these challenges are endemic to team and organizational communication using any technology. However, it is clear that balancing the benefits and drawbacks of multitasking and multicommunication in TCPs will be a crucial issue for all types of users and organizations.

Discussion

User perceptions and reflective practice offer strong support for the benefits of TCP-based social collaboration. TCPs centralized communication, making it visible and persistent, while integrations allowed diverse virtual objects and events to be inserted directly into channels for reference, discussion, and decision making. These affordances strengthened the knowledge-sharing benefits of communication visibility by closing the gap between metaknowledge and situated practice. Similarly, users reported that team coordination and collaborative workflows were aided by context awareness and the contributions of boundary work enabled by communication visibility. In particular, these affordances promoted generative role taking and self-organization within teams. Individuals found it easier to exercise self-initiative based on high levels of context awareness and based on readily available support and feedback from team members on the platform. Social connectivity across functions and social cohesion across the organization were enhanced by more collaborative working styles and opportunities for informal social interaction. Robust affordances for engagement, triggered attending, and media synchronicity allowed individuals and organizations to more closely monitor and manage attention allocation across projects and knowledge conversations. Furthermore, the analysis of user perceptions and practices indicates that these affordances interact in mutually reinforcing ways that amplify the benefits of social collaboration and contribute to greater organizational productivity and innovation.

While previous research has proven highly effective as a guide to mapping the essential dimensions of user experiences in TCP environments, there are two significant issues raised by this study that contribute to new understandings of social collaboration practices. First, the imbrication of communication visibility, team communication, and ICT-based workflows has been shown to support unique styles of collaborative work including technology-enhanced workflows. Second, the extreme flexibility and scalability of collaborative participation and media synchronicity offered by TCPs extends and transforms previous understandings of multitasking and multicommunication practices. The following discussion will attempt to provide an initial theorization of these two issues and frame opportunities for future research.

Communication Visibility and Flexible Routines

The theory of communication visibility was developed by Leonardi (2014) to account for the affordances enabled by ESM technologies such as SNPs. The affordances described by this theory emphasize the knowledge sharing and social networking functions that are characteristic of SNPs. The unique opportunity offered by TCPs is that they integrate communication visibility with capabilities for routine team communication and ICT-based workflows. The most direct effect is that the imbrication of communication visibility and collaborative workflows enhances the role of knowledge creation, collaborative deliberation, and self-reflection both *for* and *in* work:

> A multimodal polysynchronous setting enables such self-questioning to be more than a merely retrospective exercise, since it affords participants more possibilities of encountering various degrees of dialogically generated 'strangeness' in real time, thus requiring reflection in (not merely on) action. (Baralou & Tsoukas, 2015, p. 614)

In this sense, as knowledge sharing becomes integrated more directly into collaborative work processes, it thereby creates new opportunities for reflective understanding that informs thoughtful action, problem solving, and innovation. However, a second and equally important aspect of this shift is that knowledge creation in virtual contexts is amplified and extended through dialogical interactions with not just real and invisible others but also virtual epistemic objects including system events and information flows (Baralou & Tsoukas, 2015). The most radical innovation of TCPs is the way that these technologies extend the effective capacities of organizations, teams, and individuals through automation and integration of diverse external services.

While the various functions of knowledge sharing, social connectivity, team communication, and ICT-based workflows have been supported by independent technologies for some time, the centralization and flexible coordination of these functions through TCPs enables unprecedented opportunities for social collaboration. Before TCPs, the type of workflows described in this study could only be achieved through the development of disciplined collaborative procedures that manually coordinated processes and communicated information across multiple technological platforms, knowledge sets, and disciplinary or departmental contexts. More often than not,

previous research has found that collaborative workflows are not highly disciplined but rather rely on work-arounds and communication through fragile, informal social networks with individual team members facilitating crucial steps in work processes and acting as the sole communication node between organizational boundaries (Cross et al., 2000). Although the extreme flexibility of TCP platforms does require the development of organization and team-specific routines and workflows, the key difference is that these routines can be integrated, automated, and become native features of an organization's collaboration and communication environment. TCPs have the potential to allow collaboration practices that were once difficult and exemplary to become normal and routine.

The model employed by TCPs is one in which organizations and users may choose among diverse third-party services dedicated to specific functions while still managing communication, collaboration, and information sharing processes from the TCP environment. It points to a model in which organizations rely on ecologies of specialized and interconnected media and ICT technologies as opposed to employing a series of all-in-one solutions. Practically speaking, this means that TCPs will gradually become not just a bundle of media capabilities but a bundle of interconnected media and information services. The unique workflows and collaborative routines developed by organizations in different industries may become quite diverse as these services and their capabilities continue to evolve. One essential area of future research will be qualitative studies that can address how adoption of TCPs changes the way teams and organizations get work done and how different organizations and industries leverage TCPs to support customized workflows that meet unique needs.

Multicommunication and Polysynchronicity

The behavioral patterns enabled by TCPs also complicate previous research on multicommunication and media synchronicity. In their seminal study, Reinsch et al. (2008) excluded group interactions and parallel conversations hosted by virtual systems in order to focus solely on conversations between individuals. However, technologies that support communication visibility—including SNPs and TCPs—enable a default communication style based precisely on group interactions and parallel conversations. In these contexts, the intensity of multicommunication is mediated by the impact of having an open-ended number of contributors for any given conversation. On one hand, communication visibility and additional communication participants may add intensity by complicating messaging contexts. On the other hand, collaborative communication also enables generative role taking in which any team member may address a question or need based on availability and/or expertise. Thus, the distributed responsibility enabled by communication visibility may support both more responsive communication and more efficient allocation of team attention.

Similarly, the granular options for organizing groups and channels leads to new opportunities for compartmentalizing conversations and topics. While the total number of conversations and topics available to an individual communicator may increase, effective compartmentalization can support more efficient focus switching and

information discovery. Based on affordances for triggered attending, TCP users may also narrow their focus as needed by engaging fewer groups and channels while remaining available for on-demand or just-in-time participation in response to self-managed notifications or mentions from team members. Finally, in TPCs, communication intensity is mediated by a spectrum of scalable options for media synchronicity and modality including asynchronous messaging, synchronous messaging, screen-sharing, videoconferencing, and real-time virtual collaboration through ICTs. Across all of these affordances, the behavioral patterns described by TCP users are characterized by flexible and responsive approaches to multitasking, multicommunication, and attention allocation.

Reinsch et al. (2008) situated multicommunication as an extension of the earlier concept of polychronicity. Polychronicity describes the general preference for engaging in multiple tasks or events at the same time across the levels of tasks, project, and teams (Bluedorn, Kalliath, Strube, & Martin, 1999; Mohammed & Harrison, 2013). However, the emergent practices of TCP users cannot be adequately described by the concepts of multicommunication and polychronicity alone. Previous scholars have used the term polysynchronous as a general term to describe virtual contexts in which multiple channels and levels of synchronicity overlap (Baralou & Tsoukas, 2015). Based on the analysis of this study, I argue for using the term *polysynchronicity* as a parallel concept to polychronicity. Polysynchronicity characterizes a preference for flexible variability and dynamic scaling of communication synchronicity—the degree to which communication behavior is shared and coordinated. In technological contexts that enable polysynchronicity, multicommunication intensity would be mediated by the following factors:

- Variable numbers of conversations, topics, and participants
- Variable levels of compartmentalization or organization
- Variable levels of engagement, presence, and triggered attendance across concurrent conversations
- Variable levels of synchronicity and media modality

More significantly, polysynchronicity would describe affordances and preferences for exercising flexible and responsive scaling across all of these dimensions. TCP users demonstrated both an awareness of the challenges of cognitive overload and the use of proactive strategies to dynamically balance the demands of attention allocation for each of these factors. Just as TCPs enable collaboration by amplifying affordances for communication visibility, TCPs also enable attention allocation by amplifying affordances for polysynchronicity.

One of the most pressing questions for future research is whether or not organizations and individuals can be effective at balancing the benefits and drawbacks of communication visibility and multicommunication in TCPs. These questions could ideally be addressed through quantitative studies correlating productivity and TCP use. Another important opportunity will be studying how overall media channel usage patterns change in organizations that adopt TCPs. This could include exploration of how TCP adoption affects the role of face-to-face communication and traditional meetings.

Conclusion

The results of this study show that TCPs support real and meaningful changes in how individuals and organizations communicate and collaborate. The integration of media capabilities for communication visibility, routine team communication, and ICT-enabled workflows has created new affordances and promoted new practices of social collaboration. However, just as multitasking and multicommunication practices have been shown to have a curvilinear relationship to productivity, the impact of these platforms on attention allocation may prove ambiguous. Enabling more accessible and situated approaches to information sharing and social collaboration may also exacerbate the challenges of information and cognitive overload. Yet these technologies also enable more granular and transparent management of both organizational and individual attention allocation. Ultimately, the extreme flexibility of these platforms means that the adaptive practices of organizations and individual users may be the crucial factor that determines their overall productivity and viability for broader adoption in the professional world.

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Author Biography

Abram Anders is an assistant professor of business communication in the Labovitz School of Business and Economics at the University of Minnesota Duluth. He studies business and professional communication with an emphasis on social collaboration and technology-enhanced learning. His research interests also include cultural and literary studies, ethics, rhetoric, and theory.