

**SUPPORTING AND TRANSFORMING LEADERSHIP
IN ONLINE CREATIVE COLLABORATION**

A Dissertation
Presented to
The Academic Faculty

by

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In Partial Fulfillment
of the Requirements for the Degree
Doctor of Philosophy in the
School of Interactive Computing

Georgia Institute of Technology
December 2012

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**SUPPORTING AND TRANSFORMING LEADERSHIP
IN ONLINE CREATIVE COLLABORATION**

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What I cannot create, I do not understand.

—Richard Feynman

ACKNOWLEDGEMENTS

Writing this dissertation about creative collaboration was itself a creative collaboration. Thanks to an amazing group of colleagues, friends, and family, it was also a successful one. I am deeply grateful to the following people, and many others not specifically named, without whom the work described in the following pages would not have been possible.

First, I'd like to thank my family, especially my parents Bob and Melanie, my brother Rob, and my sister Kiersten. Their endless reserves of enthusiasm helped to replenish my own when it mattered most.

My advisor, Amy Bruckman, gave me a seat in her lab before we had ever met in person and soon became my trusted mentor. She embodies many of the qualities I admire most in a scholar, such as always putting her students first, valuing teaching and research equally, and exemplifying the highest standards for ethical behavior and research excellence.

My dissertation committee, Scott Counts, Ellen Do, Eric Gilbert, and Wendy Kellogg, kept me focused on the questions that mattered when my research took unexpected turns. They challenged me to do my best work, and were always quick to provide feedback and encouragement to help me meet that challenge.

Members of the ELC Lab, especially Jill Dimond, Betsy DiSalvo, Casey Fiesler, Andrea Forte, and Sarita Yardi, were constantly available with a sympathetic ear or clever research insights, whichever was needed on that particular day. They kept me sane.

The Pipeline team, especially Boris de Souza, Chris Howse, and Kevin Ziegler, wielded their formidable talents as designers, developers, and researchers to improve my ideas and bring them to life. They smoothed the rough edges of my approach to project management with patience and good humor.

My co-authors Kelly Caine and Nick Diakopoulos helped me work through some of the most important ideas in this dissertation and present them to the broader research community. Our wonderfully vibrant discussions and their fresh perspectives pushed the boundaries of my research far

beyond anywhere I could go alone.

The administrative and technical staff at Georgia Tech, especially Randy Carpenter, Eden Chandler, Monica Ross, and Don Schoner, made my life in graduate school easier in countless ways. They freed me to worry about my research while they worried about everything else.

The Newgrounds community allowed me to mine its rich wealth of creative practices and outputs. I am especially grateful to my interview participants for sharing their experiences, and the Pipeline beta testers for putting up with the frustrations of an early software prototype. Tom Fulp and the Newgrounds staff found time to support my Pipeline efforts while simultaneously completing their own extensive redesign.

I also wish to acknowledge two sources of generous financial support, a CreativeIT award from the U.S. National Science Foundation, and a Foley Scholarship awarded to me by the GVVU Center at Georgia Tech in 2011. They provided a flexibility that few graduate students could hope for, allowing me to pursue the research that deeply engaged my passions.

Finally, my friends and colleagues at Georgia Tech and in Atlanta gave me energy and inspiration when I needed it, and helped me relax when I didn't. Beyond those already mentioned, I want to thank Emma and Layla Hetherington, Eugene Medynskiy, Andrew Miller, Tom Smyth, and Lana Yarosh. I hope I can give to all of you as much as you have given me.

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SUMMARY

Online creative collaboration is challenging our basic assumptions about how people can create together. Volunteers from around the world who meet and communicate over the Internet have written the world's largest encyclopedia, developed market-leading software products, solved important open problems in mathematics, and produced award-winning films, among many examples. A growing body of research refutes the popular myth that these projects succeed through "self-organization" and instead points to the critical importance of effective leadership. Yet, we know little about what these leaders actually do, the challenges they must manage, and how technology supports or hinders their efforts.

In this dissertation, I investigated the role of leadership in online creative collaboration. I first conducted two empirical studies of existing leadership practices, focusing on the domain of online, collaborative animation projects called "collabs." In the first study, I identified the major challenges faced by collab leaders. In the second study, I identified leader traits and behaviors correlated with success. These initial findings suggested that many collab leaders, overburdened and lacking adequate technological support, respond by attempting less ambitious projects and adopting centralized leadership styles. Despite these efforts, leaders frequently become overburdened, and more than 80% of collabs fail.

To ease the burden on leaders and encourage more complex, successful projects, I led the development of a web-based, open-source software tool called Pipeline. Pipeline can support leadership by reinforcing a traditional, top-down approach, or transform leadership by redistributing it across many members of a group. This latter approach relies on social processes, rather than technical constraints, to guide behavior.

I evaluated Pipeline's ability to effectively support and transform leadership through a detailed case study of Holiday Flood, a six-week collaboration involving nearly 30 artists from around the world. The case study showed that formal leaders remained influential and Pipeline supported their traditional, centralized approach. However, there was also evidence that Pipeline transformed some

leadership behaviors, such as clarifying, informing, and monitoring, by redistributing them beyond the project's formal leaders. The result was a significantly more ambitious project which attained its goals and earned high praise from the community.

The main contributions of this dissertation include: (1) a rich description of existing leadership practices in online creative collaboration; (2) the development of redistributed leadership as a theoretical framework for analyzing the relationship between leadership and technological support; (3) design implications for supporting and transform leadership; (4) a case study illustrating how technology can support and transform leadership in the real world; and (5) the Pipeline collaboration tool itself, released as open-source software.

CHAPTER I

INTRODUCTION

1.1 Positioning Online Creative Collaboration

People are using the Internet to collaborate and create in ways never before possible. They are geographically distributed, sometimes located in countries on opposite ends of the world, yet technology helps them find each other and connect. Some are professionals and experts, while others are amateurs or novices. Yet new production models help them to identify and select tasks that match their expertise, interests, and available time, allowing almost anyone to make a meaningful contribution [11]. Many are volunteers with no expectation of being paid for their work, yet they are motivated by other, sometimes more powerful reasons: affinities for their communities, the desire to learn, anticipated reciprocity, and even altruism [91, 158]. These motivations are strengthened by new copyright licenses that encourage freedom, sharing, and remixing [96].

In some cases, the results of these new collaboration models are profound and world-changing. One of the best-known examples is Wikipedia, the free online encyclopedia which is also the world's largest encyclopedia. Since its formation in 2001, the Wikipedia community has created nearly 4 million articles just in English and millions more in the 270+ languages it supports.¹ Most of this content has been contributed by thousands of volunteer editors living throughout the world. While anyone can edit most articles, even anonymously, this openness has worked surprisingly well. Wikipedia articles have been shown to be comparable to their commercially produced, expert-penned competitors, both in terms of accuracy [61, 123] and, to a lesser extent, style and tone [123, 45].

Another high profile example is the open-source software (OSS) movement. Most OSS developers are geographically dispersed, but they come together online to volunteer their time and effort towards making new, high-quality software. Their programming work is often supported by an even larger community of users who report bugs and request features. As with Wikipedia, any content

¹As of June 2012.

created through OSS is made freely available through “copyleft” licenses such as the GNU GPL and those developed by the Creative Commons. Success stories involving OSS are numerous. An estimated 20 million people use Ubuntu, an open-source operating system based on Linux [83]. More than 60% of all websites run on the open-source Apache HTTP Server [111] and a quarter of all people who browse the web do so with the open-source Mozilla Firefox browser [32]. One out of every five new websites, more than 70 million in total, run on the open-source blogging platform WordPress [109, 156]. Many other popular software products are written in open-source programming languages like PHP and Perl.

The success of Wikipedia and OSS challenge our understandings of how and why work gets done. Correspondingly, they have drawn significant attention from researchers, who have sought to explain how and why they succeed, and relate them to theories of offline human behavior. Some scholars have suggested that these projects exemplify an entirely new way of working together. Benkler [11], for example, argues that Wikipedia and OSS represent a “third mode” of economic production, *commons-based peer production*, which joins the much older and more familiar models of firms and markets. Peer production is distinct in that “groups of individuals successfully collaborate on large-scale projects following a diverse cluster of motivational drives and social signals, rather than either market prices or managerial commands” [11].

Benkler’s theorizing of peer production has been a cornerstone of scholarship in this area, but recent empirical research complicates the picture. There is increasing evidence that although self-selection for tasks is a central feature of these projects, management and leadership are still required to help coordinate these efforts. While early writing on Wikipedia and OSS made use of explanations like “self-organization” and “the invisible hand” [151], careful empirical studies have shed light on the inner workings of these communities. What they reveal, despite a popular rhetoric of democracy and egalitarianism [155], are some surprisingly elaborate organizational structures. As the English-language Wikipedia has grown in size and complexity and attracted more users over the years, it has simultaneously developed a deep hierarchy of leadership roles, headed by co-founder Jimmy Wales [56]. Similarly, many successful OSS projects are led by “benevolent dictators” like Linux’s Linus Torvalds and sub-leaders with specialized roles and distinct permissions [151, 108]. The available evidence suggests that leaders are essential to the success of their projects, yet the

ways in which they practice leadership can differ dramatically from their counterparts in traditional organizations. One of the key distinctions is the way in which leaders must carefully exercise their authority to help the group achieve its goals, while avoiding alienating a community of intrinsically motivated volunteers who are free to quit (and take the project with them) at any time [121]. “Managerial commands” [11] may not be well-received, but suggestions, guidance, and creative vision are necessary for complex projects to succeed and sustain themselves.

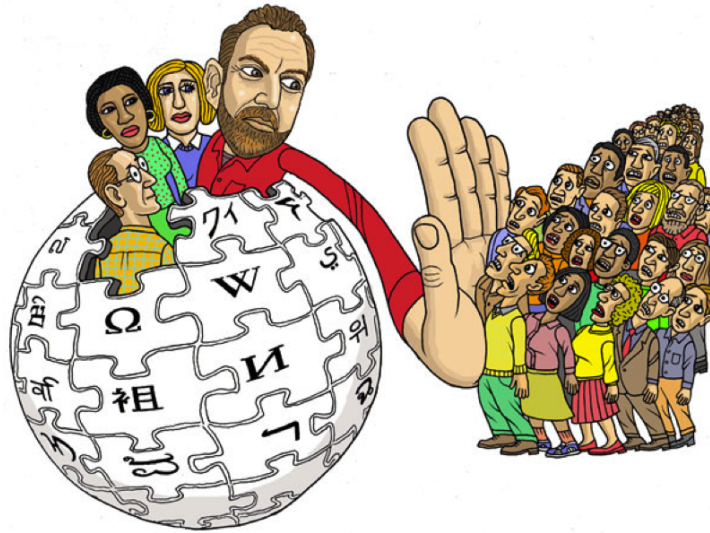


Figure 1: One artist’s interpretation of Wikipedia leadership (from [155])

Benkler also argues that an open digital commons, which enables cheap, free, and easy sharing of information among large numbers of people, is a critical element of successful peer production. He writes, “It is the freedom to interact with resources and projects without seeking anyone’s permission that marks commons-based production generally, and it is also that freedom that underlies the particular efficiencies of peer production” [11]. While this is likely true of the projects he discusses (primarily Wikipedia and OSS), there are many other examples of large-scale online collaboration which lack a commons and do not espouse a free, open-source philosophy. Some domains, like encyclopedia writing and certain types of software development, seem to lend themselves to open-source, commons-based collaboration. However, in many artistic and expression-oriented domains, open-source philosophies and commons-based production are antithetical to the values of the community. Participants in these communities often view themselves as artists with a strong sense of ownership towards their work. Seeing their personal expressions modified by others, even in the

context of a collaboration, is viewed as a violation of etiquette at best and vandalism at worst. Additionally, their desire to maintain secrecy during production and publicly release work only when it is complete and polished precludes an open, commons-based collaboration. These counterexamples are not yet well understood. While Wikipedia and OSS have been heavily studied, other domains have seen little research attention.

Taken together, the central importance of leadership and the existence of large-scale online collaboration which is not open-source suggests a compelling opportunity for additional empirical research and theory refinement. Benkler's notion of commons-based peer production is a powerful analytical tool for certain types of production models, but a broader conceptualization of online collaboration can better accommodate cross-domain comparisons and help explain the emergence of leadership and complex governance structures. To this end, I propose *online creative collaboration* as an organizing concept for this dissertation. I define online creative collaboration as *the activity of people connecting and coordinating primarily over computer-mediated communication with the purpose of working together to create new artifacts*. This definition encompasses commons-based peer production, including the examples of Wikipedia and OSS projects, as one of many forms of online creative collaboration. What it does not include is equally important:

- Offline creative collaboration (e.g. face-to-face group work)
- Online collaboration which does not seek to create new artifacts (e.g. *World of Warcraft* guild raids)
- Online creativity which is not directly collaborative (e.g. the huge repositories of content on YouTube or Flickr)
- Online creative collaboration whose members meet through, and work for, a traditional organization (e.g. distributed teams in a corporation)

All of these phenomena are fascinating and worthy of study, but while they may contribute valuable background information to my research, I do not include them in my definition of online creative collaboration. My hope in circumscribing these areas is to provide a broad enough definition to enable meaningful cross-domain comparisons and contrasts while also keeping the scope of the discussion—and this dissertation—manageable.

1.2 Research Goals

The primary goal of my dissertation is to investigate how the design of technology can impede, support, and even transform the nature of leadership in online creative collaboration. This goal is motivated by my belief that online creative collaboration is a broad phenomenon with vast potential to contribute to many domains of human creativity. We have witnessed the remarkable success of projects like Wikipedia and OSS and they continue to teach us a great deal. These projects may prove to be two pioneering examples of a more productive, inclusive, and fair way of working together that touches upon nearly every aspect of everyday life.² High-quality artifacts, ranging from buildings to novels to medicines, could be created in this way through the efforts of self-motivated volunteers. Of course, not all projects must result in this kind of “big C” creativity, which produces something the world has never seen before [82, 131]. Smaller, more personally meaningful projects offer a different kind of value through the learning experiences and self-efficacy they promote. Along these lines, Shneiderman [131] argues that software tools can foster *mega-creativity*, enabling “more people to be more creative more of the time.” Online creative collaboration holds the promise to make long strides in this direction, but first we must understand more about the phenomenon’s relative strengths and limitations.

Our present understanding of online creative collaboration’s potential is limited in at least two major ways. First, despite an immense body of research on leadership in many disciplines, including management, organizational behavior, sociology, political science, psychology, and others, spanning more than a century, little research has examined leadership in online creative collaboration. What few empirical studies do focus on leadership in this context rarely relate their findings to the vast literature on traditional leadership, instead contributing to a silo of research that is, unfortunately, somewhat disconnected. While these bottom-up, HCI- and CSCW-focused studies are valuable, they could be even more so if they engaged with significant theories and discoveries in other disciplines.

Second, as suggested above, the existing scholarship on online creative collaboration is almost

²For a more critical view, see Lanier [95]: “Let’s suppose that back in the 1980s I had said, ‘In a quarter century, when the digital revolution has made great progress and computer chips are *millions* of times faster than they are now, humanity will finally win the prize of being able to write a new encyclopedia and a new version of UNIX!’ It would have sounded utterly pathetic.”

exclusively directed at two classes of examples: Wikipedia (and other prominent wikis) and open-source software (particularly Linux-related projects). Another way to look at this narrow focus is to observe that of all the possible realms of human creativity practiced online, our understanding of online creative collaboration is largely informed by studying how people write encyclopedia articles and program operating systems. The risk of overgeneralizing these findings is significant, as the discussion of peer production above illustrates. Scholars of offline collaboration, including many in the HCI and CSCW communities, have examined a rich diversity of contexts, moving from a work-centered orientation to the home, play, and beyond, in order to refine their theories of technology use and provide relevant design guidelines. A similar diversity of study contexts is needed to build theories of, and design technologies for, online creative collaboration.

While overgeneralization is a serious concern, research in online creative collaboration more often undergeneralizes, focusing on one domain and avoiding comparisons or contrasts to others that could lead to more general theories of online creative collaboration. For example, the goal of many Wikipedia studies seems to be an improved understanding of Wikipedia *per se*, rather than online creative collaboration as a broader phenomenon. Rarely, studies will compare Wikipedia to another type of wiki or encyclopedia (e.g. [45, 87]). Similarly, OSS research usually leads to implications for OSS development or, less often, software engineering as a more general practice. Certainly, improving the success of Wikipedia and OSS development are worthy goals by themselves, but there is a missed opportunity to transfer these findings to other, less well understood domains and engage with that literature. The challenges of cross-domain comparisons and the overall dearth of this type of work has been recognized as an issue of growing concern among social computing researchers [3].

In my dissertation, I intend to address both of these research gaps. I first conduct several empirical studies of existing leadership practices in online, collaborative animation projects called “collabs.” I then design a new collaboration tool, Pipeline, based on these findings, with the goal of supporting and transforming leadership. Finally, I present a detailed case study of Pipeline’s usage in a six-week artistic collaboration, Holiday Flood.

I address the first research gap, the dearth of research on leadership in online creative collaboration, by explicitly focusing on leadership. In Chapter 2, I review major theories of traditional

leadership in management and organizational behavior, along with (largely empirical) studies of leadership in online creative collaboration. I then integrate theories of distributed leadership, which have their origin in education and management literature, and distributed cognition, which originates in cognitive science and has more recently been adapted for CSCW research. This integrated framework seeks to borrow the relative strengths of both theories to better illuminate the issues surrounding leadership in online creative collaboration. In Chapters 3 and 4, I report on two empirical studies of existing leadership practices in collab production. I show that leaders, being overburdened and lacking adequate technological support, resort to simplifying projects and adopting top-down, authoritarian styles to avoid becoming overwhelmed, yet most collabs still fail. I also identify a set of success factors for online creative collaboration geared towards leader traits and behaviors. In Chapter 5, I introduce Pipeline, a web-based collaboration tool informed by findings and theories presented in previous chapters. It is designed to *support* top-down leadership styles, but also *transform leadership* by redistributing it across the group in a more decentralized manner. In Chapter 6, I present a detailed case study of Holiday Flood, a six-week artistic collaboration organized with Pipeline, showing how the system helped support and transform the efforts of the project's formal leaders. In most of these chapters, I suggest implications for theory and design that center on more effective leadership in online creative collaboration.

To address the second research gap, the narrow domain focus of most studies of online creative collaboration, I conduct my empirical work in domains that have seen little or no research attention in the context of online creative collaboration: the production of movies, games, and artworks. Further, throughout this dissertation, I draw comparisons and contrasts between findings in these domains and the literature on others. In Chapter 2, I draw a distinction between utility-oriented domains and expression-oriented domains, noting that the former (e.g. encyclopedia writing, development of software tools) have seen the vast majority of research attention. I call for more research on expression-oriented domains, such as my studies of collabs, and list a number of other high-profile examples (e.g. *Star Wars Uncut*, *The Johnny Cash Project*) that merit scholarly inquiry. In Chapter 3, I identify four major challenges for collabs which are not shared by Wikipedia/OSS—completion, originality, subjectivity, and ownership—and propose design considerations based on

these themes. In Chapter 4, I compare and contrast success definitions and success factors in collabs versus OSS and propose several broader principles of successful online creative collaboration shared by both. In Chapter 5, I show how the unique requirements of expression-oriented domains like collabs translate into design decisions, such as lightweight, flexible structure to encourage originality, and permissions systems that respect content creators' feelings of ownership. In Chapter 6, I use the case study of the Holiday Flood artistic collaboration to illustrate how some of these features succeeded and opportunities for refinement. While many of these empirical findings and implications have special relevance within expression-oriented domains, the ultimate goal is contributing new data points to the building of more general, cross-domain theories of online creative collaboration.

1.3 Research Questions

To help organize this dissertation and clarify the purpose of each of the studies described above, I propose to address the following four research questions:

RQ1: What are the challenges for leaders in online creative collaboration?

RQ2: What factors contribute to successful online creative collaboration?

RQ3: How can technology be designed to support and transform leadership in online creative collaboration?

RQ4: How can technology be used to support and transform leadership in online creative collaboration?

As an additional organizational tool, Table 1 presents each of these research questions in relationship to the three phases of research in this dissertation (initial empirical work, system design, and system deployment), the details of each study, and the resulting publications, if any.

1.4 Structure of the Dissertation

This section concludes Chapter 1. Chapter 2 presents a literature review, focusing on theories of traditional leadership, empirical studies of leadership in online creative collaboration, and integration of theories of distributed leadership and distributed cognition. I also provide background information on the Newgrounds online community, the site of most of my empirical work, and

Table 1: Overview of work completed toward the dissertation

Phase	RQ	Study Details	Publications
Initial Empirical Work	RQ1	In-depth, qualitative interviews with 17 collab participants, focusing on the challenges for leaders and how they manage those challenges. Major challenges include structuring the project, directing and motivating artists, and integrating the artists' work.	[98, 100]
Initial Empirical Work	RQ2	Mixed-methods study of success factors. Qualitative analysis of interview data from previous study to generate hypotheses for potential success factors. Quantitative analysis of ≈ 900 collab attempts showing the hypotheses generally held true.	[99, 102]
System Design	RQ3	Iterative design of Pipeline, a web-based collaboration tool for supporting and transforming leadership. Describes how design implications from previous studies influenced specific Pipeline features. Summarizes the development process and recruitment strategies.	Under review
System Deployment	RQ4	Detailed case study of Holiday Flood, a successful six-week collaboration organized by ≈ 30 artists from around the world. Uses theories of distributed leadership and distributed cognition to show how Pipeline helped support and transform leadership.	Under review

briefly discuss several high-profile examples of online creative collaboration in expression-oriented domains.

Chapters 3 and 4 report on my initial empirical work studying existing leadership practices. In Chapter 3, I address Research Question 1 with a qualitative study of the challenges for leaders of online, collaborative animation projects (“collabs”). In Chapter 4, I examine the other side of the coin, addressing Research Question 2 by investigating success factors in online creative collaboration. This mixed-methods study combines qualitative analysis of interview data with quantitative analysis of nearly 900 collab attempts.

In Chapter 5, I address Research Question 3 by presenting the design of Pipeline, a web-based tool I developed and launched to help leaders organize more successful and complex online creative collaboration. This chapter also describes by development process and advertising/recruiting techniques.

In Chapter 6, I present a detailed case study of one Pipeline project, Holiday Flood, to address Research Question 4 and show how Pipeline supported and transformed leadership in a successful, complex project. This chapter also discusses how Pipeline was used in some unanticipated ways and opportunities for improvement.

In Chapter 7, I conclude by returning to my four research questions, summarizing the major contributions of the dissertation, and proposing areas for future work in online creative collaboration.

CHAPTER II

BACKGROUND AND RELATED WORK

In this chapter, I provide general background information and review related work on five main topics. First, I introduce Newgrounds, the online animation community that provided the site of most of the fieldwork presented in this dissertation. I discuss the history and design of Newgrounds and review academic research involving the Newgrounds community.

Next, I review two general categories of leadership research. The first, leadership in traditional organizations, is more theory-oriented. I trace the evolution of leadership theory and note a trend towards a more decentralized, distributed conception of leadership. I integrate this distributed leadership model with the theory of distributed cognition to provide a more complete framework for analyzing leadership in online creative collaboration.

The second category of leadership research, focusing on online creative collaboration, is oriented more towards empirical results. It deals mainly with research on open-source software (OSS) and Wikipedia, two examples of online creative collaboration which have seen the majority of scholarly attention. I discuss this research in terms of vertical (top-down) leadership as well as distributed leadership. I also review technological support that has been developed for leaders in these contexts.

In the next section, I discuss the idea of success in online creative collaboration, focusing mainly on OSS research, where success definitions and factors have been explored in some depth.

Finally, to enrich the discussion with examples outside of encyclopedia writing and software development, I review several high-profile examples of online creative collaboration in artistic and entertainment-oriented domains. These projects have not yet received much scholarly attention, but I provide brief summaries and cite relevant journalism to raise awareness of the importance of these under-studied domains.

2.1 *Newgrounds*

Newgrounds¹ is an online community of artists, programmers, and musicians. It is widely considered the oldest and largest online host of animated games and movies created with Adobe Flash, a popular multimedia platform. As of June 2012, Newgrounds boasts more than 2.5 million registered members; 135,000 member-created Flash movies; and 65,000 member-created Flash games. In 2010, *TIME* included Newgrounds in its list of the 50 best websites of the year [142]. The site is operated by a small staff of designers and developers based in suburban Philadelphia, Pennsylvania, with founder Tom Fulp as CEO. During the summer of 2009, I interned with the Newgrounds staff and helped develop collaboration tools for the site.

2.1.1 History

Newgrounds has been credited as one of the first destinations for user-generated content on the Web [40]. It was founded by Tom Fulp in 1995 and began accepting user-submitted Flash movies and games in 2000 [58]. The site has developed an irreverant, controversial reputation due to a series of incidents early in its history, and has maintained that reputation over the years. In 1998, Tom Fulp created an adult-oriented parody of the popular children’s show *Teletubbies*, prompting a lawsuit from the BBC and a dramatic increase in exposure and notoriety for Newgrounds. Following the dot-com bust of the early 2000s, the staff struggled to cover the site’s increasing bandwidth costs and resorted to displaying adult-oriented advertisements. The site gained additional infamy in 2004 when Gary Brolsma posted his “Numa Numa Dance” on Newgrounds [49]. The video shows Brolsma sitting at his computer, dancing and lipsyncing to Romanian electronic dance music. It was widely shared online, at the expense of an embarrassed Brolsma, and became known as one of the Internet’s first “viral videos” [124]. Newgrounds has also attracted media and legal attention over the years for hosting controversial, member-created games in which players could participate in school shootings, suicide bombings, and other violent events [58].

¹<http://www.newgrounds.com/>

2.1.2 Design

The website has gone through a number of major redesigns, most recently in early 2012 [58]. The current site design is divided into several major sections (see Figure 2). Flash animations can be viewed in the Games or Movies Portals, depending on the type. The Audio portal contains more than 300,000 member-created songs and voice recordings. Newgrounds also features an Art Portal, where members have shared more than 40,000 illustrations, paintings, and other forms of (non-photographic) still imagery. Other sections of the site include curated lists of submissions called Collections; an online store selling merchandise featuring the work of Newgrounds artists; and the Newgrounds BBS, a highly active set of discussion forums for the community. The latest redesign also introduced the “project system,” a set of basic collaboration tools to help members work together on projects, share advertising revenue, and receive proper credit.



Figure 2: The Newgrounds home page, June 2012

Newgrounds is also known for its complex and unusual voting system. When a piece of content

is submitted to Newgrounds, it goes “Under Judgement,” meaning that it must pass a short evaluation period in order to be accepted for hosting on the site. Any member can vote to “protect” (approve) or “blam” (reject) submissions that are under judgement. If the content does not receive enough positive votes, it is rejected from the site. The Newgrounds system tracks members’ voting records and rewards certain types of voting with increased influence. The system gives more influence to members whose votes consistently match the final decision. For example, members who tend to give low votes to submissions that are blammed, and high votes to submissions that are ultimately protected, are rewarded with more powerful votes. Submissions that are accepted for hosting can receive additional ratings and detailed reviews. The more content a member views and rates, the more weight his or her vote carries.

2.1.3 Research

Journalists have contributed the majority of writing about Newgrounds (as seen in the above citations), but there is also a small body of scholarly literature. Common topics of interest in this scholarship include new forms of creativity and the role of gender and masculinity. Baldwin et al. [5] discuss Newgrounds movies and games as examples of “Flashimation,” a new development in the history of animation, and identify visual characteristics such as the use of vector graphics, automatic interpolation of keyframes (known as “tweening”), and symbols. Bardzell [6] discusses both the style and content of Newgrounds animations as examples of creativity in amateur multimedia. Paolillo et al. [116, 115] identify examples of emergent genres of multimedia in the Newgrounds community by analyzing the relationship between members’ social networks and the types of content they create. Wei [153, 152] takes a political economy approach to studying Newgrounds and focuses on the shifting definitions of, and intersections between, producers and consumers of participatory media.

While the above work emphasizes the novelty and democratization of creative practices in Newgrounds, other work speaks to the reinforcement of traditional power structures. Much of this research draws from critical theory. Van Buren [144] analyzes racist animations created on Newgrounds following the events of September 11, 2001, and situates them in the history of racial stereotyping in animations. Warren et al. [149] demonstrate quantitatively how the Newgrounds

community discriminates against animations created by women, newcomers, and older members. Kendall [84, 85] makes a similar argument from a qualitative perspective, focusing on the dominance of heteronormative masculine perspectives within the Newgrounds community and the animations they produce.

All of this research provides valuable background information and context to my work in this dissertation. It generally focuses on attributes of the Newgrounds community or the content it produces. None of this work discusses collaborative projects on Newgrounds, with the exception of Paolillo et al. [116, 115], who briefly mention it in the context of genre emergence. In contrast, my interest is in delving deeply into the processes and outcomes of online creative collaboration in communities like Newgrounds, focusing on the role of leadership and how technology helps or hinders it.

2.2 Leadership in Traditional Organizations

Leadership has attracted attention from researchers in a huge variety of disciplines, including management, organizational behavior, sociology, social psychology, economics, political science, and history. An exhaustive review of this research is beyond the scope of my dissertation. In this section, I review major theoretical trends in the study of leadership, drawing mostly on the literature in management and organizational behavior, two fields which make up a substantial proportion of contemporary leadership research. These fields generally examine leadership in the context of traditional organizations, such as corporations, government agencies, and non-profit groups, though some work also looks at virtual organizations (e.g. [113, 130]). I found this research to be particularly relevant to my dissertation work because it provides a valuable set of tools for analyzing leadership at the group and organization level. Leadership theories from other disciplines, such as the societal-level approaches offered by sociology (e.g. Weberian, institutional, Neo-Marxist, relational [67]), provide useful background.

In the following sections, I provide brief summaries of theoretical approaches in organizational behavior and management, drawing extensively on reviews by Bass [8], Glynn and DeJordy [62], and Yukl [160]. These references can provide a more complete overview.

2.2.1 Vertical Leadership

2.2.1.1 Trait Approaches

Early research on leadership focused on the traits possessed by individuals shown to be effective leaders [8, 62, 160]. Proponents of this approach argued that successful leaders were “born, not made” [62], and sought to uncover the characteristics associated with such leaders. These traits included many types of special personality attributes, including skills, abilities, and even physical appearance [62]. For example, one meta-analysis found traits such as technical skills, friendliness, and emotional balance to be associated with effective leaders [8].

This approach also became known as the “Great Man” theory of leadership [62, 8]. Their “greatness” was derived from the idea that their success was heroic or mythical and somehow intertwined with fate or destiny. Also, in earlier research, the leaders who were studied were almost exclusively men [62].

Methodologically, most research following the trait approach involved correlating attributes of leaders with successful outcomes [160]. However, researchers struggled to find correlations that were common to many leadership contexts, and also to explain why not all individuals with these traits did not become leaders. This led to an overall widening in research focus to include both traits and behaviors [62].

2.2.1.2 Behavioral Approaches

The behavioral approach in leadership research centered on understanding exactly what leaders do and how it makes them more or less effective [62, 160]. The key concept in this approach held that leaders are successful because they exhibit certain types of behaviors. By identifying and classifying these behaviors, researchers could solidify our understanding of effective leadership. Traditionally, the behavioral approach included an assumption that these behaviors would apply equally well (or poorly) when performed by any leader, regardless of personal characteristics, and in any setting.

Yukl [160] categorizes behavioral approaches to leadership into two broad research areas. The first area is primarily concerned with understanding the specifics of what leaders do, including their responsibilities and formal roles. The research methods most frequently used in this area are descriptive, including observation, interviews, and diaries.

The second research area focuses on comparing and contrasting successful leaders with unsuccessful ones. The majority of this research has been conducted via surveys, including a host of validated questionnaires for describing leadership behaviors. Studies employing experimental methods are uncommon in this area of research [160].

Another way to categorize behavioral approaches to leadership research is to separate *task-oriented* theories from *people-oriented* theories [62]. Task-oriented theories focus on *initiating structure*, how leaders organize and structure the work for themselves and their followers. For example, in their study of Trauma Resuscitation Units, Klein et al. [89] show how leaders engage in *functional team leadership* by structuring and directing team member activities, monitoring the team, intervening in the team's work, and teaching team members. People-oriented theories place the emphasis on *consideration*, the personal relationships between leaders and followers. These theories suggest that effective leaders “nurture warm, friendly working relationships” and “cultivate mutual trust and respect” [62].

Like the trait approach before it, researchers encountered problems with the behavioral approach, particularly in trying to identify leadership behaviors that applied equally well to a variety of contexts [62, 160]. This led to the development of several new approaches, including the power–influence approach and the situational approach, that accounted for the effects of social settings and environments on leadership practice.

2.2.1.3 Power–Influence Approaches

The power–influence approach to leadership research is concerned with the ways that leaders can use power to influence others [160, 8]. Specifically, it “seeks to explain leadership effectiveness in terms of the amount and type of power possessed by a leader and how it is exercised” [160]. It is also interested in ways that power can be gained and given up. The scope of people influenced by power can be broadly conceived, including other leaders, followers, organizations, and external entities [160].

This research approach is closely related to behavioral approaches, but it places the emphasis on how behaviors can exert or transfer power, primarily from leaders to followers. The typical

methodological approach is survey-based, but researchers have also conducted experiments comparing different distributions of power (e.g. autocratic versus participative). Other scholarship uses descriptive methods to illustrate how leaders can empower followers through delegation or consultation [160].

2.2.1.4 *Situational Approaches*

Situational approaches to leadership research embrace the idea that effective leadership depends on the situation [160, 8]. Situational variables that may affect the leader's response could include the environment, the qualities of the followers, or the work itself. Yukl [160] divides the situational approaches into two areas. One area of research looks at how leadership behavior is affected by different types of circumstances, and is less interested in what makes leaders effective. Instead, the goal is to conduct comparative studies that shed light on what aspects of leadership behavior change or remain constant across different organizations, cultures, task complexities, etc. [160].

The second area of research is also known as *contingency theories* of leadership [8, 62, 160]. They assert that universal rules of leadership effectiveness are unobtainable. Some behaviors or traits may work well for leaders in one situation, but fail in a different situation. Rather, effective leaders are expected to be able to call upon a range of possible behaviors depending on what is appropriate for the situation. The focus then shifts to understanding how different types of situations make specific leadership behaviors or traits more or less effective [160]. An example is path-goal theory, which suggests that effective leaders help orient followers towards appropriate goals and remove obstacles to achieving those goals [75]. Path-goal theory identifies four styles of leadership (directive, supportive, participative, achievement-oriented) and aligns them with different work settings and group characteristics [75].

2.2.1.5 *Integrative Approaches*

Researchers have sought to integrate two or more of the aforementioned approaches and develop more comprehensive theories. One commonality of these integrative approaches is that most “treat leadership as a change process and the leader as a primary catalyst of change” [62]. Another commonality is that most integrative approaches consider the perceptions of followers as a crucial variable [160].

One of the best-known integrative theories of leadership is Bass's conceptualization of *transactional and transformational leadership* [8, 62, 160]. These are not mutually exclusive, but transactional leadership is viewed as more instrumental or pragmatic, rewarding or punishing members to reinforce desired outcomes. In contrast, leaders who are transformational seek to inspire and excite their followers through techniques like charisma and intellectual stimulation.

Another well-known integrative theory is *charismatic leadership* [8, 62, 160]. It was first introduced by Weber as a contrast to formal authority or tradition, but has since inspired several variant theories [67, 160]. Generally, charismatic leadership holds that leaders can possess certain characteristics which have the power to influence followers in transformative ways. While Weber originally saw charismatic leadership arising out of times of social crisis, more recent theories assert that it is possible even within traditional organizations. Although, as mentioned above, charisma is a key ingredient of transformational leadership, Bass differentiates the two theories by noting that transformational leaders strive to empower followers, while followers of charismatic leaders often remain dependent and weak [160, 8].

While all of these theories and models of leadership vary in their emphases, one commonality they share is the assumption of vertical or centralized leadership. In these models, the leader is formally appointed or "legitimate" to his or her role and rarely shares his or her authority with others. In the following section, I review alternative theories of leadership which do not assume a strong leader with centralized authority.

2.2.2 Distributed Leadership

A growing body of research has challenged the premise of a "heroic" individual leader and instead argued that leadership is often distributed across members of a group [118, 15]. This research has developed in parallel with theories of vertical leadership and encompasses nearly 80 years of research under many names, including co-leadership (1950s), emergent leadership (1960s), participative decision making (1970s), self-leadership (1980s), and shared cognition (1990s) [118]. Beginning in the 1990s, several leadership scholars sought to integrate and further develop this literature into a coherent body of knowledge. Some of them were influenced by the development of distributed cognition and activity theory around the same time. The result became known as *distributed leadership*

[140] (or *shared leadership* [118]). Distributed leadership is not a single theory or model but rather an emerging research topic informed by a rich history of theoretical and empirical research. Since the mid-1990s, a community of scholars in management, organizational behavior, and education has coalesced around distributed leadership and sought to better understand its potential and limitations.

Distributed leadership differs sharply from traditional theories of leadership, which generally assume vertical or top-down leaders exerting influence on followers. Pearce and Conger [118] explain:

“The key distinction between shared leadership and traditional models of leadership is that the influence process involves more than just downward influence on subordinates by an appointed or elected leaders . . . Rather, leadership is broadly distributed among a set of individuals instead of centralized in [the] hands of a single individual who acts in the role of a superior.”

Distributed leadership decouples leadership roles from leadership behaviors, proposing that group members without formal or “legitimate” leadership status can and do act as leaders: “rather than role or position . . . [i]t is the way in which leading is enacted in the performance of tasks that is important” [140]. The focus then shifts to understanding how, why, and when certain members perform certain leadership behaviors, and the relationship between configurations of distributed leadership and effectiveness. Although distributed leadership originally developed in contrast to vertical leadership, more recent work views these concepts as extremes on a continuum [66].

Most research under the DL banner has been conducted by management, organizational behavior, or education researchers and focuses on traditional organizations, such as schools or healthcare corporations [15]. Computer-mediated contexts have not yet received much attention from DL scholars (see Section 2.3.2, below, for an exception), and theorizing about the role of technology in fostering or hindering distributed leadership is almost completely absent from this literature. To address this gap, I propose integrating elements of distributed cognition with distributed leadership. In the following sections, I briefly review distributed cognition theory and then describe my approach for integrating it with distributed leadership.

2.2.2.1 *Distributed Cognition*

Distributed cognition (DCog) is a theory about cognition “in the wild”; i.e., how information is gathered and processed in the real world [77]. It asserts that cognition is a social, embodied process, and cannot be divorced from the culture in which it is situated. The theory considers systems of functional relationships between components, which can include individuals, groups, tools, computers, and other elements, and is chiefly concerned with how information moves between them, and over time.

Distributed cognition’s origins lie in cognitive science, as a response to a prevailing school of thought holding that cognition takes place only inside the human brain. Hollan et al. [73] argued that distributed cognition could also serve as a new foundation for HCI research and design. Halverson [69] analyzed the utility of distributed cognition in the context of CSCW, comparing it to activity theory, and identified some key advantages of distributed cognition. Distributed cognition is flexible, allowing the unit of analysis to be determined by the phenomenon, and including both people and artifacts in analyses without privileging either. Distributed cognition is also highly data-driven and presents data in a way that is convenient for informing system design.

These attributes make distributed cognition a valuable theory for understanding collaborative processes when a large proportion of communication is mediated, such as in online communities. Recently, scholars have begun to think about online creative collaboration, such as Wikipedia, in terms of distributed cognition. For example, Geiger and Ribes [60] analyzed vandalism detection on Wikipedia—a system of vandals, vandal fighters, and software tools—and argued that non-human agents such as vandalism-detection bots occupy significant social roles.

2.2.2.2 *Integrating Distributed Leadership and Distributed Cognition*

DL and DCog originated in different disciplines and have generally been considered separately. I suggest that combining elements from both theories can offer new insights into the design and study of social computing systems.

DL and DCog share some core concepts but there are notable differences as well. One similarity is that both theories assume a unit of analysis that is dependent on context, dynamically reconfigurable, and informed by empirical data. For DCog, the unit of analysis is a cognitive process and it

is “delimited by the functional relationships among the elements that participate in it” [73]. For DL, the unit of analysis is the activity of leadership, which is composed of leadership behaviors that can be performed by any member of a group. DCog and DL are also similar in that both seek to broaden the unit of analysis beyond the individual. DL “does not privilege the work of particular individuals or categories of persons, nor is there a presumption about which individual’s behavior carries more weight with colleagues” [65]. It also “allows for the possibility that all organization members may be leaders at some stage” [65]. Similarly, DCog “does not privilege the individual” [69] and holds that cognitive processes can be “distributed across members of a social group” [73].

DCog differs from DL in that it allows for cognitive processes to be distributed across artifacts and time as well as people. Consequently, it has proven especially applicable for analyzing systems that include a substantial technological component [69, 73]. DL remains focused on people, and though it acknowledges that leadership can change over time [65], it does not account for the role of non-human systems in leadership. Researchers have also established DCog as a valuable source of design considerations for new systems (e.g. [14]). While DL may also make valuable contributions to system design, I were unable to find any examples of such attempts.

On the other hand, because DL is more human-centered than DCog, it is better suited for providing insight into why the human elements of the system behave the ways they do. DL studies typically involve in-depth, phenomenological interviews with leaders that explore both the rationale behind decisions as well as their practical effects. This includes, for example, the role of power and influence, though this is still a nascent area of research [66]. DL studies have also sought to identify different patterns of leadership and understand the sociocultural forces that created them (e.g. [41, 15]). Because DCog is concerned mainly with functional relationships among elements, it is only able to account for the externally observable consequences of emotions, motivations, etc. experienced by individuals within the system [69].

In summary, both DL and DCog assume a unit of analysis that is dependent on context, informed by empirical data, changing over time, and broader than the individual. They differ in that DL is more human-centered, providing greater insight into the “whys” of human behavior in a system, while DCog, which includes non-human artifacts in its analysis, is better equipped to provide design implications. I propose that an integrated theory combining the strengths of DCog and DL can bring

a valuable new perspective to social computing research and design.

2.3 *Leadership in Online Creative Collaboration*

2.3.1 Vertical Leadership

The most prominent leadership position in many forms of online creative collaboration is that of the project leader. Crowston et al. [31] note that the duties of most open-source software (OSS) leaders involve “providing a vision; coordinating contributors’ efforts; attracting developers to the project; and keeping the project together and preventing forking.” Figure 3 depicts a diagram of a typical leadership hierarchy in one popular OSS project, the Qt application framework (here, the project leader is called the “Chief Maintainer”) [103]. Some project leaders contribute in a largely administrative capacity, while others remain active in creating content. Often, as in the case of Linux [120], the person who begins an OSS project occupies the position of project leader, typically until he or she chooses to relinquish it. For this reason and the fact that many project leaders have broad authority over the direction of their projects, they are often referred to, half-jokingly, as the “Benevolent Dictator for Life” or “BDFL.” For Reagle [121], the “BDFL” title exemplifies such leaders’ “seemingly paradoxical” roles within online creative collaboration. On the one hand, they lead seemingly egalitarian communities, while on the other, they also hold authority over them. Reagle’s theory of “authorial leadership” proposes that project leaders leverage accumulated social capital and humor to mitigate backlash from occasional exertions of authority [121]. Such mitigation is necessary because “[h]eavy-handed control can deter participation” [130].

Leaders are associated with not only starting OSS projects, but also providing the original, novel, innovative element that sets the project apart from others. Raymond [120] distinguishes between what he has famously termed the cathedral and bazaar models of software development. The former model, initially put forth by Brooks [17], describes traditional software development efforts, in which software is “built like cathedrals, carefully crafted by individual wizards or small bands of mages working in splendid isolation” [120]. Put another way, ‘the key to software design ... is conceptual integrity, the equivalent of architectural unit that comes from a master plan’ [151] which “dictates that the design must proceed from one mind, or from a very small number of agreeing resonant minds” [17, 151]. In contrast, Raymond introduces the bazaar model to describe OSS

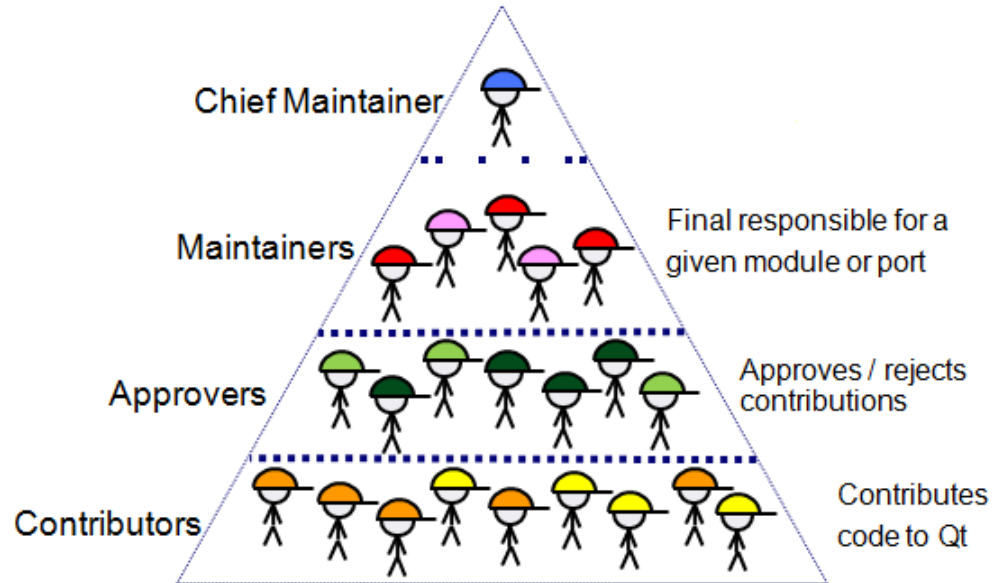


Figure 3: Leadership hierarchy in the open-source Qt application framework (from [103])

development, in which software is developed “in a great babbling bazaar of differing agendas and approaches ... out of which a coherent and stable system could seemingly emerge only by a succession of miracles” [120]. Despite the many differences between traditional and OSS development noted by Raymond and later research, Raymond is adamant that neither the cathedral nor the bazaar model, per se, can produce innovation:

“There is a ... fundamental error in the implicit assumption that the cathedral model (or the bazaar model, or any other kind of management structure) can somehow make innovation happen reliably. This is nonsense. Gangs don’t have breakthrough insights ... *Insight comes from individuals*. The most their surrounding social machinery can ever hope to do is to be responsive to breakthrough insights—to nourish and reward and rigorously test them instead of squashing them.” [120, original emphasis]

Raymond goes on to acknowledge the value of groups for developing promising ideas, but cautions that “every such group development starts from—is necessarily sparked by—one good idea in one person’s head. Cathedrals and bazaars and other social structures can catch that lightning and refine it, but they cannot make it on demand” [120]. He provides Linux and fetchmail as two examples of successful, popular OSS projects that began with “strong, attractive base designs” contributed by individual project leaders (Linus Torvalds and Raymond himself, respectively). Weber

[151], elaborating on the Linux example, notes that “leadership played a critical early role in getting the project started, setting an initial focal point, and maintaining coordination on it.” Torvalds’ contribution drew interest because developers saw “plausible promise” [120, 151] in the early, rough block of code he provided; that is, it seemed like an interesting challenge and their efforts would eventually pay off. This plausible promise, in turn, convinces a percentage of developers to place a “bet” and participate in the project voluntarily. Bet-placing is one way that leaders are given authority in OSS development; because all participation is voluntary, “the leader is in a real sense more dependent on followers than the other way around” [151]. Thus, leaders in OSS projects fail when they do not address the needs of the developers they lead. Successful OSS leaders must be effective moderators, in particular managing egocentric behavior associated with OSS developers and setting appropriate goals that developers find rewarding. Because of the voluntary nature of participation in OSS, if leaders do not adequately address these issues, they risk losing developers to a “fork” (a branching-off of the project in a different direction, led by another developer) or to other projects altogether [151]).

Strong leaders have been shown to be important in areas of online creative collaboration beyond OSS and Wikipedia. A study of the online mathematics collaboration Polymath found that the project’s two formal leaders, the prominent mathematicians Terence Tao and Timothy Gowers, were essential to its success, though regular members also made significant contributions [29]. In the online animation community Scratch, Kafai et al. [81] observed a successful game development collaboration which was “primarily centralized and dependent on a strong leader.” They refer to this emergent leader role as a “benevolent dictatorship,” a reference to the models described above.

2.3.2 Distributed Leadership

As online creative collaboration projects gain more members, their leadership structure often changes. Project leaders may quickly find themselves outmatched by the amount of work to be done. As a result, new governance structures involving decentralization or specialization may be created to help the leader manage his or her workload.

Many OSS projects evolve a more decentralized, distributed governance model as they mature. A notable example is the Apache project [52, 106], in which top-level decisions are voted on by

members of the Apache Group. These members are core developers chosen based on their contributions to the project, in the style of a meritocracy [52]. Other research shows how governance in the Debian distribution of Linux became more decentralized, and authority more distributed, over time [113, 125]. Nakakoji et. al. [110], in their classification of OSS project types, refer to this leadership approach as council-style central control. In reference to Raymond's [120] cathedral-bazaar dichotomy, they position council-style central control alongside cathedral-style central control, in which a project leader maintains tight control over the direction of a project, and bazaar-style decentralized control, in which loose control facilitates many variations via forking. They also draw a connection between leadership approaches and the project's purpose. For example, more original projects tend to operate via cathedral-like central control [110].

Specialization of roles is commonplace in large OSS projects [43, 126]. Moon and Sproull [108] describe the process by which authority in Linux was gradually transferred from Linus Torvalds, the project leader, to a set of lieutenants called "maintainers." Rather than developing new code, these lieutenants were responsible for reviewing other developers' code, integrating code into patches, and ferrying the result up to Torvalds for approval. Other roles may include bug triagers, quality assurance leaders, and release managers [47, 106, 43]. Developers may self-assign these roles or be assigned one by the leadership in a given OSS project. When developers join OSS projects, they are often rewarded for specializing in one area [147].

Decentralization and specialization have also been observed in open-content publishing projects like Wikipedia. Forte et al. [56] found that elaborate governance structures have evolved in the English-language Wikipedia to manage the massive influx of new users and content (currently over 10 million user-created articles). What began in 2001 as a project led by founder Jimbo Wales and editor-in-chief Larry Sanger now includes a multi-tiered hierarchy of access levels, including administrators, bureaucrats, and stewards [55] (Table 2). Moreover, governance in Wikipedia is increasingly decentralized. Administrators wield more local authority and sub-communities called "WikiProjects" embrace conflicting policies [56]. Some editors appoint themselves as "Maintainers" of certain articles to which they are primary contributors, demonstrating leadership, commitment, and even territoriality [139].

While some empirical studies of online creative collaboration make observations of "shared

Table 2: Access levels in the English Wikipedia (adapted from [56])

Access Level	Permission(s)
Administrator	Protect/unprotect pages Delete/undelete pages Block/unblock users Special revert tools
Bureaucrat	Make administrators Rename users Make other bureaucrats
Steward	Change all user access levels on all Wikimedia projects
Oversight	Hide page revisions from all other user types
Checkuser	View user Internet protocol addresses
Rollback	Revert edits
Uploader	Upload as a new user
Account creator	Create unlimited accounts
Developer	Access to MediaWiki software and Foundation servers (various sub-levels)

leadership” (e.g. [81, 52]), these observations are rarely connected to leadership theory. Zhu et al.’s studies of distributed leadership in Wikipedia [161, 162] merit special attention here, because they are among the online studies of online creative collaboration that explicitly engage with the DL literature. In the first study [162], the goal was to simply determine whether or not shared leadership could be identified in Wikipedia. They operationalized four leadership behaviors from Pearce and Conger’s [118] definition—providing positive feedback, providing negative feedback, directing, and social exchange—and developed a machine learning model that searched for examples of these behaviors in 4 million messages sent between Wikipedia editors. The results suggest strong evidence of shared leadership in Wikipedia, with non-administrators performing many leadership behaviors.

In a more extensive follow-up study [161], Zhu et al. elaborated on their theoretical framework, connecting the four aforementioned leadership behaviors to their theoretical bases. Messages containing positive feedback are indicators of transactional leadership (see Section 2.2.1.5, above), negative feedback indicates aversive leadership, and directive messages are evidence of directive leadership. All three behaviors are classified as task-oriented behaviors, while the fourth leadership behavior, social exchange, is evidence of person-based leadership (see Section 2.2.1.2, above). Zhu et al. also use House’s path–goal theory [75] for their definition of leadership (see Section 2.2.1.2, above). Finally, the authors define the concept of leader “legitimacy,” borrowed from Yukl [160], as

leaders who "occupy formal leadership positions in an organization, volunteer community or other social system." Their legitimacy "stems from the selection process, whether they are appointed by supervisors, elected by the membership or appointed because they fulfilled more or less explicit criteria" [161]. They operationalize leader legitimacy in Wikipedia as editors with administrator status, since administrators are elected through a formal process. In looking at effectiveness, they focused on editors' effectiveness at influencing others, rather than the overall effectiveness of their efforts on improving Wikipedia. They found that while legitimate leaders (administrators) were more influential overall, non-admins also substantially influence others via leadership behaviors. In particular, transactional leadership (positive feedback) and person-oriented leadership (social exchange) were shown to increase motivation, while aversive leadership (negative feedback) decreased motivation.

There is limited evidence of decentralization and specialization in other areas of online creative collaboration. In the Scratch online animation community, Kafai et al. identified successful, emergent collaboration models such as partnerships and team efforts, which functioned "through a shared leadership model that spread the responsibilities of organization, decision-making, and development across its members" [81].

2.3.3 Technological Support

Open-source software projects also adopt new technological support to ease the burden on leaders. In the case of Linux, one result was BitKeeper, a revision control system that supports project management in a decentralized fashion [151]. Similar systems, such as CVS, have been attributed to the success of OSS projects [68, 157]. Bug tracking systems, like Bugzilla, provide complementary features that have also been identified as a "cornerstone" [43] of many OSS projects. These tools have been augmented by integrated visualizations, such as the Social Health Overview, which visualizes change requests [43]; and Augur, which visualizes the software artifact itself, along with information about the author and modification history [57]. More recently, online communities such as GitHub successfully combine revision control systems and bug trackers with social networking tools [33, 143]. These technical solutions substantially automate or decentralize portions of the development process that were once left to the project leader to deal with manually.

Tools have also been developed to ease the burden on leaders in Wikipedia. Many of these tools

are integrated directly into Wikipedia’s underlying software, MediaWiki. For example, Huggle is tool that, along with automated anti-vandalism scripts or “bots,” helps editors identify and remove vandalism in Wikipedia [60]. WikiDashboard [136] can help readers identify potential leaders by visualizing the proportion of edits contributed by editors to each Wikipedia article. WikiTasks [92] appears as a sidebar next to a Wikipedia article and allows editors to suggest or complete tasks to improve it. SuggestBot [28] takes an automated approach to task management, suggesting work to editors based on their edit history. Other tools, such as History Flow visualizations [145] and Chromograms [150], provide visualizations of editing activity that could prove useful for leaders, but are geared towards researchers and not directly integrated into Wikipedia.

Few technological systems have been developed to support online creative collaboration in more artistic, expressive domains. A notable exception is Wreckamovie, a web-based platform for organizing collaborative film productions [80]. The Scratch online community [107, 81] and Jumpcut [36], a now-defunct online video community, provide technological support for remixing of movies and games, a form of indirect collaboration. More direct “collabs” are organized in the Scratch forums [81].

2.4 Success in Online Creative Collaboration

In my dissertation, I am interested not only in supporting leadership in online creative collaboration as it is now; I also want to transform leadership through the design of technological support. The ultimate goal of this transformation is to produce more effective leadership and more successful projects. Achieving this goal requires a discussion of how success may be defined, and what factors contribute to success in online creative collaboration. I review the literature in each of these areas in the following sections.

2.4.1 Success Definitions

The majority of scholarship exploring definitions of success in online creative collaboration focus on open-source software. In part, this is because defining success is a topic that has already received a great deal of attention in traditional software engineering literature. Defining OSS success is complicated because of its ongoing, evolutionary nature; OSS projects are never truly completed, only abandoned. Success metrics that may have worked well in traditional software development

contexts often prove inappropriate for OSS development [30]. For example, successful traditional projects may end with a public release, while many OSS projects begin with a public release, contributed by the leader to attract co-developers.

Attempts to generate new metrics for OSS success have generally embraced a multi-dimensional conceptualization of success. They also tend to be informed by a combination of theory and multiple empirical data sources. I review two recent attempts here.

English and Schweik [46] produced a six-part classification, based on phone interviews with OSS developers, manual coding of a sample of OSS projects from SourceForge.net, and theoretical insights from Hardin's "Tragedy of the Commons" [71]. In this system, OSS projects can be successful, abandoned, or indeterminate at two key stages in their life cycle, Initiation and Growth. A successful Initiation stage is defined as OSS developers achieving a first release, and a successful Growth stage is defined as achieving three subsequent releases. English and Schweik operationalized these definitions and tested them on 110,933 SourceForge projects, with low error rates. Wiggins and Crowston [154] validated a refined version with another SourceForge data set, also with good results. Of 117,733 projects, they classified 31% as abandoned at the Initiation stage, 28% as abandoned at the Growth stage, and 14% as successful at both the Initiation and Growth stages.

Crowston et al. [30] developed a set of 18 measures of OSS success, organized into four system process phases: creation and maintenance, quality, use, and consequences. These measures were based on DeLone and McLean's process model for information systems [35], a literature review of success measures in OSS research, and a survey of OSS developers on SlashDot.org. The authors validated their model by operationalizing three of the 18 measures: number of developers, bug-fixing time, and popularity and testing them on a sample of 120 SourceForge projects. The resulting correlations between measures suggested high convergent validity.

Little work has focused on success definitions in other domains of online creative collaboration. As with OSS, many of these projects have no clear endpoint and place more focus on improving processes rather than measuring outcomes. For example, the purpose of Wikipedia as stated by Jimmy Wales, to give every person in the world free access to the sum of human knowledge, is sufficiently ambitious that it may never be reached, so most contributors view the project as a work-in-progress, albeit an active and highly promising one. There is a substantial body of work measuring the quality

of contributions in Wikipedia—for example, comparing the accuracy of Wikipedia articles vs. Encyclopedia Britannica entries [61]—but this research is rarely framed in terms of success or failure.

2.4.2 Success Factors

A somewhat distinct body of work has sought to understand how and why OSS projects succeed, especially in comparison to traditional software development. Answers to this question, developed by scholars of business, computer science, economics, sociology, and many other disciplines, have been as diverse and multi-dimensional as the definitions of success themselves. Some themes that can be distilled from this broad literature include:

- intrinsic motivation and self-selection for tasks [11, 151, 120]
- a charismatic, capable leader [120, 121, 151]
- a meritocratic, rational culture [151, 120, 157]
- a modular, granular division of labor [11, 151]
- use of collaborative technologies, such as CVS, TODO lists, and mailing lists [68, 157, 43]

As argued by Weber [151], the success of OSS is likely best explained by a confluence of these factors, although the relative importance of each is a topic of ongoing investigation. Our goal here is simply to introduce these themes before presenting the current work; for a comprehensive overview, see [31]. In Chapter 4, I return to these themes and discuss a subset in detail to enable comparisons and contrasts with collabs.

2.5 *Online Creative Collaboration for Art and Entertainment*

Not all online creative collaboration is software development or encyclopedia writing, though the vast majority of scholarly attention has been directed at projects in these utility-oriented domains. In the past five years, a small group of high-profile examples of online creative collaboration in artistic and entertainment-oriented domains have surfaced. In this section, I provide brief sketches of these projects for several reasons.

First, since the goal of these projects is to provide an artistic or expressive artifact, such as a music video or film, they offer strong evidence to support claims that online creative collaboration is a broad phenomenon, or that crowdsourcing can produce highly creative work. Yet academic

research on online creative collaboration is limited in these types of domains, and nonexistent with respect to these particular projects. By providing summaries of these projects along with relevant journalism and links, I hope to generate scholarly interest and offer a starting point for understanding them, and others like them, more deeply.

Second, these projects have drawn significant interest from mass media, critics, and practitioners, including several prestigious awards. This suggests that these projects are influential in creative communities and have important lessons to teach us about successful online creative collaboration. If these communities have recognized, if not embraced, online creative collaboration as a legitimate model of creative production, then its importance is likely only to increase over time.

Third, even a cursory review of these projects, coupled with the journalistic accounts cited below, provides many indicators of technologies and social structures that are relevant to social computing research. There is evidence, for example, of vertical leadership and “benevolent dictators,” as well as several examples of new technological support customized for these unique projects. Empirical studies are needed to reconcile these social and technological developments with the existing literature on online creative collaboration in other domains.

The five examples I discuss—Mass Animation, The Virtual Choirs, Star Wars Uncut, The Johnny Cash Project, and Life in a Day—span from late 2008 to the present day, and are presented in roughly chronological order according to when they were founded.

Mass Animation In November 2008, Yair Landau, a former Sony Pictures Animation executive, launched *Mass Animation*,² with its first goal being the creation of a 3D-animated short film called “Live Music.” Landau organized the production process as an online collaboration between a small team of professional filmmakers and amateur animators from around the world. Landau’s team created the film’s story, music, and characters. The animation work was open to the public. Participants chose one of 107 sequences to animate, animated it using a free 60-day trial of the Maya 3D animation software provided by Autodesk, and shared the result on a custom-built Facebook application [105]. If multiple animators worked on the same sequence, ratings for each submission

²<http://www.massanimation.com/>

would determine the winner. More than 58,000 people from 101 countries participated by animating sequences or using the Facebook app. Of these, Landau's team selected 51 animators from 17 countries, aged 14 to 48, to be finalists [7]. These finalists worked with the professional filmmakers to complete the rest of the animation work. The finished film was released a year later, in November 2009, and screened in theaters as an opener for the feature film *Planet 51* [7]. The finalists or ("Mass Animators") were listed in the end credits for "Live Music" and each received \$500 for their efforts. The total production cost was estimated to be \$1 million [105].

The Virtual Choirs In the *Virtual Choirs*, Eric Whitacre, a prominent classical composer, sought to conduct a choir of singers from around the world. In 2009, he recorded a video of himself conducting one of his compositions, "Lux Aurumque," and shared it on YouTube, inviting others to record videos of themselves singing the song. The project attracted 185 videos from participants in 12 countries [112]. Whitacre combined all the videos into a single compilation, overlaying the audio tracks to create a virtual choir. The result, released as a YouTube video in March 2010, has more than 3 million views as of June 2012.³ The success of "Lux Aurumque" prompted Whitacre to lead a second Virtual Choir, "Sleep," released in April 2011 [1]. It drew over 2,000 videos from 58 countries.⁴ Whitacre's third Virtual Choir, "Water Night," attracted more than 3,700 videos from 73 countries and debuted on YouTube in April 2012 [112].⁵

Star Wars Uncut The goal of the *Star Wars Uncut* project was to recreate the first film of the original *Star Wars* trilogy in a massively distributed way. The creator, Casey Pugh, divided up the entire two-hour film into 473 15-second segments [133]. He then invited Star Wars fans to claim a segment, remake it in any way they want (live action, stop-motion animation, computer graphics etc.), and share the result. Pugh, a Vimeo employee at the time, built an elaborate collaboration and rating system using the Vimeo API to support the project [138]. If multiple fans claimed the same segment, a "winner" would be chosen by selecting the highest-rated video for that segment. The system also allowed fans to track which segments were completed or available and monitor

³<http://www.youtube.com/watch?v=D7o7BrlbaDs>

⁴<http://www.youtube.com/watch?v=6WhWDCw3Mng>

⁵<http://www.youtube.com/watch?v=V3rRaL-Czxw>

individual users' activity on the site. When all segments were finished, Pugh hired a professional editor to assemble the project into a completed film, which was released online for free in August 2010.⁶ Later that year, Pugh and his team won a Creative Arts Emmy Award for Outstanding Achievement in Interactive Media [133].

The Johnny Cash Project In *The Johnny Cash Project*,⁷ fans of the late musician Johnny Cash are invited to contribute to a music video of his final studio recording, "Ain't No Grave." The project was launched in 2010 by Aaron Koblin of Google's Data Arts Team and filmmaker Chris Milk, with the goal of collaboratively creating a "living portrait" of the musician [59]. Participants use a web-based painting interface to redraw frames from the music video however they choose. The results can be viewed in sequence with the song and filtered by user-selected criteria, such as highest rated, director curated, most brush strokes, etc. The project was nominated for a Grammy Award in recognition of its artistic achievements [42].

Life in a Day *Life in a Day* was a documentary film project organized as a partnership between YouTube, LG, and filmmaker Ridley Scott. The film would be comprised entirely of footage filmed on July 24, 2010, by members of the YouTube community. Academy Award-winning filmmaker Kevin Macdonald directed the film, with Scott serving as producer. The project attracted more than 80,000 video submissions from 192 countries [63]. The film's editor, Joe Walker, hired a team of 25 multilingual film students to organize and rate the material using a simple system of one to five stars [134]. The process took them 2.5 months, each watching 12 hours of video per day [63]. Walker and Macdonald then personally reviewed the submissions with four or five stars, using the best ones in the final edit [134]. The 390 contributors whose videos were included were credited as co-directors [63, 159]. The completed film runs 95 minutes in length and debuted at the Sundance Film Festival in January 2011, to generally positive critical acclaim [159]. It was later released in theaters on July 24, 2011. The film can also be viewed for free on YouTube.⁸

⁶<http://www.starwarsuncut.com/>

⁷<http://www.thejohnnycashproject.com/>

⁸<http://www.youtube.com/LifeinaDay>

2.6 Chapter Summary

In this chapter, I first described Newgrounds, the site of much of the fieldwork in this dissertation, including its history, design, and relevant research. I then discussed leadership research in two sections. In the first section, I reviewed theories of leadership in traditional organizations. I began with theories that emphasized vertical leadership, tracing the evolution from trait-based approaches to situational and integrative approaches. I then discussed more distributed theories of leadership. I suggested that an integration of distributed leadership and distributed cognition could yield an especially valuable theoretical framework for understanding leadership in online creative collaboration. In the second section, I reviewed research on leadership in online creative collaboration, which is more empirically-oriented and focuses on Wikipedia and open-source software development. I discussed examples of both vertical and distributed leadership in these contexts, as well as technological support for online leadership. In the next section, I discussed the notion of success in online creative collaboration, including success definitions and success factors, using primarily examples from the OSS literature. Finally, I provided several examples of online creative collaboration in artistic and entertainment-oriented domains to enrich the discussion beyond encyclopedia writing and software development, and to spur interest in focusing scholarly attention in a broader set of domains.

CHAPTER III

CHALLENGES FOR LEADERS

RQ1: What are the challenges for leaders in online creative collaboration?

This chapter describes the first of two empirical studies of the current state of leadership in online creative collaboration. In this study, I focus on how leaders manage the challenges of online, collaborative animation projects called “collabs.” I use qualitative, interview-based research methods to show that leaders are crucial to the success of collabs, but leaders face three major challenges: designing the project, managing the artists, and completing the project. I also show how leaders frequently become overburdened and lack adequate technological support, causing the majority of collabs to fail to produce a completed animation. Additionally, I explain how collabs, as examples of online creative collaboration in artistic, expressive domains, have some unique requirements that question the generalizability of previous research in contexts like Wikipedia and open-source software development. Finally, I discuss the theoretical and design implications of these results.

3.1 *Methods*

3.1.1 Sites and Scope

I studied three online communities where members collaborate over the Internet to create computer-animated movies, focusing on Newgrounds (see Section 2.1). To corroborate these findings, I also studied two smaller online animation communities that can be described as satellite communities of Newgrounds. Members of these communities collaborate among themselves and then submit the resulting animations to Newgrounds. I found that practices surrounding collaboration were generally consistent across all three online communities, although members of the satellite communities tended to be more close-knit, and many of their projects involved permutations of the same groups of animators.

These communities host a huge variety of interactions. For this study, I focus on collaboration practices related to computer-animated movie production. Although most animations submitted to

Newgrounds are “solo projects” (created entirely by a single animator), I focus on collaboratively authored animations or “collabs.” The goal of most collabs is to produce a Flash-animated movie, video game, or artwork.

3.1.2 Data Collection and Analysis

I conducted a series of in-depth, qualitative interviews with Flash animators between October 2006 and October 2007. My questions followed a semi-structured format [129] and focused on participants’ experiences as members of collaborative projects in online animation communities. The average interview duration was about 60 minutes (min: 40; max: 90). With permission, telephone interviews were audio-recorded and fully transcribed. I analyzed this data using a bottom-up, thematic approach, in which data are iteratively coded based on themes and categories to produce a coding scheme. This scheme is re-coded and refined, allowing conclusions to emerge from the data [129].

I recruited participants by email, online ads posted on the sites listed above, and “snowball sampling,” seeking a variety of participants. In total, I interviewed 17 animators, 14 by telephone and 3 by email. Participants included successful and unsuccessful project leaders, as well as Flash artists who had contributed to—but never led—collaborative projects. They represented a range of nationalities (6 countries), experiences (novice to expert), and ages (16 to 29), but all were male. Because I interviewed Flash artists who typically expect to be credited for their work, I felt it was appropriate to offer participants the option of receiving such credit [18]. At the written request of my participants, most names used in this chapter are real names.

Table 3 lists interviewee names, ages, and countries of residence. An asterisk (*) indicates the interviewee had collab leader experience. Quotation marks indicate a pseudonym.

In addition to these interviews, I studied the Newgrounds community as a participant-observer from August 2006 to January 2012. I was also employed as an intern at the Newgrounds headquarters in suburban Philadelphia, Pennsylvania from May to August 2009. During this time, I worked with, observed, and interviewed the Newgrounds staff to learn their perspective on collabs. The notes from these experiences were used as corroborating evidence for the interview data described above.

Table 3: Interviewee names, ages, and countries of residence

Name	Age	Location
Joseph Blanchette*	24	United States
Eric Carlson	19	United States
Luis Castanon*	27	United States
Michael Frank*	19	United States
Tom Fulp*	29	United States
James Hole*	16	Australia
Tyler Koch*	19	United States
Massimo Maitan*	21	Australia
Anders-Martin Meister	16	Estonia
Ross O'Donovan*	19	Australia
Kraig Phillips	27	United States
Joseph Rooks*	21	United States
Kester Smith	21	United Kingdom
“Sven”	18	Netherlands
Hans Van Harken*	17	Spain
Robert Westgate	21	United Kingdom
“William”	19	United States

3.2 *Results*

3.2.1 **Designing the Project**

A collab begins when an experienced member of an online animation community conceives an idea for a collaborative project. This member typically assumes the role of the organizer or leader, creating an informal hierarchical structure [72] for the duration of the collab production process. One of the leader’s first duties involves acting as the designer for the project. Acting as a designer presents two tasks for collab leaders. First, the leader must structure his or her collab idea in a way that is feasible and comprehensible to other members. Second, the leader must propose this structure to the community and convince others to join. I describe these tasks in the next sections.

3.2.1.1 *Structuring the Project*

The division of labor in collabs is typically modularized. Specifically, it is the leader’s task to divide up a collab into animated segments, or “modules,” each of which can be claimed and animated by a different artist working independently from, and in parallel with, others. Massimo Maitan contrasted this modularized approach with the specialized, team-based or role-based approach more typical of professional animation studios:

“Every author on Newgrounds likes to make their own thing. You wouldn’t be able to give one person a job of storyboarding and one person a job of animating it and one person a job of recording the sound. It just wouldn’t work. People have to do their own thing on Newgrounds, so it’s a lot easier to just let them do their piece of animation and take a whole month to do it.”

Such feelings of ownership preclude a highly specialized approach to collaboration. They also provide several implications for collab leadership. In support of Parnas’ [117] proposition that modularization reduces communication needs by decreasing the social dependences involved, I found that communication in collabs often flows vertically (between artists and the leader) but rarely flows horizontally (between artists):

“They [the artists] didn’t really have contact with the other members that much; it was just mainly through me. So I just have to get along with the other animators, but they really didn’t have to get along with each other.” (Joseph Blanchette)

One result of this vertical communication pattern is that collabs tend to feel more “collaborative” for leaders than artists, who, in contrast, tend to feel isolated:

“I felt like I was working with people when I was running it. But when I was just creating a part, it just felt like, you know, just do your part and then turn it in and wait for everybody else to finish their parts. Kind of like working at an office, almost. Just turn in your report, and that’s it.” (Michael Frank)

Artists’ limited communication with one another, coupled with their strong feelings of ownership over their contributions, creates an interesting challenge for the leader. As Grinter notes, “decomposition implies recomposition” [64]; eventually, the leader must try to compile artists’ submissions into an entertaining and meaningful whole. But how can this “extreme” form of modularization lead to a coherent result that people outside of the collab would enjoy watching? I identified two strategies leaders employ when structuring their projects to foster coherency among artists’ contributions: specifications (“specs”) and themes.

First, leaders generate a set of technical specifications, or *specs*, for the collab that describe how the artists' submissions must be formatted. Common specs include dimensions, frames per second (fps), background color, duration, and version of the Adobe Flash software. They ensure that the leader can compile artwork submitted by multiple animators with unique computer setups and working styles without running into compatibility issues:

"I think that you need to be really specific in terms of the technical requirements that you want from each person, such as, like, the frame rates, and the really technical stuff, because those will just . . . you have to give people really concrete boundaries in terms of how to put their movie together—not the creative part, but the technical aspects of it—in order for it to succeed to begin with." (Luis Castanon)

Leaders choose some specs with a particular aesthetic consideration in mind. For example, an animation drawn in the traditional, frame-by-frame style at 24 fps better simulates the illusion of motion than one drawn at 12 fps, but requires twice as much work on the part of the artist. Other specs are conventionalized more arbitrarily. For example, because the default workspace size in Adobe Flash is 550×400 pixels, leaders typically choose it for the "dimensions" spec unless they have a compelling reason not to. As Becker [10] explains:

"Many of the things artists . . . do in coordinating their activities are chosen from among a range of possible ways of accomplishing the same thing, any one of which would be acceptable as long as everyone used it."

Second, the leader provides a *theme*, the content guidelines for a collab. Common themes include a story, a piece of music, a visual element, and an event, such as a holiday. For example, the "Valentine 29" (2007) collab's theme was the story of the infamous St. Valentine's Day Massacre of 1929 in which seven Chicago gangsters were murdered. The collab leader, Hans Van Harken, required all contributions to illustrate aspects of this historical event:

"[For 'Valentine 29'], we got one story and we split that story into chapters, each artist making a chapter, making it a continuous story with different styles in each chapter. I just thought it'd be cool because it's just, like, if you get key scenes in a story

and each scene is developed by a different viewpoint, you really get like five different viewpoints out of one thing.”

Themes, such as this story, provide the crucial unifying glue that binds together artworks from a variety of animators which may otherwise appear nonsensical or even random. Effective themes, like TODO lists in OSS projects [68], exploit tensions between individuality and conformity, freedom and restriction. On the one hand, themes are similar to specs in that they place constraints on animators and limit their creative freedom. On the other hand, these same constraints are held constant across all artworks submitted to the collab; each artist deals with them in a different way. In this sense, themes provide structure and focus for animators, allaying “blank page syndrome,” and challenging them to express their personalities within the confines of the theme. In James Hole’s words, *“If you give limitations to the artists, and they try to work inside this box, they can do really good [work].”* Successful results display creativity at the individual level while the theme’s common restriction creates connections between artworks and invites comparisons and contrasts. Robert Westgate summarizes the relationship between innovation and convention:

“If people are more free, people will come up with a huge range of ideas, and people won’t get bored over the course of the Flash. But at the same time, they’ve got to be restrictive enough so that when the Flash is put together, it works.”

As an example, Figure 4 depicts the first post of the collab thread for “The Animation Battle” (2012). The collab leader, ZoVies, has provided specs (e.g. dimensions of 600×400 pixels, 20 fps), themes (e.g. *“you get one opponent and you will fight against him”*), and other initial structure.

Third, collab leaders must describe the way in which work will be divided up and integrated later on, so that artists understand how their module fits into the broader picture. Most divisions of labor are based on one of three *arrangements*: planned, improvised, or themed.

In the planned arrangement, the leader defines the relationships between segments before any animation work has begun. These arrangements lend themselves well to collabs with temporally-oriented themes, such as the historical storyline in “Valentine ’29” or the music video presented in “Stop Cryin Your Heart Out” (2005).

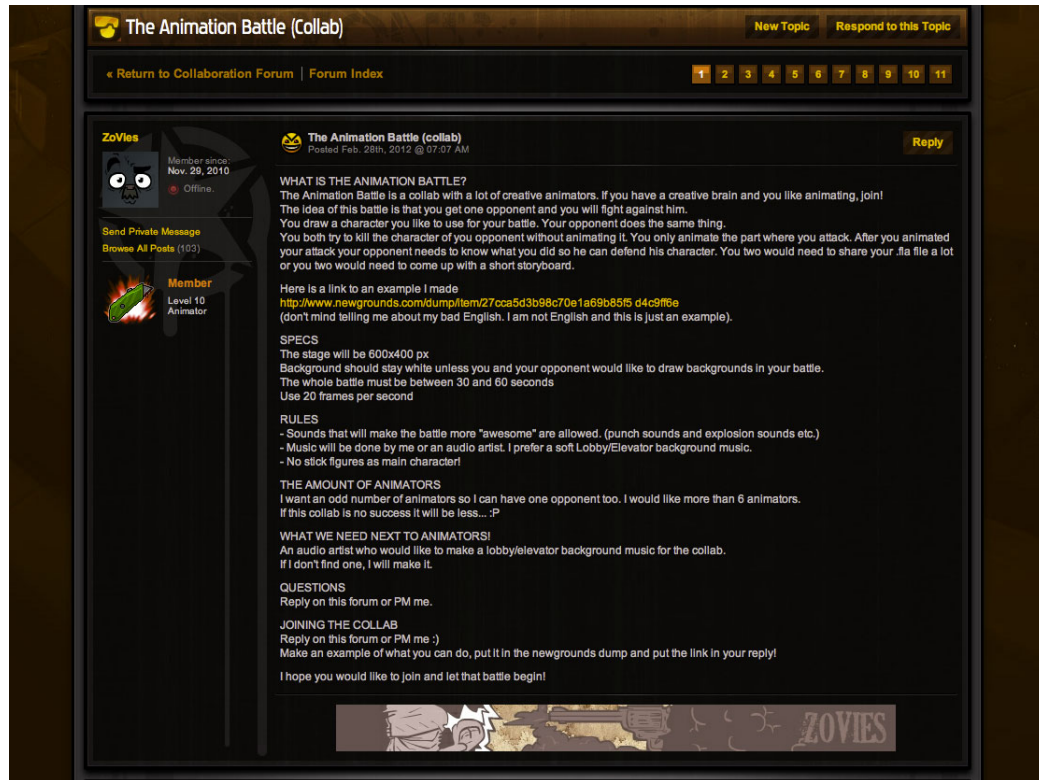


Figure 4: Initial planning and structure in the collab thread for “The Animation Battle” (2012)

In the improvised arrangement, the relationship between artists’ contributions is determined on-the-fly in an improvisational fashion. These collabs are often based around loose narratives, as in “Pass-my-Flash 2” (2008), or visual elements, as in “The Red Line” (2007). They resemble the early 20th century Surrealist game “exquisite corpse” in which players passed around partially-obscured drawings for others to continue [2].

In the themed arrangement, contributions are related by a shared idea or theme, similar to an edited collection of short stories or poems. The leader decides on the sequence of submissions only after he or she receives all of them. Unlike the temporally-oriented planned arrangements, themed arrangements are usually based on an abstract concept. Examples include fan-based collabs like the *Street Fighter* parody “Street Fighter Collab” (2009) and the Michael Jackson tribute “MJ Tribute Collab” (2005).

These arrangements tend to have different levels of interdependence and popularity (see Table 4). Themed arrangements generally require the least amount of interdependence among artists and, perhaps as a result, are the most popular collab type. Most planned arrangements require a

moderate amount of interdependence among artists, with music videos being an especially popular instance of this collab type. Improvised arrangements are uncommon and demand a high degree of interdependence among artists. Work in these collabs proceeds in a linear fashion rather than in parallel, as with planned and themed collabs. Consequently, improvised collabs have a high risk of failure because all participants must wait for each artist to complete his or her segment, one at a time, creating possible bottlenecks.

Table 4: Examples of planned, improvised, and themed collab arrangements

Arrangement	Interdependence	Example
Themed	Low	In “Street Fighter Collab” (2009), Stamper (the leader) invited artists to submit 30-second animations featuring their favorite <i>Street Fighter</i> characters. Stamper selected the best ones to include in the finished movie. Viewers could choose any individual clip to watch from a menu or “Play All” to watch all the clips in a sequence determined by Stamper.
Planned	Moderate	In “Valentine ’29” (2007), Hans van Harken (the leader) wrote a script and divided it into chapters. Artists were invited to claim each chapter and animate it according to the script but using their own artistic styles. Hans arranged the chapters in the proper sequence to create a finished movie.
Improvised	High	In “Pass-my-Flash 2” (2008), Luis (the leader) created a short clip which served as the first chapter of a story. Artists were invited to submit short clips that continued the story. Luis chose the best one, appended it to the movie, and reposted the source files. The process was then repeated for several rounds.

Once the leader has decided upon the specs, themes, and arrangements that structure his or her collab, the next step is to propose this collab to the community.

3.2.1.2 Proposing the Project

A leader proposes a project by posting a “collab thread” in the community’s Collaboration forum (see Figure 5). From that point on, the collab thread is the locus of all activity. Artists ask questions, make comments, and share their works-in-progress via replies to the thread; likewise, the leader provides feedback and announces project updates there. To share files, collab participants often post links to external file hosting sites in the collab thread. In other words, collab participants “keep it public” via discussion forums much in the same way as OSS developers do so on mailing lists [68].



Figure 5: The Newgrounds Collaboration forum

While OSS developers use mailing lists to maintain group awareness [68], they heavily employ bug tracking systems and revision control systems to support asset management and coordination [70, 43]. Collab threads serve all of these purposes. To promote group awareness, many collab leaders shoulder the burden of posting regular progress updates in the collab thread. At certain points in the production process, such as when artists are signing up and need to be made aware of which parts are claimed and which are available, leaders must post these updates almost continuously. This “informational awareness” [38] is not ideal because leaders must expend additional effort to supply it. When they do not, artists are unaware of the collab’s status.

When a collab thread is posted lacking a clear explanation of its theme, arrangement, and specs, it is unlikely to survive. Artists often prefer a well-planned, clearly explained collab to spontaneity and revision. Luis observes, *“The more groundwork the person who’s hosting it has done usually decides how well the actual project ... how well it does.”* Joseph Rooks offers a specific example from leading “The Clockcrew TV Collab 2” (2007):

“People all had these different ideas and sometimes the ideas conflict with one another

...Before I decided to announce [the collab] to the community I had to sit down and decide how I wanted to approach this myself, because I have a habit of diving in and announcing everything ahead of time and everyone's just going crazy and I'm all confused about how I want to approach it. Everyone's just left waiting for me to make my decisions."

By working out many of the potential issues beforehand, Joseph R. eliminates potential conflicts that may stall the project later on. In this way, "front loading" collab proposals with detailed plans not only helps artists know what to expect, but also provides solutions to likely problems before they arise. As a result, artists can avoid some of the difficulties of distributed teamwork [72] and spend more time working on content.

3.2.2 Managing the Artists

A common goal for collab participants is the swift release of their project. However, a collab is released only if animators deem it completed. Animators are not interested in releasing a mostly-finished animation and audiences are not interested in watching one. As Tyler Koch explains, "*The last thing I want to do is put out a project before it's finished, unless I absolutely have to.*" For Joseph R., leading "The Clockcrew TV Collab 2" in secret until its release was an important part of the fun:

"I had kept the movie above top secret the entire year and a half. No one shared their parts, no matter how frustrated they got, except maybe with a few friends ... I think the secrecy contributes to the excitement when the movie actually came out and made it more enjoyable for everyone."

Leaders maintain control over their collabs unless they choose to relinquish it. In Massimo's words, "*You're the one who starts it, so you get to pick what happens.*" Hence, many leaders feel responsible for ensuring the successful completion of their collabs, as Joseph R. explains:

"A lot of people start collaborations and never finish them, because they—what a lot of people don't understand is that when you start a collaboration, you have to hold the collab's hand all the way through and guide it through every step of the way. You can't

just give people a theme and a few rules and say, “This is the deadline,” and expect it to get done.”

This sense of responsibility compels leaders to assume a management role in their collabs, by recruiting, directing, motivating, keeping, and replacing artists as they deem necessary. The following sections detail the leaders’ specific duties for each of these managerial activities.

3.2.2.1 Recruiting Artists

Once leaders have posted their collab threads, they must then recruit artists. The simplest way to recruit is on a “*first come, first serve*” (Anders-Martin Meister, Tyler) basis, but as James Hole explains, the tradeoff is one of quantity—and a richer sense of collaboration—over quality:

“If . . . everyone can join up and do a piece, and everything gets in, that’ll end up—you’ll get a lot of pieces and a lot of people will join, but the quality won’t necessarily be as high. But it’s more group-active, that sort of way. So . . . if you do it like, with everyone makes a part but you might not necessarily get in, the quality of the outcome is better but cooperation, the group work, isn’t as strong.”

Alternatively, some leaders restrict admittance to artists with quantifiable success in the community. The Newgrounds Batting Average (BA), a measure of the average rating of an artist’s best three submitted animations, enables this form of gatekeeping. However, as Ross O’Donovan warns, metrics such as the Batting Average poorly account for many artists whose history of contributions belies their present talent:

“When someone’s arranging a collaboration, they would try to keep in mind . . . not necessarily the batting average you see on Newgrounds, because there are people who are really talented artists, except they’re lazy, or they get a kick out of making crappy submissions to Newgrounds because they think it’s funny.”

As a third option for recruiting artists, leaders may arrange a tryout competition and award slots in the collab to the contest’s winners. But tryouts make heavy demands of artists, particular those who do not make the final cut. They also tend to be emotionally taxing for leaders:

“Rejecting people is always hard, especially when you know they spent at least a few hours working on something to participate in your vision for creating something and then you rejected them after they did it. It doesn’t feel right.” (Tom Fulp)

“The hardest part was just being selective about who joins ... Just having to reject people, that’s pretty much it. Like expel them from school, or something like that.”
(Michael)

Finally, some leaders sidestep the admissions process altogether by recruiting artists whose work they respect or with whom they have existing relationships. When this happens, a policy of active pursuit often yields the best results. For Kraig Phillips, such “badgering” is often essential for securing his involvement: *“All the other collabs I’ve joined [besides two] I’ve done so because I was personally and repeatedly asked to join.”* Joseph R. provides a leader’s complementary viewpoint on this style of recruitment:

“Waiting for people to sign up versus actively pursuing particular people you want to participate is going to make a difference in the quality of the animation. Because if you’re just waiting around for people to come to you, you’re going to get the people who are bored, people who have the free time. But if you go asking people who are well-known animators who might be interested, but they might be sitting on the fence and don’t want to jump in, going after people and being persuasive really helps to shape your project in the way you want it to be shaped.”

Leaders, in summary, adopt several strategies for recruiting artists, including “first-come, first serve,” Batting Average restrictions, tryouts, and badgering. Once an adequate number of artists have been recruited, the leader’s next task is to provide creative direction for artists while they produce their animations.

3.2.2.2 Directing Artists

Creative direction poses two major challenges for leaders. First, because leaders derive their authority from artists, leaders must find a balance between exercising this authority and leveraging the

creativity of individual artists. Artists rebuff leaders who strip them of their artistic freedom and relegate their contributions to “mere” implementation:

“If you’re collaborating, you gotta make everybody feel like they’re a part of it. You’ve got to make sure—you’ve got to make them feel like it’s all their movie. Because if it’s not, then they won’t want to work on it.” (Tyler)

To keep artists involved, many leaders adopt an egalitarian attitude to their role in the collab production process:

“I just led em. They did the rest.” (Massimo)

“I don’t think of it as a position of power. I think of it as a position that enables me to ... give them things to participate in.” (Joseph R.)

When taken to the extreme, however, such egalitarianism can adversely affect the quality of the finished animation. Joseph B. provides one such account from his experience leading “The Matrix Has You.” (2004) collab:

“There was one problem ... where me and one of the animators didn’t quite see eye-to-eye on the way the movie should be made. We’d keep going back and forth about how scenes could have changed. I would give my suggestions, but ultimately, I said, ‘I want this to be your movie, primarily. So I want to give you suggestions on what I would do, but if you don’t agree with it, I’m not going to force you to do them.’ So, ultimately, the movie turned out not as good as I would have hoped, but you look at the movie and you can tell that it’s something that that animator did and it was in his style.”

More generally, when collabs fail, leaders are often blamed for underutilizing their authority:

“Collaborations fail because people get an idea in their head and they can’t accurately convey their vision to the people they want to participate. The collaboration doesn’t appear very appealing because the person doesn’t seem organized, and they don’t seem to have a strong artistic vision of where they want to go with it.” (Joseph R.)

“There have been collaborations that have been, just, you know, haven’t really taken off the ground. Just haven’t really gone anywhere, or they’ve been abandoned . . . It’s just common because some people who aren’t up to the task actually arranging the collaborations when they think they can.” (Ross)

A second consequence of a collab leader’s creative direction is that it often develops into a deeply-felt, personal commitment to his or her collab. In Tyler’s words, *“The person that starts [a collab] is the one that finishes it, because it’s their idea.”* When leaders desert their collabs, Luis explains, it is difficult to install a new leader while upholding the original leader’s vision:

“I’ve seen a couple of collaborative efforts where somebody has tried to take it over because the person quit or something, and it just doesn’t work out as well, because it’s hard for anybody to sort of look through the eyes of what somebody else had in mind. It always comes out different and not really as faithful to what the original person probably had in mind.”

The evidence suggests that collabs can rarely weather the loss of their leaders. In Luis’s words, *“If the person hosting it loses interest, it sort of all falls apart.”* An exception, reported by Hans, occurs when an artist and leader coordinate the transfer of power prior to the leader’s exit:

“I asked the author if I could just take care of the project. He was about to leave the collab, and I said, ‘No, no, man, here, just let me take care of it. Don’t worry about it.’ I thought his idea had potential. I saw it [as] really possible and original.”

When leaders lose motivation and drop out, collabs are unlikely to succeed. In the next sections, I discuss artists’ loss of motivation and dropouts and how leaders work to avoid these situations.

3.2.2.3 Motivating Artists

Most artists are amateurs, volunteers, or both, meaning their commitments to collabs are subordinate to higher priorities, such as full-time employment, schoolwork, or family life:

“The largest problem is this isn’t our job. We’re all just hobbyists. Any little real life thing that pulls us away from it will. It’s tough to make sure everybody gets their work

done and make sure everybody's still involved. If we were all getting paid for it, it'd be [different]. We're not, so nobody takes it really all that seriously.” (Tyler)

Although leaders are often amateurs and volunteers as well, they tend to have stronger incentives to complete a collab. Accordingly, leaders take on the role of motivating artists. The leader's aptitude at motivating artists is often directly attributed with the outcome of the collab:

“I think it's all down to who's running it, whether or not it gets finished. It's how much enthusiasm they have for the project, I think, is a major part. If they really care then they'll find people to do the pieces. Their enthusiasm will make other people want to continue and want to finish their pieces. I think definitely their own desire to finish it and make it as good as it can be is going to be a big factor.” (Kester Smith)

It can be difficult for leaders to determine how much pressure to apply to artists who are not producing results quickly enough. Leaders, such as Joseph B., recognize that because collab participants are volunteers, they have little authority to coerce artists:

“You really don't have much control over the other people, when you get right down to it. If they don't do it, then it won't get done . . . But ultimately, I don't want to force them to do it. If they don't want to, I just find someone else.”

On the one hand, if leaders apply too much pressure, artists may feel rushed and submit artwork of inferior quality. As Tyler explains, *“For a lot of Flash artists, especially me, you have to be in the mood to do it or else everything is going to be crap.”* Artists may instead simply quit the collab out of frustration. On the other hand, if leaders do not pressure artists at all, the project can be delayed for weeks or even months while the leader seeks out an adequate replacement. Tyler sums up this dilemma:

“I don't want to rush people, but I don't want to give them more time than they [need]—I don't want them to be lazy about it, either.”

3.2.2.4 Replacing Artists

Even when leaders are patient, animators may still drop out. “*Some people are simply trying something out*” (Massimo). In this case, it is the responsibility of the leader to quickly find replacements in order to keep the collab moving forward. For Kester, such dropouts are an opportunity for the leader to reflect on his or her dedication to the collab:

“You actually have to go out and look for replacements. If you really care about a project, you go out and find other people to fill up those spaces and get it done. And if you don’t care about it, then you’re just going to be like, ‘Oh, it’s not working. I just give up.’”

For other leaders, dropouts are inevitable and part of the leader’s job description. From this point of view, finding replacements for dropouts is preferable to the alternative:

“[Leaders will] just let it go and let people do whatever they want, instead of really pressing them for it ... either because they don’t realize how vital communication is, or they think if they keep pressing people and pressing people for the parts that they promised, maybe the fear is that the person will drop out and they’ll be out a part and they’ll have to find a replacement ... When you have someone just promising a part, it’s better to press them and have them drop out, so that you can replace them, than to let them go until the deadline and find out that they haven’t done anything ... ” (Joseph R.)

Joseph R.’s remark illustrates how leaders may use their authority to remove obstacles to their collabs’ progress, even when doing so is awkward. “*Pressing [is] something that you might not feel comfortable doing at first,*” advises Joseph R., “*but it’s a part of making it work.*” To avoid this awkwardness, Anders-Martin envisioned a system that would automatically replace artists who fail to make a collab’s internal deadlines:

“If people don’t submit updates to their collab parts to the program, like every week, or whatever the timeline—time limit, they would be removed from the list, and someone

who's reserved a part, like when someone drops out, would get it instead. It would do it automatically."

Leaders are not the only collab participants who act to mitigate the effects of dropouts and steer the collab towards completion. As an artist, Kester created multiple animations for "The Bunny Suicide Collab" (2007), with mixed results:

"I only went into [the collab] because it had just been hanging around for ages. I thought, I'm just going to make a piece to get rid of it. So I made them a piece pretty quickly, and they're like, 'Oh, great, good, we only have a few more to get.' They were still there months later. So I came back and had another look, and I was like, What the hell's going on? They were like, 'Yep, we just need four more pieces.' So I made them another one ... and it stayed there for even longer. It stayed there even after I made them two bits. It actually took more than a year from when it was originally started, I think, to when it was actually finished."

Thus, leaders must work actively to keep progress moving forward on a collab, by constantly motivating artists and swiftly replacing those who drop out. Motivated artists may lighten the leader's workload and take some responsibility in this process by claiming remaining animated segments that stand in the way of the collab's completion.

3.2.3 Completing the Project

In the previous section, I described how leaders rely on artists to complete a collab's animations. Once these animations are completed and received by the leader, however, the dynamic of responsibility is reversed. Now it is the leader who must answer to the artists' requests for progress updates and endure the collective pressure exerted upon him or her. Artists may become impatient, especially if the leader is unable to finish in a timely fashion. Leaders often seek out ways to alleviate this impatience. When a number of personal issues delayed his progress on "The Clockcrew TV Collab 2" (2007), Joseph R. found that his frequent status reports were mutually satisfying:

"I came to the realization that if I tell people what's going on, like if I constantly update them with the progress of the movie and don't leave them to wonder, then they won't

get upset and they won't start thinking that I'm slacking off and being lazy and they'll appreciate the work that I'm doing on it. And in turn, that fuels me to do a better job—to do the best job I can on it . . . The communication exchange is very important in making both sides feel appreciated.”

Although artists make heavy demands of the leader, the work required of leaders to complete the project is no less demanding. In the following section, I discuss two major challenges posed for leaders, integration and attribution. The leader must decide not only which segments will be included in the finished animation, but also who will receive credit for working on the collab. These decisions are intertwined. Artists whose work is not included are unlikely to be credited; likewise, artists who are credited have typically submitted accepted work.

3.2.3.1 Integrating the Artworks

Integration Criteria Collab leaders typically articulate the integration criteria at the start of the project. The most common criterion that leaders mentioned using in the interviews was quality, as explained by Robert:

“If the [submission] is good enough, it'll be put in . . . The one person who decides whether stuff goes in or not is either . . . the person who created the collab or the person who's putting it together into the Flash.”

Leaders rarely elaborate on their expectations of what a “good enough” contribution entails. Instead, leaders either assume their standards align with the community's, or they create a segment for the collab themselves and post it as a benchmark for quality. Kester described one collab where the leader had “*pretty much finished his piece when he started the collab, so he was able to say, This is how good mine is, you've got to make one about as good as this.*”

At the opposite end of the spectrum, leaders may eschew any type of integration criteria, instead using a “first-come, first-serve” system in which any artist who claims a segment is guaranteed to have their submission included in the finished animation. Leaders tend to adopt a first-come, first-serve system for collabs that (1) require unusually large numbers of artists, (2) appeal to a niche interest, or (3) are geared towards novice animators. This policy often attracts substantial interest

and promotes an inclusive, collaborative feeling within the collab, but the quality of the resulting animation usually suffers. James elaborated on this tradeoff between quality and community:

“If you just do part-by-part, like everyone can join up and do a piece, and everything gets in . . . You’ll get a lot of pieces and a lot of people will join, but the quality won’t necessarily be as high.”

The inclusive integration criteria implies a low threshold for attribution as all contributors are credited, whereas a quality based integration criteria can create more reputational value by associating that quality with contributors. In either case, once leaders have settled on their integration criteria and receive the completed segments from artists, they face multiple social, aesthetic, and technical challenges.

Integration Challenges Leaders rarely juxtapose segments arbitrarily in the process of integration. More often, integration is performed with an aesthetic sensitivity in which each segment is positioned in a way that accentuates its best attributes. For many leaders, successful integration means achieving a favorable equilibrium between variety and continuity. Leaders often strive to maintain variety because it provides visual interest and calls attention to the individuality of the contributing artists. Joseph B. recalled, *“I’ve seen some collaborations where the styles just kind of looked the same . . . and there wasn’t really a reason to watch.”*

On the other hand, variety taken to the extreme is chaotic. Leaders expressed much of the same appreciation for continuity as they did for variety. James observed that variety is *“one of the best parts about collaborations, different people’s art styles coming together . . . but it’s still important [that], like, in some way it flows.”* This continuity is often much more difficult for leaders to achieve than variety, which follows naturally from artists’ diverse backgrounds and skill sets.

To exacerbate these aesthetic challenges, leaders must also deal with social challenges. Artists feel a strong sense of ownership towards their work. When leaders attempt to integrate artists’ contributions, their efforts to improve variety or continuity may be stymied by this ownership. Artists like Anders-Martin insist on leaders seeking permission before making any substantial changes to their contributions, or, better still, asking the artists themselves to make the changes:

“If you don’t like something, you just tell the person to change it themselves rather than changing it for them . . . How would you feel if someone . . . changed your work without telling you? It’s just . . . you should at least inform the person.”

From the opposite perspective, leaders often respect artists’ feelings of ownership until integration problems arise, such as when an artist’s contribution disrupts the continuity of the collab (Joseph R.), or fails to meet the leader’s expectations for humor or craftsmanship (Michael, Kester). In these cases, conflict can erupt when leaders disregard the wishes of artists by omitting or substantially altering their work. This conflict may arise partly out of mismatched goals. Leaders are concerned primarily with maximizing the quality of the collab as a whole. Artists, in contrast, prioritize inclusion in the collab and preservation of their artistic integrity. They feel detached from projects whose leaders have excised their contributions “for the greater good,” especially since they are unlikely to receive any credit for their cut scenes.

Alternatively, a leader may deem it necessary to change a submission in ways that can leave its creator feeling “*pretty pissed*” (Kester) or “*quite annoyed*” (Tyler). Many artists would just as soon quit a collab as have the leader modify their work beyond recognition. However, quitting in a meaningful way is made difficult by the power differential that exists between leaders and artists. Once leaders have received an artist’s submission files, there is little the artist can do to prevent the leader from using it however he or she pleases. Artists have no community-based recourse for abuse of their contributions.

Leaders also face technical challenges to successful integration. James identifies file size as a serious problem, as Newgrounds restricts uploaded animations to 10 megabytes, and artists frequently submit hand-drawn artwork that hasn’t been optimized. A second common concern involves Flash “symbols,” graphical elements that often cause problems when files from different artists are merged. Luis explained:

“I don’t name any of my stuff when I work on my own, but when I have to work on a group project, I have to go through the trouble of naming all my stuff and labeling it all uniquely so that I don’t run into conflicts when I have somebody else’s stuff coming into and sort of merging with mine.”

More generally, leaders often struggle to make sense of artists' animation styles when they differ from the leaders' own. Hans found that integrating nearly “drove [him] insane” because “each artist has a different style ... a different format, a different setup,” even when basic specs are agreed upon. Tom agreed: “The hard thing for me, working on [collabs], is dealing with other people’s techniques and methods for making stuff.”

Integration Strategies When any one of these challenges proves to be too frustrating, leaders may respond by excluding that artist’s segment from the final animation and revoking his or her chance at attribution.

Leaders are most successful at balancing variety and continuity when they take into consideration the underlying structure of the collab, not just its aesthetics. If a project has a clear, straightforward narrative, the leader can experiment with more diverse artistic styles. If the collab’s structure itself is unusual or complex, the leader might strive for a more consistent visual style to balance it out.

Figure 6 shows two different implementations of this technique. Both group of animators successfully balance visual and narrative coherence, albeit in opposite ways. In “Valentine ’29” (above), each artist displays a distinct style that varies considerably from the others, but the collab’s straightforward storyline provides a consistent structure that limits confusion. In contrast, the segments in “Pass-my-Flash 2” (below) show a high degree of continuity. This visual similarity brings a valuable sense of order to freewheeling, almost chaotic narrative.

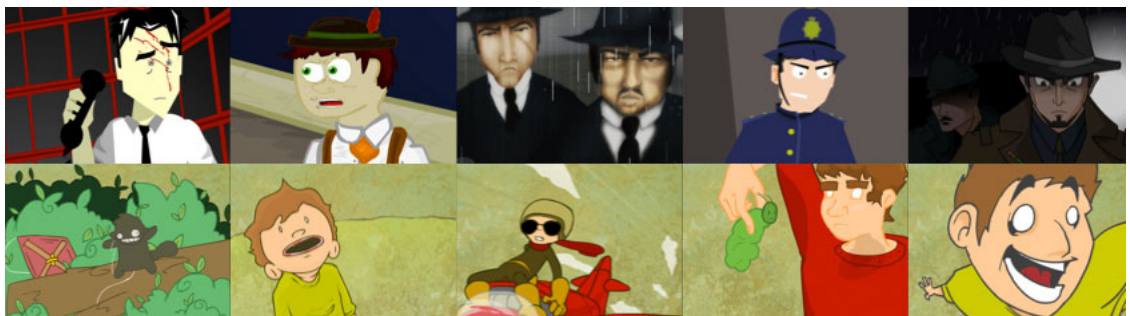


Figure 6: Stylistic variety in “Valentine ’29” vs. continuity in “Pass-my-Flash 2”

Another way that leaders promote continuity within their collabs is by taking advantage of the Adobe Flash technology’s affordances for sharing and reuse. Ross led one collab whose participants

achieved a consistent visual style by coordinating things like tools, color palettes, and symbols so that elements of an animation frame could be re-used by collaborators. As another approach, leaders may create transitions—short clips linking one animated segment to another—to improve continuity between jarring contributions. For example, when leading the “Retro Collab” (2007), James assigned a start and end color to each contributor so as to ease transitions, but found that as the number of contributors climbed to over 20, he needed to work on the interchanges himself.

When leaders complete the integration process, they often post a link to a pre-release version in the collab thread for artists to inspect for errors and glitches. “*Normally,*” explained Ross, “*you’ll find like fifty problems.*” Massimo described the potential viewer backlash that he circumvents by making available the collab for “bug” testing:

*“About two days or three days after that everyone’s got their animation in ... I post it on a free hosting site and show it to everybody before I even think about putting it on Newgrounds. Before somebody goes, ‘S***, I didn’t want that to be like that,’ or, ‘You imported my Flash and there’s that little sprite that looks absolutely s***. So you messed it up for me. It’s all your fault.’ I usually post it so people can point out any ... bugs.”*

This process bears similarities to the Wikipedia Featured Article review process [146]. Both begin with an individual nominating a project for review; both leverage the community to simultaneously identify and correct problems; both conclude with some form of final decision. Unlike Wikipedia, however, there is no expectation of consensus. Collab leaders may ignore any suggestions, including the suggestion not to proceed with a release. Also, collab reviewers are typically the artists themselves, rather than a distinct body with a general interest in reviewing, as is common in Wikipedia. These distinctions yield a more informal process than what is required to produce a Featured Article, but one that nevertheless often succeeds in identifying most significant bugs in a pre-release collab.

Once all such bugs are resolved, the leader initiates the process of publishing the finished animation on Newgrounds. A final complication stands between the collab and its public release: the leader must mete out authorship credit to artists.

3.2.3.2 *Attributing the Artists*

Newgrounds features a “multi-author system” (MAS) in which multiple contributors may be credited as “coauthors” on a single project. Among online animation communities, Newgrounds appears to stand alone in offering such a system. When a Newgrounds member submits an animation to the Flash Portal, he or she is automatically granted “first author” status by the MAS. Because, as mentioned earlier, leaders typically submit collabs to Newgrounds, the first author of a collab is almost always the leader. Only the first author is provided with the ability to add coauthors. James observed that coauthorship “is something that people really strive to get when they participate in collabs, so that it goes under the profile.” Holding coauthor status means that one’s user account is linked to the collab via the technical architecture of Newgrounds. The collab appears on the coauthor’s user profile and influences his or her reputation.

Attribution Criteria Although most collab participants value coauthorship, it is not always possible to make everyone involved with a collab a coauthor. The MAS allows leaders to credit themselves and up to 9 other contributors; this limitation is not imposed for technical reasons, Tom explained, but rather to curb abuse. When a collab has more than 10 participants, leaders must use some criteria to decide who is granted coauthor status. These vary widely from leader to leader, with the most commonly mentioned criteria including:

Quality: Artists with the best submissions, as judged by the leader or a vote

Quantity: Artists with the most accepted submissions

Attitude: Artists deemed the most helpful or friendly

Role: Certain roles, such as leaders and artists assigned to create the menu or end credits, are guaranteed credit.

Sometimes, leaders define their attribution criteria at the start of a collab; just as often, however, leaders assign coauthors without explicitly stating their criteria.

Attribution Challenges The coarse granularity of the MAS provides a major challenge to attribution. Until recently, the system only allowed collab participants to be credited as generic “Authors,”

rather than the more specific, meaningful titles seen in the end credits of feature films [10]. As a result, conflicts have arisen when leaders refuse to attribute collaborators using a title they feel is inaccurate. For instance, Tom recounted a story of a collaborator who was refused status as an “Author” since he had contributed only to programming and not to the collab’s story or artwork:

“The original creator, he did the story, he did the artwork, and he created the character. And all the programming for the sequel was done by another user, Bill. They both had to do a lot of work to make this game. When the game was released, the creator didn’t coauthor Bill, and his argument was that Bill wasn’t an author, he was a programmer. And he refused to basically have him listed as a coauthor of the game. That’s not how he saw the relationship.”

In addition to title disputes, many collab participants are frustrated by the MAS’s 10-coauthor maximum. Tyler elaborated on these problems:

“Not a whole lot of collabs are going to have more than ten people . . . If they do . . . no way to make everybody happy that way. Somebody’s going to get screwed on that one . . . If you’re part of the project, you definitely deserve the credit for it. If you get screwed out of the credit, that just sucks.”

Although Tyler’s attitude is shared by many collab participants, I spoke to others who are satisfied with a maximum of 10 coauthors. Often, the supplied reason involves the motivating effects of competition. If an artist wants to be included, Kester argued, he or she must make something of value:

“I think it worked better when they had five [coauthors], to be honest . . . People are really working to become one of them. If there’s less, then people aren’t really struggling. They don’t need to work as hard to get the coauthor spot.”

Thus, although it may be tempting to assume that simply increasing the MAS’s maximum number of coauthors will resolve many of the aforementioned issues, the reality of the situation is more complex.

Attribution Strategies The Newgrounds community has adapted to the limitations imposed by the MAS by devising alternative forms of attribution. Taken together, these attribution techniques can be conceived of as a hierarchy, with some options more desirable than others. At the top of this hierarchy is coauthorship via the MAS, the most prestigious form of attribution due to the high exposure it offers coauthors. One step lower in the attribution hierarchy, leaders almost always set up finished animations to display the name of the artist responsible for each segment while that segment plays. Any artist whose work is accepted in the finished animation will be attributed in this way. Finally, at the lowest level of the hierarchy, leaders often list the names of artists whose work was rejected from the finished animation in the “Author Comments” section—a text box akin to CD liner notes displayed below the finished animation. Although, as James noted, *“that’s really all the recognition they’d get,”* most artists consider it preferable to none.

Figure 7 shows an example collab, “One o’Clock Jump” (2005), where all three elements of the attribution hierarchy are used. In position 1, the collab leader, Luis, has officially coauthored nine Newgrounds members, including himself. In position 2, the username “Pako” appears as a visual overlay while his segment plays. In position 3, Luis apologizes for not being able to coauthor every member of the collab and includes a complete list of contributors in the Author Comments.

Some leaders, such as Ross and Joseph R., handle attribution challenges in a simpler way: by submitting the collab with a “studio account”, a single user account that is meant to represent all of the collab’s participants. As Joseph R. explained, *“We coauthor no one, because it’s fair to everyone.”*

3.3 Implications for Theory

3.3.1 Unique Requirements of Artistic, Expressive Domains

When doing empirical work in a relatively unexplored domain, it is crucial to make connections to better-understood domains. This enables meaningful comparisons and contrasts, and allows the researcher to situate his or her findings in a broader context and work towards generalizability. I have argued that collab leaders face many difficulties and they lack adequate technological support. These assertions beg a number of questions, both theoretical and practical. Are the challenges faced by collab leaders similar or distinct from those faced by leaders of other types of online creative

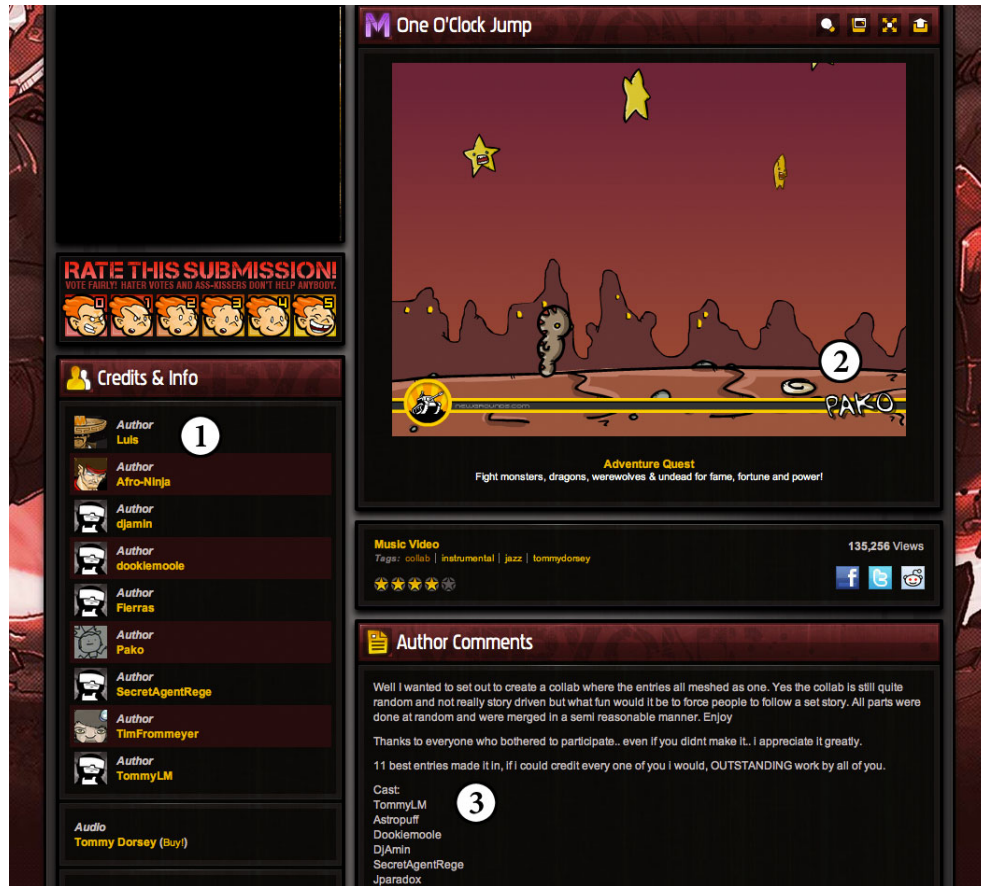


Figure 7: Attribution via coauthorship (1), visual overlay (2), and Author Comments (3) in “One o’Clock Jump” (2005)

collaboration, such as Wikipedia or OSS development? If they are different, what is the underlying cause of the difference? And from a more practical perspective, where can we look for design solutions? Can the technological systems used in other examples of online creative collaboration, like Wikipedia’s MediaWiki platform or Mozilla’s Bugzilla system, address the needs of collab leaders? If not, what is special about collabs that makes existing collaboration tools, so successful in other projects, inadequate in this one?

One way to address these questions is to take a domain-centered view of online creative collaboration. In other words, we can look to the unique requirements of the domain in which each online creative collaboration operates as an explanation for differences in social structures and technological needs. As noted in Chapter 2, much of the current research on online creative collaboration focuses on either Wikipedia or open-source software development. While software development

and encyclopedia writing are distinct creative activities in many ways, they share a key similarity in that both are generally *utility-oriented*. That is, the goal of both kinds of projects is to create something that is useful, whether it is an article summarizing existing knowledge on a topic or a new programming language or web browser. A different category of human creativity is *expression-oriented*. These activities often produce art or entertainment, such as painting a picture, writing a short story, or performing music.

This utility-oriented versus expression-oriented classification is useful because it allows me to draw some fairly clear contrasts between empirical findings on Wikipedia and OSS and the Newgrounds collabs described above. Of course, this classification is not a perfect dichotomy; for example, video game development is a type of software development, yet its outcome is often entertaining or expresses a viewpoint. There is tremendous variety in OSS development, Newgrounds collabs, and even Wikipedia articles, and any cross-domain comparison will necessarily make generalizations that do not apply to every member of a category. However, as the following sections will illustrate, there are sufficient commonalities within each domain (and absent from others) to allow for some important differences to emerge. I describe four major differences, based around the themes of completion, originality, subjectivity, and ownership, below. Table 5 summarizes these differences.

Table 5: Key differences between collabs, Wikipedia, and open-source software

	Collabs	Wikipedia	OSS
Completion	<i>Single</i> release; members only want to release polished work	<i>Continuous</i> release; most recent edit becomes latest version	<i>Frequent</i> release; “re-release early, release often” mantra
Originality	Members strive for originality above all	WP:NOR prohibits original research	Often replicate commercial projects
Subjectivity	Members defer to the leader to resolve creative differences	NPOV policy: describe conflicts but avoid taking a position	“Rational culture” prefers technologically superior options
Ownership	Members feel strong ownership towards their work	Copyleft and WP:OWN policy discourage ownership	Copyleft and “bias for action” discourage ownership

3.3.1.1 Completion

Collabs require us to unpack the meaning of a “release” and understand the relationship between release cycles, quality assurance, and leadership challenges. Collab leaders work towards a single

release because artists typically want to make public only “finished” work. For a collab to be finished, the leader must secure participation from potentially dozens of volunteers. Should the leader fail to recruit, motivate, direct, and replace these artists, the collab will be neither completed nor released, meaning that all of the effort invested will be in vain. In this sense, collabs resemble film productions in that completion is both an event in itself (the debut) and an all-or-nothing affair.

OSS projects and Wikipedia articles are never completed, only abandoned. They continue as long as people are interested in contributing to them. OSS projects, following Raymond’s [120] advice to release early and often, are characterized by frequent releases to identify bugs more quickly. Bugs not caught in the current release can be fixed for the next one, reducing the pressure on leaders. Active OSS projects may appoint a release manager to coordinate these frequent—sometimes daily [122]—releases [47, 106]. In Wikipedia, no leader stands between an editor’s contributions and their public release. Changes take effect instantly, making quality control a persistent challenge [119].

Thus, as we move from continuous release (Wikipedia) to frequent release (OSS projects) to single release (film and animation), the burden on the leaders increases (see Table 6). In a single release project, the leader must strive for perfection because the first release is the only release. In projects with more frequent releases, such as OSS projects and Wikipedia, leaders instead coordinate the iterative improvement of already-released projects.

Table 6: Release cycles for different examples of online creative collaboration

Release Cycle	Continuous	Frequent	Single
Example	Wikipedia	Open-source software	Collabs

3.3.1.2 Originality

In online animation communities, originality is both the paramount goal of most collab projects and the metric by which it is evaluated. Asked what constitutes a “good collab idea,” the responses of my participants were remarkably consistent. For example, Joseph R. asserts, *“It’s gotta be something original ... The best ones are usually something different, something that’s not really been done before.”* However, as Becker [10] explains, originality is risky, effortful, and otherwise challenging to artistic collaboration because it prevents artists from taking advantage of familiar work practices

and patterns of social interaction. For example, Becker describes the work of Henry Partch, who spends a year training musicians to play the instruments and learn the notation he has invented; in contrast, a professional symphony using conventional instruments and notation can learn to play the same amount of music in a day [9]. Many collab leaders and artists, as amateur volunteers, lack the time or experience to pull off highly original collabs. Even if collab leaders are experienced artists, the pool of qualified artists from which they can draw is small. As a result, highly original projects are rarely attempted:

“More original ideas, they’re popping up less and less because they just don’t get done. Everyone has their own lives to deal with. When you tread into unknown ground, things take longer to do. It takes longer to learn things and they just don’t get done.” (Tyler)

Specifications, themes, arrangements, and the integration process provide tools with which collab leaders can manage originality and convention, although this management process places a considerable burden on the leader. Other forms of online creative collaboration succeed by sidestepping the issue of originality altogether. For example, Klineciewicz observes that very few OSS developers attempt innovative projects, possibly because “[b]reakthrough projects tend to be more difficult to understand and adopt for potential users” [90]. Most successful OSS projects either provide a free, comparable alternative to a commercial software product, or extend academically produced code [90, 127]. On Wikipedia, original research is prohibited by policy [123, 24]. To summarize, the more original a project is, the more difficult it is for everyone involved to work on it.

3.3.1.3 Subjectivity

Most real-world design problems lack one “correct” solution. Rather, multiple solutions are possible, each with its own advantages and disadvantages [137]. More open-ended or “ill-defined” problems are more difficult to solve [137]. Animated moviemaking is an especially open-ended problem because artistic expression is fundamentally subjective; no animation style is definitively more “correct” than another. Thus, disagreement among artists seems inevitable. Collab leaders manage this challenge by supplying creative direction for the project; artists accept their authority until it is abused. Creative direction provides decisive answers to the many questions that arise during collab production:

“There are so many questions to be asked about, you know, ‘What don’t you want us to do?’ ‘What’s the format?’ ‘Do you want a picture of a TV frame around my part or is that something that you’ll handle in post-production?’ Just being there to answer the questions is really important in something [so] complex.” (Joseph R.)

In other online collaborations, the goals and solutions are more well-defined. Many OSS projects seek to provide free alternatives to existing commercial products; the goal is to replicate their functionality [90]. Wikipedia articles borrow in the familiar format and formal tone of a reference work [45] and the site makes extensive use of a 20,000-word style guide.¹ The comparatively straightforward goals and solutions of these projects constrain the space of possibilities, limiting the need for creative direction.

Additionally, these projects embrace policies of objectivity as a substitute for a leader’s creative direction. In many OSS projects, “[m]embers try to make their behavior logically plausible and technologically superior options are always chosen in decision-making” while “emotional or authoritative factors are precluded in . . . communication” [157]. Similarly, Wikipedia editors are required to embrace a “neutral point of view” (NPOV) rather than writing in a “personally invested tone” [123, 24]. By promoting facts and logic over opinions and emotion, OSS developers and Wikipedia editors are guided by a set of shared beliefs that mitigates the need for a creative director’s decisions.

3.3.1.4 Ownership

Strong feelings of ownership among collab artists constrain how the leader may work with their submissions. In the integration phase of the collab production process, leaders must grapple not only with technical and aesthetic considerations, but also social ones as they attempt to create a coherent finished animation. Norms in online animation communities prohibit the leader from changing artists’ work without first seeking permission or, alternatively, asking artists to make more substantial modifications themselves. Both of these processes are time-consuming and inefficient. As most communication within collabs takes place over asynchronous discussion forums, it may take hours or days before a request made by the leader is received by an artist.

¹http://en.wikipedia.org/wiki/Wikipedia:Manual_of_Style

Other online creative collaborations operate in a more open fashion. In “pure” OSS projects—i.e., projects where “every developer . . . and contributor is a volunteer” [37]—the available evidence suggests that ownership of code modules is uncommon. For example, case studies have shown that more than one developer contributes to most code modules in FreeBSD [37], Apache [68, 106], Subversion [68], NetBSD [68], and SugarCRM [34]. Through online revision control systems such as CVS and bug tracking systems such as Bugzilla, OSS developers are able to quickly iterate on each others’ contributions, promoting rapid improvements. Yamauchi et al. [157] identify a “bias for action” over coordination in OSS projects, meaning that developers are likely to contribute to a project module before expressing any commitment to it.

In Wikipedia, article ownership is prohibited by the WP:NOR policy: “If you create or edit an article, know that others will edit it, and within reason you should not prevent them from doing so.”² Quantitative measures confirm that this policy is generally obeyed and enforced by Wikipedia editors.³ In the English Wikipedia, only 7.5% of articles have a single editor, while about 50% of articles have over seven distinct editors and about 5% have more than fifty [22]. Because articles can be edited by anyone without prior approval, most acts of vandalism can be corrected within minutes [119] and articles can be updated to reflect recent events almost in real time. Thus, OSS projects and Wikipedia’s open formats promote an efficiency that collab leaders are unable to replicate.

3.3.2 The Need for Redistributed Leadership

Collab leaders face many challenges. They shoulder burdens and assume myriad roles—from creative director to competent animator—in their efforts to design, manage, and complete successful projects. They provide an extreme example of Butler et al.’s observation that “technical responsibility in online groups goes hand in hand with social responsibility” [25]. For many collab leaders, saddled with domain-specific challenges, these dual responsibilities can be overwhelming, and the collab may consequently fail. In Chapter 4, I will show quantitatively just how common failure is among collabs: more than 80% of projects do not result in a completed animation.

To help more collabs succeed, we must first understand why leaders are often so overburdened.

²http://en.wikipedia.org/wiki/Wikipedia:No_original_research

³A notable exception are the self-identified “Maintainers” who have been shown to express territoriality towards the articles they frequently edit (< 1,500 out of several million articles) [139].

This knowledge may generalize to other examples of online creative collaboration which experience high failure rates or struggling leaders. I propose that insights from distributed leadership and distributed cognition, reviewed in Chapter 2, can shed light on this question. *My hypothesis is that collab leaders are overburdened by the challenges of creative, geographically distributed collaborations, and technology for supporting and transforming leadership (via redistribution) could help ease this burden.* I summarize the evidence supporting this hypothesis in the following sections.

3.3.2.1 *Inadequate Technological Support*

Leaders of creative, geographically distributed collaborations face many challenges, some of which I reported early in this chapter. In the case of Newgrounds collabs, they must design the project by structuring it and proposing it to the community. They must manage artists by recruiting, directing, motivating, and replacing them. And once the artists' work is complete, leaders must complete the project, integrating the various work segments and meting out attribution. Despite all of these challenges, leaders lack adequate technological support and must rely on ill-suited, generic communications tools.

As described above, leaders announce a new collab by posting a thread on the forums describing the collab's goals. However, finding these collab threads can be difficult. For many years, Newgrounds staff limited collab threads to one forum, the Flash forum, where they were intermingled with technical questions about Flash development. If forum members are interested in a collab, they reply to the thread, bumping it to the top of the forum. Smaller collabs or those dealing with niche interests are at a significant disadvantage because they compete for exposure with the most popular threads in the forum. Once a thread falls off the front page of the forum, it is typically soon forgotten and dies.

Those collabs fortunate enough to attract a critical mass of members use the thread itself as a central hub for organization. However, forums are generally designed for conversation rather than collaboration, and Newgrounds is no exception. One issue is the quantity of communication. As collabs attract members and generate activity, their threads quickly balloon in size. Some collabs go on for months, accumulating thousands of replies across dozens of pages, an almost impenetrable barrier for newcomers. Another issue with the forum is the chronological ordering of replies.

Members who solicit feedback on works in progress are lucky to receive any comments before their post is lost in a sea of subsequent replies on other matters. A final issue with the forum is the lack of support for file sharing and management, a major obstacle for complex multimedia projects like collabs. The Newgrounds forums originally did not support file uploads at all; now each reply can include one file (images only).

3.3.2.2 *Oversimplified Projects, Overburdened Leaders*

Collab leaders respond to the limitations of the Newgrounds forums in two main ways: simplifying the structure and goals of the collab, and picking up the slack themselves. Most leaders design collabs to minimize the need for communication between members, and consequently maximize the probability of success. As a result, divide-and-conquer style projects with top-down, centralized leadership are typical. As mentioned above, the most common collab arrangement is the “themed” collab, where members create standalone segments loosely connected by a shared theme, such as tributes to a popular musician or television show. These highly modular segments can be created almost entirely independently and in parallel. While members focus on creating these segments, leaders handle almost everything else: providing feedback and creative direction, motivating artists and replacing drop-outs, collecting files, posting daily progress updates and member lists, and integrating all the pieces into a coherent whole when the animation work is completed.

Clearly, the existing tools used by leaders are far from adequate. Better technological support could ease the burden on leaders, increase communication between members, open up new leadership styles, and result in more successful, complex, creative projects. In particular, this new technological support could be designed to both support existing leadership practices, and transform them by redistributing them more broadly across the group.

3.3.3 **Authorship and Peer Production**

Little research has addressed online creative collaboration in artistic- or entertainment-oriented domains, and an even smaller fraction of this work deals with integration or attribution. A valuable step towards generalizability would be to situate these findings in a broader theoretical framework alongside other forms of online creative collaboration. Benkler’s [11] theory of *social production* provides one promising candidate. Benkler argues that to succeed, social production requires (1)

modularization, (2) heterogeneous granularity, and (3) low-cost integration of work. While others have shown that Wikipedia and many OSS projects exemplify all three, I found that low-cost integration continues to elude collabs. I proposed three reasons why this may be (aesthetic, social, and technical challenges) and suggested design implications to reduce the cost of integration. Future studies in other contexts may help refine Benkler’s theory and reveal connections between the many different genres of online creative collaboration.

This study also points to the need to understand, and design for, notions of authorship, ownership, and attribution that are rapidly evolving in online creative contexts. Flash animations provide just one example of this phenomenon. Digital artifacts, including movies and games [107], music [27], and writing [79], can now be collaboratively created, published, deconstructed, remixed, and re-published by groups of people who may never meet or even explicitly communicate with each other. In light of these new creative practices, and the various legal mechanisms used to promote or inhibit them [96, 36], attribution provides a starting point for exploring how technological support can help people retain the incentives and recognition that they value.

3.4 Implications for Design

3.4.1 Designing for Artistic, Expressive Domains

I argued above that collabs present an example of expression-oriented online creative collaboration. They differ from the more extensively researched, utility-oriented projects like Wikipedia and OSS projects in key ways, namely completion, originality, subjectivity, and ownership. From these theoretical findings, I can derive design implications for technologies that support expression-oriented online creative collaboration.

Collab members often prefer to keep a project “under wraps” while it is in production and share it with the public only after it is finished. This suggests that designers should consider offering privacy controls which allow collab members to control visibility and access to projects in progress. It may be desirable for communication and content within the collab to remain hidden until release, with the exception of a public-facing announcements page of some kind. A system for managing collab membership and invitations, possibly with tiered permissions, may also be helpful. The current forum system, which is open to the public, offers few privacy options aside from private

messages, which can only be sent between a pair of users.

Another key difference, originality, emphasizes that collab members highly prize originality and novelty. Making something that hasn't been done before is an appealing goal for many, especially more experienced collab leaders. To support originality, designers may want to steer away from systems that heavily constrain workflows or place significant limitations on what users can create together. It may be tempting to build tools specifically geared towards a small set of popular collab designs, but collab members are likely to circumvent these tools in order to create something more original. A more lightweight approach that maximizes flexibility and offers limited structure may work best.

Comparisons to Wikipedia and OSS also emphasized the particularly subjective nature of collab production, where clear right or wrong answers are rare due to the artistic and expressive goals of many projects. In cases of uncertainty, collab members defer to the creative vision of the leader, but this approach risks leaders becoming overburdened if they are asked to make too many minor decisions. Technological support for subjectivity should assume the need for leaders to have the final say in many creative decisions, but also allow leaders to delegate some decision-making among a broader set of collaborators.

The findings above also suggest that many collab members view themselves as artists and feel a strong sense of ownership toward their work. This suggests that, in contrast to many systems designed for open-source collaboration, technology for supporting collabs and other types of expressive projects should give content creators significant control over their contributions. It may not be advisable for systems to allow members to directly modify other members' content, but rather orient collaboration around suggested changes and possibly contributing variations to be considered alongside the original [137].

3.4.2 Designing for Redistributed Leadership

This research showed how collabs leaders were overburdened, the types of challenges they face, and their strategies for managing these challenges. As mentioned above, I suggest that the limitations of the forum software help explain why so many leaders struggle and most collabs fail. New technological support can help support leaders' efforts and transform them via redistribution across

the group in order to avoid becoming overwhelmed. The literature on DCog and DL provides some theoretical insights into how to accomplish this. From DL and DCog, I borrow the idea that leadership and cognitive processes can be distributed across members of a social group. This suggests *decentralization* as a design principle: collaboration tools should allow leaders to easily share their authority with other members of the project. From DCog, I borrow the idea that cognitive processes can also involve coordination with artifacts, and extend this notion beyond cognitive processes to include leadership. This suggests the design principle of *automation*, meaning that the technological system itself should be able to assist with leadership as a non-human agent, much as, for example, bots and scripts perform social roles in combating Wikipedia vandalism [60]. Finally, since DL and DCog emphasize that distributions can happen over time, new technological support should allow leaders to reconfigure decentralization and automation in real time, in response to changing circumstances.

3.4.3 Designing for Integration and Attribution

3.4.3.1 Cr-editing

These findings underscore the importance of integration and attribution in online creative collaboration, and illustrate the extent to which these two tasks can be interleaved. In the domain of Flash animation, the burden of managing these challenges usually falls onto the shoulders of one person, the collab leader, who must simultaneously integrate (edit) the materials submitted to him or her by artists, and attribute (credit) those whose contributions are included. Yet, technologies often divide this *cr-editing* process, making the burden on the cr-editor that much more onerous. In the case of the collabs presented here, leaders primarily edit in the Flash authoring software but credit on the Newgrounds website. Designers may consider ways of closing gaps like these, for example, by building APIs for sharing attribution metadata between authoring environments and publication venues, equipping authoring environments with special tools for maintaining attribution metadata during integration, or providing interfaces for lightweight integration within the publication venues.

3.4.3.2 Collaborative Authorship

It may be tempting to view the Newgrounds MAS only in terms of its perceived shortcomings, such as the 10-coauthor maximum or the generic “Author” title. Yet, among the countless online

communities that have sprung up to support user-generated content, it is difficult to collect even a handful of examples that provide any specialized technological support for crediting multiple collaborators on a single project. Instead, many of these websites, at least from an architectural viewpoint, assume that the *uploader* of a piece of content and the *creator* of that content are the same person, and that this person acted alone. This assumption appears both in websites based around content that is usually authored by individuals (e.g., photo sharing on Flickr), and those hosting content that is often collaboratively authored. For example, YouTube is one of many online hosts of user-generated content lacking features for attributing multiple users. In Figure 8, creators of the *Chad Vader: Day Shift Manager* parody series (2006–) circumvent these limitations by uploading their episodes with a studio account (blamesocietyfilms) and crediting individual cast members in the video’s “Description” field.

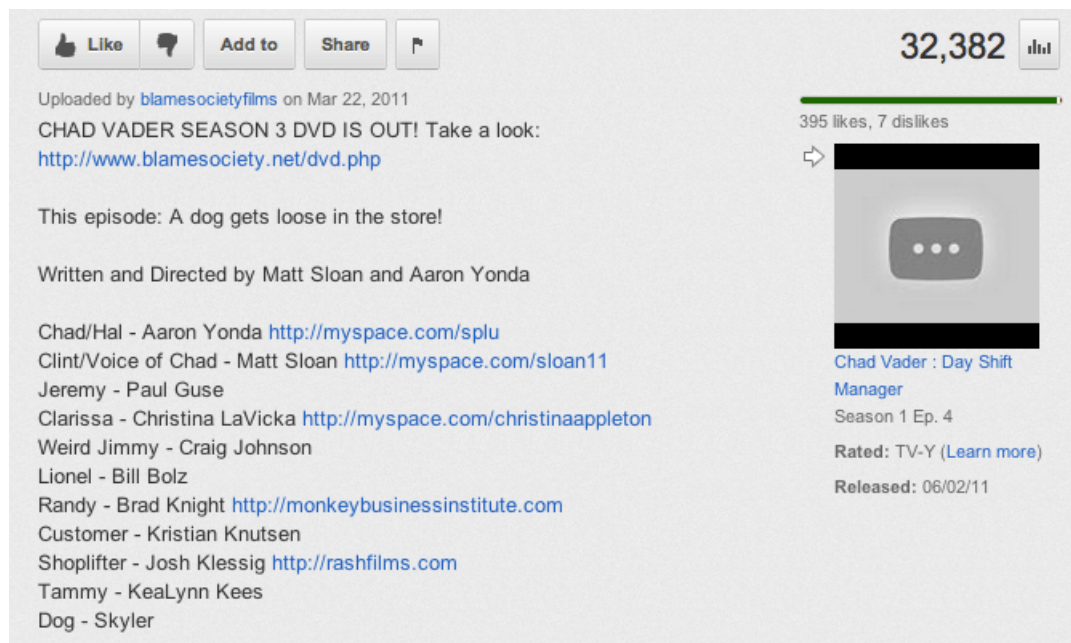


Figure 8: Circumventing attribution limitations on YouTube

From this perspective, while the Newgrounds MAS leaves room for improvement, it nevertheless stands apart by offering even basic collaborative authoring features. While my participants disagreed over specifics, all agreed that the MAS was better than nothing. As online creative collaboration becomes more commonplace, the need for technological support for collaborative authorship is likely to grow. Designers may consider the MAS, and systems like it, as starting points

when dealing with online communities whose practices challenge a simplistic definition of creator, (co)author, or uploader.

3.4.3.3 *Community Values*

Even within one domain of online creative collaboration, attitudes surrounding what type of attribution is appropriate can differ markedly. Faced with the limitations of the MAS, some collab participants embraced the 10-coauthor maximum, while others railed against it and developed a hierarchy of attribution alternatives. Over time, the online animation community may reach a consensus about what type of attribution systems it values, just as many offline creative communities have developed social norms and professional standards for attribution [10, 13]. One practical suggestion I make to accelerate this process is to design systems which separate attribution and commendation. For example, in Wikipedia, the “history” tab automatically tracks edits to a given article (attribution), but editors can also manually recognize outstanding efforts (commendation) by posting barnstars on each other’s user pages [93]. In the community I studied, these notions were conflated, forcing collab leaders to choose one or the other, and severing meaningful connections between artists and their work.

I also found a connection between the results of this study and the legal concept of *droit moral*, or authorial moral rights, which forms the basis of modern copyright law in some countries [94]. These rights, which include recognition as the creator (attribution), choosing when and how the work is disseminated (disclosure), and prohibition against misrepresenting the creator’s expression (integrity), encompass many of the concerns voiced by my participants. For example, artists wanted to be coauthored for their efforts (attribution), leaders solicited artists for bug testing before publishing the final animation (disclosure), and leaders asked permission before making major changes to artists’ segments (integrity). As the adoption of *droit moral* ideas occurred organically in the strategies employed by leaders, designers may consider them as important principles to incorporate explicitly in future collaborative authoring environments.

3.5 *Chapter Summary*

In this chapter, I reported on the challenges for leaders of online, collaborative animation projects called “collabs.” The primary data source for this study was a set of in-depth interviews with 17

members of Newgrounds and related communities who had experience working on collabs. From this data, I found that leaders are crucial to the success of collabs, but leaders face three major challenges: designing the project, managing the artists, and completing the project. I also found that most leaders reported being overburdened and lacked adequate technological support, and the majority of collabs failed to produce a completed animation. Finally, I found that collabs, as examples of online creative collaboration in artistic, expressive domains, have some unique requirements that question the generalizability of previous research in contexts like Wikipedia and open-source software development.

The work presented in this chapter has both theoretical and design implications. From a theoretical perspective, I identified four key differences between expression-oriented and utility-oriented online creative collaboration: completion, originality, subjectivity, and ownership. I also proposed that the challenges faced by collab leaders, and the resulting failure of many projects, could be partly explained by applying theories of distributed leadership and distributed cognition. Additionally, I discussed the integration- and attribution-oriented challenges that collab leaders manage in terms of Benkler's theory of social production.

These results can also inform the design of social computing systems in several ways. I suggested that artistic, expressive forms of online creative collaboration could benefit from certain types of technological support, such as privacy controls, flexible workflows, and tools for delegation. I also proposed that software can help support and transform leadership more effectively in online creative collaboration through design principles like decentralization and automation. Finally, I offered design considerations for appropriate recognition of authorship in online creative collaboration.

In the next chapter, I build on these results with a second empirical study of existing leadership practices which focuses on success factors in online creative collaboration.

CHAPTER IV

SUCCESS FACTORS

RQ2: What factors contribute to successful online creative collaboration?

This chapter describes the second of two empirical studies investigating existing leadership practices in online creative collaboration. The previous study focused on challenges for leaders, while this study looks at the opposite side of the coin: what makes online creative collaboration successful? To address this question, I again turn to collaborative animation production in the Newgrounds community.

Studying success factors requires us to first understand how participants in collaborative efforts define success. As described in Section 3.3.1.1 of the previous chapter, most collab participants define success as completing a collab. Unlike open-source software (OSS) projects and Wikipedia articles, collabs are not constantly improved and re-released many times. Rather, they are typically released to the public just once, much like an independent film debut, and almost never changed again. Newgrounds members refer to completed collabs as “successful,” whereas incomplete collab are “failed” or “dead.” Other potential success metrics, such as the ratings and popularity of completed collabs, were typically viewed as secondary.

Completed collabs offer several benefits to their creators. First, only completed collabs are hosted on Newgrounds for audiences to watch; otherwise, the work goes mostly unnoticed. Second, the ratings assigned to completed collabs by audiences contribute to each creator’s Batting Average (BA), the average score of all of his or her Newgrounds submissions. The BA is used to determine member rankings, thus affecting creators’ exposure and reputation within the community. Third, completed collabs may generate income for creators, through Newgrounds’ ad-based revenue sharing program (tied to percentages specified in the multi-author system), cash prizes awarded by the Newgrounds staff for highly rated submissions, or sponsorship from third parties.

In Section 2.4, I noted that few studies have considered success definitions in domains of online

creative collaboration other than OSS development. Therefore, in this research, I focus on comparing and contrasting success in collabs to success in OSS. As with previous research on OSS success (e.g. [46, 30]), this investigation of successful online creative collaboration takes a mixed-methods approach. First, I use in-depth interviews to generate an initial set of success factors for collabs, described in the next section, and discuss those factors in terms of contemporary leadership theory. From these results, I derive a set of hypotheses that I explore more deeply in a second, quantitative study, described in the next section. I then compare and contrast success factors in collabs to previous empirical research on leadership in open-source software development. Finally, I discuss implications for theory, focusing on developing more general principles of online creative collaboration, as well as implication for the design of social computing systems that foster success.

4.1 Qualitative Study

4.1.1 Methods

To learn how members of the Newgrounds community define success and identify potential success factors, I drew upon the interview data from the previous study of challenges for leaders. As a reminder, the data came from in-depth, semi-structured interviews with 17 animators who had collab experience. More details about the participants, recruitment, and interview techniques can be found in Section 3.1.2. For this study, I performed a bottom-up analysis of the responses to a series of questions about successful collabs, e.g., “What makes a collab likely to succeed?” and “What does a successful collab look like?” The results of this analysis are detailed below. As with the previous study, I use real names when describing participants unless they requested otherwise.

4.1.2 Results

In my interviews, participants identified a number of potential success factors, which I organize into three themes: planning and structure, reputation and experience, and communication and dedication. I present each of these themes, illustrated with participant quotes, in the following section.

4.1.2.1 Planning and Structure

Participants frequently mentioned the amount of planning and structure that leaders had invested in a collab thread as a strong indicator of success. Plans and structure not only offer logistical benefits,

but also create a favorable impression of the leader:

“Collaborations fail because people get an idea in their head and they can’t accurately convey their vision to the people they want to participate. And the collaboration doesn’t appear very appealing because the person doesn’t seem organized.” (Joseph Rooks)

Participants singled out technical constraints, or “specs” (e.g., frame rates, dimensions, and file size) as especially important to a successful collab. These details are crucial to communicate early on in order to prevent serious compatibility problems in the collab’s future:

“You have to give people really concrete boundaries in terms of how to put their movie together—not the creative part, but the technical aspects of it—in order for it to succeed to begin with.” (Luis Castanon)

“One thing that’s important is laying down the ground rules for everyone . . . You have to let them know what frame rate they’re working with and what the size of the movie’s going to be. It’s really easy to forget—it’s really easy to start one and forget the little details that you need from people . . . You’ll get people submitting things that aren’t the right size, or they aren’t the right frame rate, or they have other problems with them.”
(Tom Fulp)

4.1.2.2 Reputation and Experience

For other participants, familiarity with the people involved in a collab is at least as important as the idea itself and how well it is organized. Often, the first thing artists look for in a collab thread is a “familiar face”; i.e., the name of a friend or past collaborator:

“If I was going to join a collaboration, I’d probably like to stick with the crowd that I know.” (Ross O’Donovan)

“If it’s somebody that you know and trust—I mean just to submit decent Flash—then, yeah, it’s a good idea to join that collab.” (Michael Frank)

Artists who lack this familiarity may view the user profiles of the collab thread’s supporters to get a sense of their reputation in the community. On Newgrounds, user profiles display a complete

history of a user's submitted animations as well as their ratings. The average rating of a user's submissions, a single 0–5 score, comprises his or her Batting Average or BA. Artists with high BAs or lengthy histories of submitted animations are thought to be competent, bolstering the collab's chances of success:

“You check if people have done them before. If they’ve done them before, they’re most likely to be able to do them. Or if they’ve got their own solo projects, then they’re more likely to follow through on their projects.” (James Hole)

A collab leader's reputation, in particular, must endure considerable scrutiny by artists:

“It definitely helps when the leader is someone who already has the respect of the other users ... When a popular artist asks people to get involved, they already assume it's going to have a certain level of quality to it. If it's some unknown person who wants you to be involved in a collab, you don't know how they're—what the quality is going to be like. You don't really want to work alongside crap.” (Tom Fulp)

If collab leaders are not well known, artists may resort to looking through their previous work to get a sense for their competency. For example:

“I think it also is important that people have a substantial amount of experience on their own with Flash and animation before they take the leadership role in a project of that nature. Just because it leads to a lot of frustration when you know more than the person who's essentially going to be giving you orders, in a way.” (Luis Castanon)

“I definitely think your library of your own Flash submissions is probably your best collateral for getting people involved in your collab. It's all about what you've done.”
(Tom Fulp)

4.1.2.3 Communication and Dedication

Some potential success factors, such as communication and dedication, are brought into relief only after a collab has started. As artists drop out and join the collab in progress, new waves of replacements benefits from additional information about the collab's progress up to that time.

Participants suggested that more activity in a thread, indicated by the number and frequency of replies, often corresponds to a greater likelihood of success. More active threads get increased exposure on the first few pages of the forum, inviting still more replies, in a beneficent cycle:

“The thing about collabs, it’s all about community. If only one person’s interested, they’ll just regularly bump up the thread, but after awhile they’ll just give up or somebody just comes along and tells them, “No, this is rubbish.” But if it’s a really good idea, loads of people will take part and the thread will just keep being bumped and bumped up to the top page.” (Robert Westgate)

Measures of reply counts may only partly explain why highly active threads seem to offer more success potential. The nature of that activity is also important. Participants told me that frequent communication between a collab leader and non-leader collab participants is essential to the success of any collab:

“A collaboration can’t succeed without [communication]. At least, not a complex one. A movie director doesn’t walk onto the set and say, “I want you to do this, this, and this. I’ll be back in a few hours to check on you.” A movie director is constantly there giving his guidance.” (Joseph Rooks)

Joseph’s conviction that leaders must be in constant contact with collab participants speaks to a broader notion of dedication that participants sought out. Collabs with dedicated leaders, participants explained to us, are more likely to succeed because the leaders are personally invested in their outcomes:

“[A good leader is] someone with the dedication to actually, you know, see a project through to [success] and make sure everyone’s doing their own stuff. It’s just incredibly important if you want to get a collaboration off the ground.” (Ross O’Donovan)

4.1.3 Discussion

Participants shared well-developed strategies for identifying collabs with high potential to succeed. These strategies can be grouped into three sets of criteria: planning and structure (determined mostly

by the thread first post), reputation and experience (determined mostly by leader attributes), and communication and dedication (determined mostly by thread activity dynamics).

Many of these success factors can be mapped onto theories of effective leadership reviewed in Chapter 2. Interviewees emphasized the importance of having strong technical skills, being dedicated and committed to the collab's success, and having experience with past collabs. These qualities can be connected to *trait-based* theories of effective leadership. Additionally, interviewees asserted that successful collab leaders performed certain behaviors, such as providing initial planning and structure in a new collab, and frequently communicating with members while a collab is in progress. These success factors are more aligned with *behavioral* theories of leader effectiveness. Other success factors identified by interviewees, such as being prominent and respected in the community, speak most directly to *power-influence* theories of leadership.

Taken together, the success factors suggested by my interviewees are supported by scholarly research on what constitutes successful leadership. However, it is too soon to say that these factors accurately predict collab success. The interview data, while providing an invaluable starting point, is retrospective and somewhat anecdotal; the interviewees themselves admitted that their predictions and assessments of success potential do not always bear out. Moreover, the trait-based, behavioral, and situational leadership theories developed from research in traditional organizations may not apply equally well to online creative collaboration generally, or Newgrounds collabs particularly. Fortunately, the Newgrounds forums and Flash Portal offer a wealth of data for empirically validating these success factors and the theoretical principles related to them. It is possible to treat each qualitatively generated success factor as a hypothesis to be supported or refuted with evidence from large-scale quantitative analysis of collab threads and leader attributes. With this goal in mind, I propose the following five hypotheses derived from the interview data.

4.1.3.1 Planning and Structure

H1: Successful leaders provide more initial planning and structure, especially technical specifications.

This hypothesis from interview participants also aligns with behavioral theories of leadership. *Planning and clarifying roles and objectives* have been shown to be effective leadership behaviors

[160]. In addition, effective leadership often involves *initiating structure*, in which “leaders define and organize work roles and design” [62], and “structuring and directing team members’ activities” [89]. The measure I use for “initial planning and structure” is the quantity of planning/structural elements provided by the leader in the first post of a collab thread. I describe the process and rationale for identifying these elements in detail below.

4.1.3.2 *Reputation and Experience*

H2: Successful leaders are more prominent and respected in the community.

Being prominent and respected in a community are markers of a strong reputation, which is often associated with power–influence theories of leadership. Often, this reputation is derived through expertise; if non-leaders lack this expertise but require it for an important problem, the leader has “expert power” over them. As noted by Yukl [160], “Reputation depends in part on actual expertise and in part on impression management.” Some leaders can successfully “fake it ’til they make it” but most will eventually require a solid base of real expertise.

Many factors may contribute to a Newgrounds member’s online reputation. For the purposes of this research, I define a “prominent and respected” leader as one who posts frequently in the discussion forums, has won many awards for his or her submissions, and has achieved a high Bating Average (thus appearing near the top of the Newgrounds leaderboard). These are markers of expertise, similar to offline counterparts such as framed diplomas and trophies [160].

H3: Successful leaders have more experience with solo projects and past collabs.

As noted by Fiedler [51], there is surprisingly little research on the role of experience in effective leadership, and purely time-based measures (e.g. how long a leader has performed his or her role) are not strongly correlated with success. I measure a collab leader’s experience in two ways. Interviewees noted the importance of leaders working on successful collabs in the past, which I operationalize as the number of completed collabs the leader is coauthored on. This metric, based around potentially powerful developmental experiences [104], is a better measure of experience than time-based metrics [51], e.g. the length of time the leader has been a member of Newgrounds. Interviewees also mentioned that successful leaders should have strong technical skills using Flash,

which I operationalize as the number of completed solo projects the leader has hosted on Newgrounds.

Technical skills are included in many conceptualizations of trait-based leadership theories (e.g. [160]). Experience is harder to categorize, as it is normally discussed in the context of leadership development or training. Some work suggests the importance of experience is best explained through contingency or situational theories of leadership; that is, different combinations of leader traits and situations can result in meaningful learning experiences [104, 50]. Bass [8] categorizes experience as a situational variable because “leaders’ experience with leadership changes the situational favorability to them.” For this research, I categorize experience as a trait, viewing it as essentially a collective term used by interviewees to refer to knowledge, skills, and abilities that are difficult to name or tease apart.

4.1.3.3 Communication and Dedication

H4: Members of successful collabs communicate more frequently and consistently.

H5: Leaders of successful collabs communicate more frequently and consistently.

Behavioral leadership theories support the idea that effective leaders are good communicators. Specifically, two communication-centric leadership behaviors shown to be important are *informing* (tell members what they need to know) and *monitoring* (keeping track of progress) [160]. While interviewees emphasized the necessity of frequent communication, the leadership literature warns against too much communication, which can waste the leader’s time and overwhelm members with information that isn’t relevant [160]. To measure communication frequency for this study, I examine the number and frequency of replies made by each member or leader in a collab thread.

Interviewees also mentioned consistent communication as a potential success factor; collab threads should see a steady stream of replies, and leaders should demonstrate commitment and dedication. These qualities are similar to empirically validated leadership traits such as persistence and dependability [160]. I analyze these traits indirectly by graphing the activity dynamics for leaders and members in collab threads and looking for patterns of consistent communication.

While other hypotheses are possible to generate from my interviews, I present this list as a subset to explore more deeply with a second study.

4.2 *Quantitative Study*

The goal with this second study is to leverage participants' domain knowledge and expertise as a starting point for a complementary, quantitative investigation of success factors in online creative collaboration. In the following sections, I describe the methods and results of this second study.

4.2.1 **Methods**

4.2.1.1 *Data Collection and Cleanup*

The target of my data collection was the Newgrounds discussion forums (BBS). To collect this data, Kevin Ziegler, an undergraduate research assistant, and I built a web scraping tool using the BeautifulSoup¹ library for Python and a MySQL database. I then used this tool to scrape all threads in the Flash forum² whose last reply was posted before January 1, 2008, for a total of 137,328 forum threads. The scraping took place in September 2008, nine months after the latest reply of the most recently active threads in the initial corpus. This delay was intended to provide sufficient time for collab threads to reach an outcome (either completion or failure). For each thread, the scraper collected the title, reply count, date posted and author of the first and last posts, and the unique ID. From this initial corpus of 137,328 threads, I then sought to separate collab threads for further analysis. Most thread creators use the word “collab” in their titles to signal that the thread is a collab thread. My solution was to separate threads with the word “collab” in their titles, resulting in a set of 2,797 probable collab threads.

I then purposefully sampled 892 collab threads from this set in three bins: low (<10 replies, N=300), medium (10–50 replies, N=300), and high activity (>50 replies, N=292³). Two factors motivated this decision. First, collab threads generate a highly variable amount of activity, ranging from zero replies to thousands; most generate only a few replies. A random sample would likely comprise almost entirely low activity threads. Second, activity within threads is likely to correspond to success; a thread with a high reply count has attracted many participants and much interest, whereas a thread with few or no replies suggests that the community ignored it. I chose the cutoff

¹<http://www.crummy.com/software/BeautifulSoup/>

²When this analysis was performed in 2008, the Flash forum was the only area of the Newgrounds BBS where collab threads were permitted. In 2009, the Newgrounds staff created a new Collaboration forum specifically for collab-oriented discussion.

³Only 292 collab threads in the data set had more than 50 replies.

point of 50 because it was the mean reply count for the pilot data set.

For each *collab thread*, the scraper collected the author, date posted, and message content for every reply, supplementing the data collected for every thread in the initial corpus. The scraper also collected data about the thread creator, i.e. leader, of each collab thread. For each *thread creator*, the scraper collected the total number of forum posts, completed solo animations, participation in completed collabs, awards won, and Batting Average (BA). I adjusted these data to match the thread creator's contribution history at the time he or she started each collab thread. This adjustment was needed to reflect the thread creator's reputation at the time the community was deciding whether or not to join his or her collab thread. I also removed the data for two creators with abnormally high participation in completed collabs, after determining them to be outliers using Grubbs' test ($z=43.04$ and $z=49.97$). Finally, Newgrounds requires at least one accepted submission to calculate a member's BA. For analyses related to BAs, I excluded 283 collab threads whose leaders had no accepted submissions, and therefore did not have BAs.

A portion of these collab threads resulted in a success; i.e., a completed animation hosted on Newgrounds. For these threads, I used content analysis (see next section) to find the unique ID for the associated completed animation on Newgrounds. I then recorded the date each animation was published on Newgrounds.

Figure 9 shows an example collab thread for the "Street Fighter Collab" (2009). Position 1 shows attributes for the leader, Stamper, such as his total forum posts (2,460). More leader attributes are displayed on Stamper's profile page. Position 2 shows planning/structural elements in the collab thread's first post, including dimensions (720×480), frame rate (30 fps), and maximum clip length. More elements are present in the lower half of the first post (not shown). Position 3 shows the total number of replies for the collab thread (1,678, spread across 56 pages). This reply count represents some of the data I collected for analyzing activity dynamics within collab threads.

4.2.1.2 Data Analysis

I performed five types of analysis on these data:

- A content analysis of the first posts in collab threads

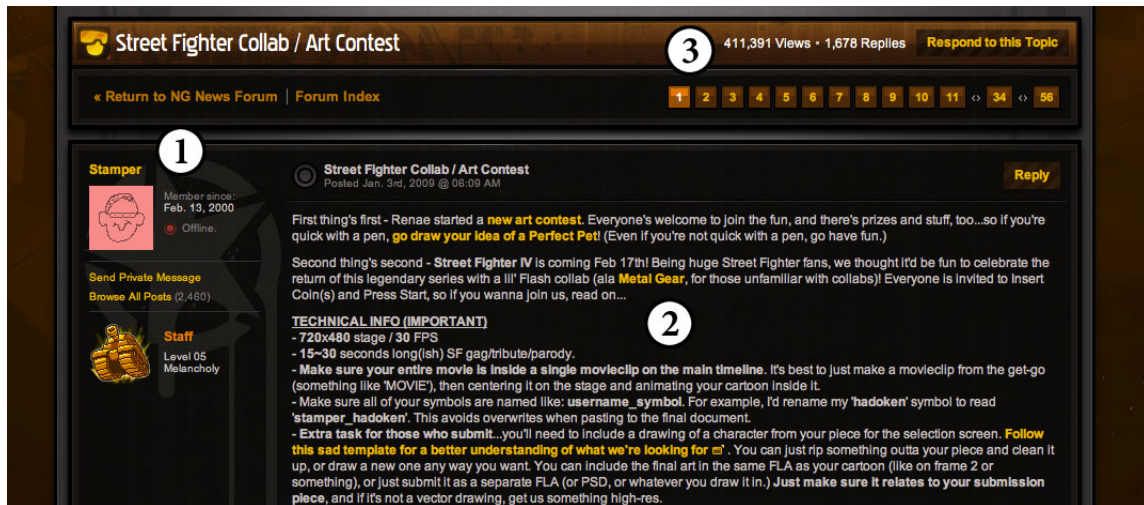


Figure 9: Leader attributes (1), planning/structural elements (2), and activity dynamics (3) in “Street Fighter Collab” (2009)

- A categorization of the outcome of threads as either success (meaning completion of an animation) or failure
- Mann–Whitney U-tests comparing successful vs. failed collabs with respect to (1) first post attributes, (2) activity dynamics, and (3) leader attributes

Each of these analyses is detailed in the following section.

First, I performed a content analysis [97] by manually coding the first post of each collab thread for structural elements. Kevin Ziegler and I served as judges for the content analysis. First, we developed a coding scheme by independently analyzing the same set of 50 collab thread first posts. We then met to discuss our analyses and merge them to produce a single coding scheme. Next, we used the merged coding scheme to independently code another set of 50 first posts. We then met a second time to compare codes, reconcile any disagreements or confusions, and finalize the coding scheme. I assessed intercoder reliability for each item in the coding scheme using ReCal,⁴ with satisfactory results (average intercoder agreement per item: 94%; average Cohen’s κ per item: 0.70). Both of us then claimed half of the 892 first posts and independently coded them. The final coding scheme contained 44 items, grouped into six broad categories:

Themes: Content guidelines for the project, e.g., music video, single narrative, comedy sketches

⁴<http://dfreelon.org/utis/recalfront/>

(12 codes)

Specs: Technical specifications for the project, e.g., dimensions, frame rate, audio streaming (11 codes)

Authorship: Criteria determining which artists get “co-author” credit, e.g., best submissions, most helpful, voting (6 codes)

Restrictions: Prohibited content types for the project, e.g., violence, nudity, profanity (5 codes)

Gatekeeping: Rules governing who can join the project, e.g., leader’s pick, experience baselines, tryouts (5 codes)

Communication: Instructions for contacting the leader, e.g., email, IM, phone/voice (5 codes)

Following this content analysis, we then independently categorized the outcome of each collab using three triangulation criteria: (1) the content of the most recent replies, (2) the list of completed animations in the profile of the leader, and (3) a search of Newgrounds for completed animations matching the title of the thread. If we found that the collab led to a completed animation, we categorized the collab as a success and recorded the unique ID of the resulting completed animation. If not, we categorized the collab as a failure.

Next, I compared first post attributes in successful vs. failed collabs using Mann–Whitney U-tests. The Mann–Whitney U-test, a nonparametric alternative to the independent two-sample t-test, enables comparisons of two independent samples which are not normally distributed [74]. I ran a U-test for each of the six categories derived from the content analysis, described above. For example, one U-test compared the number of specs in the first posts of successful vs. failed collabs.

Finally, I compared the activity dynamics and attributes of leaders in successful vs. failed collabs using two sets of U-tests. “Activity dynamics” refers to the posting frequency of leaders and all posters in each thread. I limited the analysis of activity dynamics to the high activity bin to enable more nuanced comparisons. The data for leader attributes are described above. All statistical analyses were performed using SPSS.

4.2.2 Results

The results show that out of a total of 892 collab threads, 112 were categorized as successful, while 780, or 87.4%, were categorized as failed. Because I oversampled medium and high activity threads,

the total failure percentage is likely even higher. Collab success may be even more challenging than this result suggests.

In the remainder of this section, I describe the results with respect to the three categories of success factors identified in the qualitative study: planning and structure (collab thread first posts), reputation and experience (collab leader attributes), and communication and dedication (collab thread activity dynamics).

4.2.2.1 Planning and Structure

Table 7 shows the results of the Mann–Whitney U-tests comparing six categories of planning/structural elements in the first posts of successful vs. failed collab threads. Overall, the results of these six U-tests show that first posts of successful collab threads have, on average, more planning/structural elements than failed ones. Specifically, successful first posts are more likely to have a theme than failed ones ($U=28636$, $p<0.01$). Successful first posts have more specs than failed ones (on average, 3.74 specs vs. 2.03 specs), $U=23361.5$, $p<0.01$. They also have, on average, more authorship criteria ($U=36476$, $p<0.01$), more communication preferences ($U=35394$, $p<0.01$), more restrictions ($U=38022.5$, $p<0.01$), and more gatekeeping rules ($U=38019$, $p<0.01$).

Table 7: Planning/structural elements in first posts of successful vs. failed collabs

Element	Successful Collabs			Failed Collabs		
	Mean	StDev	N	Mean	StDev	N
Themes*	0.94	0.24	112	0.73	0.45	780
Specs*	3.74	1.70	112	2.03	2.02	780
Authorship*	0.29	0.53	112	0.11	0.41	780
Restrictions*	0.63	0.99	112	0.40	0.81	780
Gatekeeping*	0.39	0.61	112	0.25	0.54	780
Communication*	0.83	0.90	112	0.52	0.79	780
* $p<0.01$						

To distinguish whether the sheer amount of text or the type of content in the first post predicted success, I ran a U-test comparing the word count in the first posts of successful vs. failed high activity collab threads. The results showed that the posts were not significantly different ($U=9298.5$, $p=0.33$).

4.2.2.2 Reputation and Experience

In Table 8, I summarize the results of a comparison between leaders of successful collabs and leaders of failed collabs. Five leader attributes were compared with Mann–Whitney U-tests. First, the results show that leaders of successful collabs had previously participated in, on average, more collabs than leaders of failed collabs ($U=30812.5$, $p<0.01$). In this case, “participated” means being listed as a co-author—but not necessarily leading—in a completed collab. Second, leaders of successful collabs had previously completed, on average, more solo projects than leaders of failed collabs ($U=29861.5$, $p<0.01$). Third, leaders of successful collabs had won, on average, more awards than leaders of failed collabs ($U=35867$, $p<0.01$). Fourth, leaders of successful collabs had made, on average, almost twice as many total forum posts than leaders of failed collabs ($U=27911$, $p<0.01$). Finally, leaders of successful collabs had, on average, a higher Batting Average than leaders of failed collabs ($U=17647.5$, $p<0.01$).

Table 8: Leader attributes in successful vs. failed collabs

Attribute	Successful Collabs			Failed Collabs		
	Mean	StDev	N	Mean	StDev	N
Past collabs*	2.80	3.71	112	1.70	3.61	778
Past solo projects*	5.42	5.93	112	3.35	5.70	780
Awards won*	1.60	3.88	112	0.60	1.93	780
Forum posts*	986	1623	112	586	1320	780
Batting Average* (max: 5.0)	3.17	0.43	91	2.92	0.57	518
* $p<0.01$						

To summarize these results, leaders of successful collabs, on average, had completed more collabs and solo projects, won more awards, had posted more on the discussion forums, and had higher rated Newgrounds submissions than leaders of failed collabs.

4.2.2.3 Communication and Dedication

Figures 10 and 11 illustrate the results of the analysis of activity dynamics in successful and failed collab threads with high activity (>50 replies). To create these graphs, I first determined a “completion time” for each collab thread. If a thread was successful, the completion time was the elapsed time between the date the thread was started and the date the completed animation was posted on Newgrounds. If a thread failed, the completion time was the elapsed time between the date the

thread was started and the date of the most recent reply in that thread. Next, for threads with completion times of at least ten days, I divided the completion time into ten equal units, or time intervals, each corresponding to 10% of the total completion time. This time interval comprises the x-axes in Figures 10 and 11. Then, I calculated the percentage of the total number of replies in a thread posted by all collab members (including leaders) during each time interval. I divided these percentages into two groups, successful collabs and failed collabs, and averaged them, again for each time interval. I then repeated this process for the replies of leaders only. These values are displayed on the y-axes in Figures 10 and 11.

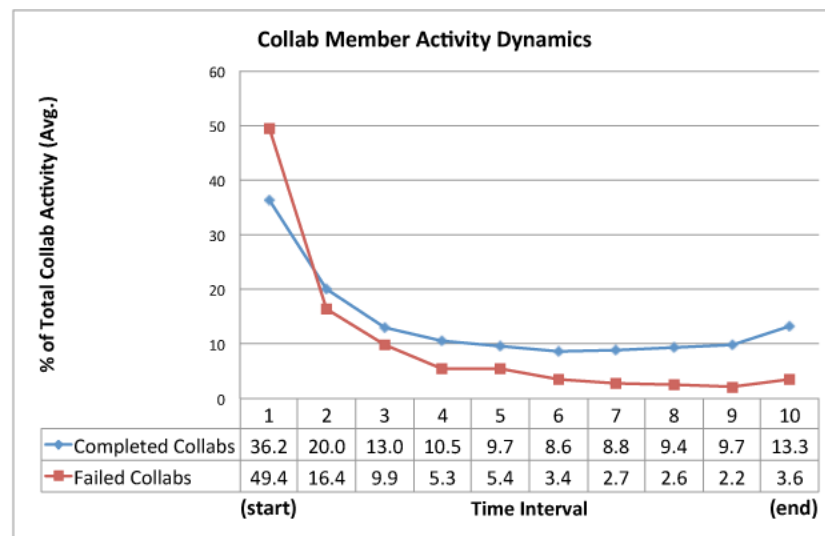


Figure 10: Activity dynamics in successful vs. failed collabs (all members)

Failed collab thread activity, for leaders only and all members, was highest in the first (10%) interval and subsequently declined. About half of all replies made to a failed collab thread are made in the first time interval, compared to about a third of all replies in successful collab threads. By the second time interval, this pattern has reversed; a greater proportion of total thread activity happens for successful threads, and this trend continues until completion time for both successful and failed threads. By the time collab threads are half finished, failed threads wind down, with a smaller proportion of total thread activity happening in the final time interval than in the middle one. In contrast, successful threads see increased total thread activity as the thread approaches completion time. By the final time interval, successful threads see twice the proportion of total thread activity that they see at the midpoint in the thread's lifespan.

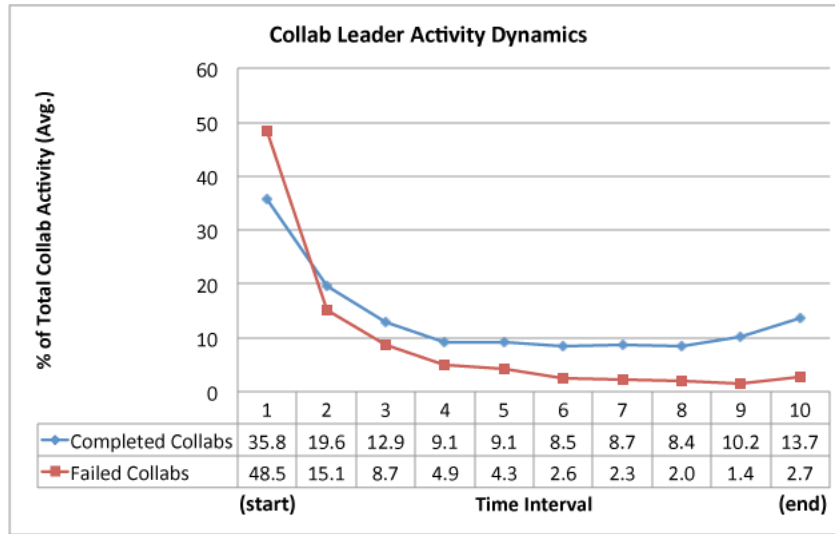


Figure 11: Activity dynamics in successful vs failed collabs (leaders only)

Table 9 depicts the results of the Mann–Whitney U-tests comparing the mean and standard deviation for replies per day in successful and failed collab threads, separated into two groups: replies by everyone in the collab, and replies by just the collab leader. The results suggest that successful threads see substantially more replies, by everyone and by leaders in particular, than failed collab threads. Specifically, members of successful collab threads post an average of 333% more replies ($U=4588.5$, $p<0.01$). Leaders make an average of 228% more posts ($U=5545.5$, $p<0.01$). Although Figures 10 and 11 show similar posting trends among leaders and all members of collabs, the results in Table 9 show that all members collectively post nearly three times more often than leaders alone.

Table 9: Activity dynamics in successful vs. failed collabs

Dynamic	Successful Collabs			Failed Collabs		
	Mean	StDev	N	Mean	StDev	N
Posts per day* (all members)	24.22	30.51	109	7.28	11.3	182
Posts per day* (leaders only)	4.24	4.92	109	1.86	3.04	182
* $p<0.01$						

4.2.3 Discussion

Earlier in this chapter, I derived a list of five hypotheses by interviewing collab participants about success. I now revisit these hypotheses with the results of the quantitative study in mind.

4.2.3.1 *Planning and Structure*

H1: Successful leaders provide more initial planning and structure, especially technical specifications.

The results support this hypothesis. As shown in Table 7, the first posts in successful collabs had more planning/structural elements across each of the six categories than first posts in failed collabs. The most prominent of these elements were technical specifications or “specs,” such as dimensions or frame rates. On average, successful collabs had 3.74 specs in their first posts, compared to 2.03 in the first posts of failed collabs. The other planning/structural elements were less common, with an average of less than one of each in the first posts of both successful and failed collabs. Thus, while all types of planning/structural elements are more common in successful collabs, specs are the most numerous. In contrast, authorship criteria, determining which artists are credited as “co-authors,” were the least common planning/structural elements.

I also found that word counts in first posts were similar in successful vs. failed collabs. Put another way, successful first posts were not longer (or shorter) than failed ones, but they contained more planning/structural elements, potentially making better use of the space. These results underscore the importance of leaders providing particular types of information in a first post, rather than simply writing a lengthy first post, or providing many irrelevant details.

4.2.3.2 *Reputation and Experience*

H2: Successful leaders are more prominent and respected in the community.

I found evidence to support this hypothesis. Table 8 shows that leaders of successful collabs had, on average, more completed solo projects, more forum posts, more awards won, and a higher Batting Average than leaders of failed collabs. In a study of Usenet newsgroups, Arguello et al. [4] found that newcomers’ posts attracted fewer replies than people who had posted previously. The results suggest that this finding may generalize to online creative collaboration.

H3: Successful leaders have more experience with solo projects and past collabs.

This hypothesis is supported by the results. Table 8 shows that leaders of successful collabs were more experienced in Flash, having completed, on average, 5.42 solo projects prior to starting

a collab. In contrast, leaders of failed collabs had completed, on average, 3.35 solo projects. The results are similar for leaders' prior experience with completed collabs. Leaders of successful collabs had, on average, previously participated in 2.80 completed collabs, compared to 1.70 for leaders of failed collabs. In general, leaders had about twice as much prior experience with solo projects as collabs, reflecting a general trend on Newgrounds. For example, as of July 2012, just 8 of the 50 highest-scoring movies on Newgrounds were collabs; the rest were solo projects.⁵

4.2.3.3 *Communication and Dedication*

H4: Members of successful collabs communicate more frequently and consistently.

Table 9 and Figure 10 summarize the evidence in support of this hypothesis. Members of successful collabs collectively post, on average, about three times more than members of failed collabs (24.22 vs. 7.28 posts per day). In addition, Figure 10 shows that successful collab threads see a marked increase in posting “momentum” after the midpoint in the collab’s lifespan, whereas in failed collabs, thread activity decreases over time, picking up only slightly in the last time interval. Thus, successful collab threads not only see more thread activity in general, but also a more consistent distribution of activity over time.

H5: Leaders of successful collabs communicate more frequently and consistently.

I find this last hypothesis to be supported by the results, as well. Table 9 suggests that leaders of successful collabs are more active and communicative than leaders of failed ones. Successful collab leaders post, on average, about three times as much as leaders of failed collabs. This difference amounts to slightly over four posts per day versus slightly less than two. Figure 11 reveals a difference in leader posting patterns, beyond just frequency. Although both successful and failed collab leaders post throughout the collab thread’s lifespan, leaders of successful collabs post more regularly. In contrast, failed collab leaders do almost half of their replying during the thread’s first time interval. This difference mirrors the posting patterns of all collab members described above.

⁵<http://www.newgrounds.com/movies/browse/sort/score>

4.2.3.4 Limitations

There are some sampling biases in the data. By selecting only collab threads that explicitly contain the word “collab” in the title, I may have skewed the results towards collabs that followed the community’s conventions. I also treated each collab thread as the unit of analysis and, therefore, statistically independent; however, I acknowledge that there are likely to be leaders and artists who contributed to multiple collabs in the data.

More generally, this study is preliminary in nature. Rather than testing *a priori* hypotheses, I generated a list of qualitative hypotheses and pursued them more deeply with exploratory quantitative analyses. I worked with archival rather than experimental data, so the results can only suggest correlations, not causation. While I found meaningful differences, more work is needed to validate the results with focused studies. For example, principal components analysis or hierarchical regression could determine how much variance is accounted for by each of the variables I discovered and mitigate potential issues with statistical independence. Also, specifically examining leaders of both successful and failed collabs could help validate the results.

4.3 Discussion

In the first part of this chapter, I reported on a qualitative study of success factors identified by collab participants. In the second part of this chapter, I ran a quantitative study looking at correlations between the interviewees’ success factors and the outcomes of nearly 900 collabs. While validating success factors in the context of collaborative animation production is beneficial to communities like Newgrounds, it is also important to understand how these findings generalize to online creative collaboration as a broader phenomenon. In this section, I discuss key similarities and differences between success factors in collaborative animation production and previous empirical research in open-source software development. I choose OSS as a comparison point because, as reviewed in Section 2.4, this domain of online creative collaboration has received the vast majority of scholarly attention with respect to success definitions and factors.

4.3.1 Planning and Structure

My interview participants stressed the importance of leaders providing planning and structure early in a collab's lifespan. They argued that substantial planning up front, such as listing technical specifications, reduces confusion and conflict later on. The quantitative analysis offered support for these perceptions: more planning/structural elements in collab first posts were associated with success. Participants also suggested that leaders who have carefully thought through the process appear more trustworthy and reliable.

In contrast, organization in OSS projects is often viewed as more of a distributed, evolutionary process, rather than an immutable set of plans conceived and enforced by a project leader. Benkler [11] emphasizes self-identification for tasks, the idea that people choose their work in a bottom-up fashion, reducing the need for centralized delegation. Raymond explicitly contrasts a traditional software project manager to an OSS project leader, arguing that the former's role as an organizer can seem "strangely irrelevant" because OSS developers organize themselves [120].

What, then, is the leader's role in the organization of an OSS project? Weber quotes Danny Hillis: "There are only two ways we know of to make extremely complicated things. One is by engineering, and the other is by evolution" [151]. Most OSS projects evolve. Weber explains, "In some cases, but not all, a project leader does set the effective definition of the problem that needs to be solved" [151]. If the leader's problem definition is not sufficient, new experiments are tried, and new definitions evolve beyond the leader's original idea. In contrast, collab participants tend to stick to the leader's plan. In Hillis's terms, most collabs are created through engineering—a single architect's carefully plotted conceptual course—rather than evolution.

To summarize, successful collabs tend to embrace up-front, centralized planning over the evolution and iteration typical of OSS projects.

4.3.2 Reputation and Experience

In my interviews, participants told me that successful collab leaders have solid reputations within the community and substantial previous experience with collabs and solo projects. Some participants preferred to work with leaders they already know. Others assess the ability of unfamiliar leaders by exploring their history of past submissions to Newgrounds. The Batting Average, a score

representing the average quality of a Newgrounds member's submissions, facilitates this decision-making process. The quantitative study showed that all of these criteria were more pronounced in successful collabs.

These results align with those found by scholars of OSS projects, where a leader's reputation and experience are also held in high regard. For example, O'Mahony and Ferraro [113] found that OSS developers who made more impactful (not simply more) technical contributions to the Debian distribution of Linux were more likely to become leaders. However, members of these projects also place special emphasis on "soft skills" like charisma and charm. To this point, Raymond observes, "A certain base level of design and coding skill is required ... but it's far from the whole story" [120]. Perhaps even more important, Raymond argues, is a leader's personality and people skills. "It is not a coincidence," he suggests, "that Linus [Torvalds, founder of Linux] is a nice guy who makes people like him and want to help him" [120]. Reagle [121] extends this reasoning to a theory of "authorial leadership" that applies to open content communities more generally. According to one key component of his theory, "Leaders often convince by persuasion and example though they also retain charismatic authority accumulated from their merit" [121]. Merit helps a leader step into that role, but persuasion and example, mediated by humor, help him or her keep it. While it is quite possible that charisma and related social skills play an important role in successful collab leadership, my interviewees did not specifically mention these traits.

In summary, both successful collabs and successful OSS projects tend to be run by leaders who have proven technical competency and a record of past successes in their respective communities. In addition, OSS developers emphasize the importance of leaders' soft skills, such as personality and charm.

4.3.3 Communication and Dedication

Successful collabs, according to my participants, are characterized by frequent communication among all members, especially the leader. This interview data was supported by the quantitative findings. Participants argued that the best leaders seem dedicated to the success of the project. This dedication manifests not only as regular and active communication in the collab thread, but also as longevity—a willingness to lead from start to finish.

Similar practices are found in successful OSS projects. Frequent communication is often seen as an essential property of a healthy OSS project [68, 157]. One of Weber's eight principles of the open source process is "talk a lot," and developers' often-contentious discussions can cover a range of topics far beyond the project itself [151]. Adhering to this principle is among a project leader's primary responsibilities, as exemplified by Linus Torvalds. Weber observes, "Torvalds seems intuitively to understand that, given his presumptive claim on leadership as founder of the Linux project, he could fail his followers in only one way—by being unresponsive to them" [151]. Raymond, attempting to emulate Torvalds's successful leadership of the Linux project, sent "chatty announcements" to the email list of his OSS project, fetchmail, often multiple times per week [120]. While frequent communication has been shown to be an activity of successful leaders, there is less empirical evidence that OSS developers who frequently communicate will *become* leaders. In one study of the Debian OSS project, there was not a strong correlation between participation in online discussion and likelihood that the developer would become a leader, though the authors cast doubt on the quality of their measure [113].

An OSS project leader's dedication is threatened by "forking." In most of these projects, it is widely believed that if members disagree with the direction a project is taking, they are always permitted to "fork" it: "a dissatisfied community, or some constituency thereof, can always leave and start again under new leadership" [121]. Licensing schemes such as the GPL and Creative Commons ShareAlike allow code and content to be legally copied and modified at any time, without seeking permission. As a result, leaders' authority is "eternally contingent"; even the most dedicated leaders rely on the approval of the community [121]. In practice, there is "strong social pressure against forking projects," partly because it divides the community and duplicates efforts [120]. At the same time, forking "is not always a bad thing, nor does the open source community always perceive it as bad" [151]. For example, forking can provide a means for innovative ideas to be explored, not just escape from an incompetent project leader [151].

A collab leader's concern is not forking, but quitting. Leaders maintain control of their collabs, partly for philosophical reasons—many leaders feel a strong sense of ownership over their idea—and partly for practical reasons—most project files are passed to, and held by, the leader, not a digital commons. In addition, open source content licenses have not been embraced by Newgrounds

members. If collab participants grow disillusioned with the leadership, their best and only recourse is simply to quit, leaving their work behind. Unlike forking, collab dropouts are almost always undesirable.

To summarize, frequent communication among leaders and members is shown to be good practice in both collabs and OSS projects. However, collab leaders hold their positions for the duration of the collab, whereas OSS project leaders' authority is vulnerable to forking.

Table 10, below, summarizes some major distinctions between successful collabs and successful OSS projects.

Table 10: Key differences between successful collabs and open-source software

	Successful Collabs	Successful OSS Projects
Planning and Structure	Leaders minimize conflict by presenting plans early on and sticking to them	Project goals evolve beyond leaders' original plans
Reputation and Experience	Leaders have deep technical skills and experience	Leaders have deep technical skills and experience, <i>plus</i> soft skills
Communication and Dedication	Leaders and members frequently communicate; leaders go down with the ship	Leaders and members frequently communicate; leaders are vulnerable to forking

4.4 Implications

4.4.1 Implications for Theory

Online creative collaboration may be one of the most important and surprising consequences of increased access to information technology. Its most prominent examples, Wikipedia and open-source software, offer compelling evidence of a third model of production, alongside the familiar firm- and market-based models [11]. We are beginning to see new examples emerge in other domains, such as video [36], music [26, 27], and mathematics [29], suggesting that online creative collaboration is a much broader phenomenon than just software development and encyclopedia writing. This breadth raises a number of new questions. What effect, if any, does the domain have on the collaboration? Do the lessons learned from successful Wikipedia and OSS projects transfer to these new domains? If not, which principles don't always apply, and why not? Answers to these questions are essential to deepening our theoretical understanding of online creative collaboration. More practically, they will help us design appropriate support tools and communities to foster online creative collaboration in a growing number of domains.

This study has taken initial steps to address these questions by comparing and contrasting two examples of online creative collaboration in seemingly very different domains: animated movie-making and software development. I focused on success as a unifying concept that spans both types of projects. The results surprised me. Even among these two seemingly disparate examples, I found notable similarities and differences in how they operate and what makes them successful.

The similarities between successful collabs and OSS projects suggest broader principles of online creative collaboration. One potential principle is the importance of leaders with particular characteristics. I found that across collabs and OSS, successful projects were managed by leaders with solid reputations and respect in their communities. They had both technical competence and soft skills. They had knowledge of the domain and experience running successful group efforts. Collabs and OSS projects differed in the tenure of these leaders, but in both cases, it was important that whoever was leading a project at the moment possessed these attributes.

A second potential principle centers around communication. In both collabs and OSS, successful projects boast frequent communication and high activity, by project members and their leaders alike. Weber's principle, "talk a lot" [151], appears to extend to collabs, but less clear is what leaders and members should talk *about*. Although this analysis of communication in collabs did not examine the content of those conversations in detail, the research on communication in OSS projects suggests some possibilities: sharing information to improve group awareness, motivating members to complete their tasks, and resolving conflicts through debate [151, 68, 120]. Another open question in this area is the relationship between the leader's communication and the group's overall communication—perhaps groups are talkative because their leaders are talkative, or vice-versa.

Although the applicability of these principles to OSS and collabs is promising, more work is needed to test them in still other domains. Otherwise, we risk making the questionable assumption that research in just one or two domains (e.g., Wikipedia and OSS) is sufficient to identify general rules of online creative collaboration. While finding these commonalities is of critical importance, we must be cautious of premature generalization in a research area that has yet to see many cross-domain empirical studies.

The differences I noticed between the early organization of collabs and OSS projects provides a salient example. I found that for collabs, a key success factor seems to be planning and structure

in the first post of a collab thread—the more, the better. Moreover, these plans—like their authors, the project leaders—rarely change throughout the collab’s life span. In contrast, the literature on OSS suggests that plans are of secondary importance. The project leader’s original idea may be quickly abandoned in favor of a better one. More generally, the emphasis is on evolution and self-organization, as opposed to adherence to one person’s grand vision. But why this difference? What about collabs makes engineering, not evolution, the more successful strategy?

This type of question will also benefit from more research. Lacking other examples of online creative collaboration in which early planning and structure are important, I can only theorize. One possibility is that the difference is complexity. Weber notes that “there are inherent limits to software that can be built by one or two people” [151]. Large software projects, like an operating system or web browser, require many skill sets and, therefore, many people. They have what Brooks famously called *essential complexity* [16]. They are also the type of OSS projects that see the most research attention, perhaps because they exemplify the OSS development process’s success at managing this complexity.

In contrast, collabs are almost always simpler, less ambitious projects. As mentioned above, most submissions on Newgrounds are solo projects, not collabs. It is quite possible for one person to complete a five-minute animated movie. Creating the same movie with ten people, for example, becomes a matter of dividing up the work and minimizing interdependencies—in Benkler’s terms, creating modular, granular tasks [11]. From this perspective, it is not difficult to imagine why a clear plan and structure would work well. However, if the collab was a feature-length movie, a level of complexity more comparable to many high-profile OSS projects, then this simple division of labor and organizational strategy may not hold up. Instead, an OSS-inspired, evolutionary style might be more successful. As with the other principles I propose, this one requires additional research to confirm.

Finally, I note that success rates for both OSS projects and collabs were low—less than 20% [154, 46]. To some extent, given the many challenges to distributed work and the inherent complexity of the projects that are attempted, failures are inevitable. However, I suggest that understanding success factors in online creative collaboration, such as those identified in this chapter, may help

improve these success rates. Lessons learned from the most successful examples of online creative collaboration, like OSS and Wikipedia, may transfer to other domains, and vice-versa. As researchers, we can investigate where these lessons hold up and where they break down, and begin to identify broader principles.

4.4.2 Implications for Design

In this section, I provide three suggestions to designers of creativity support systems for promoting successful online creative collaboration.

4.4.2.1 Scaffolding for Organization

The results showed that collabs with more organization and structure, especially technical specifications, are more likely to be successful. However, many collab threads lacked even basic structural elements. Designers may consider scaffolding [132] the process of leading online creative collaboration projects by providing tools to help novices remember key structural and organizational elements. As novices develop more leadership experience, these tools could be hidden or made optional. For example, in Newgrounds collabs, it may be helpful to remind new leaders about providing crucial details such as a theme, a frame rate, dimensions, and their contact information.

4.4.2.2 Promoting Effective Leadership Traits

Leaders of successful collabs have, on average, completed several solo animation projects, won at least one award, posted nearly a thousand times on the forums, and have a Batting Average of 3.0 or higher. However, novice animators or newcomers to the Newgrounds community may not be aware of the import of this information when joining or starting collabs. Designers aiming to support successful online creative collaboration may consider ways of promoting leadership traits in contexts where members are deciding which projects to join. For example, on Newgrounds, collab leaders' histories of contribution could be highlighted and made sortable next to their collab thread titles, rather than requiring candidate animators to know which attributes are important and where to find them.

4.4.2.3 Reflecting on Activity Dynamics

I found that frequent and sustained posting by leaders and non-leader members characterized successful collabs. More specifically, I also found that successful collabs often see an increase in “momentum” halfway through their lifespan. However, it is difficult for Newgrounds members to identify these activity dynamics in collab threads with thousands of replies over a long period of time. Designing tools for reflection on activity dynamics within online creative collaboration projects may help people assess projects’ completion potential. For example, researchers have developed information visualizations of editing patterns in Wikipedia articles [136, 145] and task assignments in open source software projects [43]. I propose that forms of online creative collaboration with clear definitions of completion, such as Newgrounds collabs, may especially benefit from this type of technological support because of the high risk of failure.

4.5 Chapter Summary

In this chapter, I presented a study of success factors in online creative collaboration, focusing on the domain of collaborative animation production or “collabs.” Similar to previous studies of success factors in open-source software (OSS) development, I took a mixed-methods approach to this research, including both qualitative and quantitative components. In the first part of the study, I used data from a series of in-depth interviews with 17 collab participants to understand how they identify success factors in Newgrounds collabs. From these interviews, I compared the success factors suggested by interviews to theories of effective leadership in traditional organizations, finding significant overlaps, and generated five hypotheses for success in online creative collaboration. These hypotheses could be categorized into success factors dealing with planning and structure, reputation and experience, and communication and dedication. The second part of this study tested these hypotheses using quantitative analyses, including content analysis and Mann–Whitney U-tests, of nearly 900 previous collab attempts. The results showed that the interviewees’ intuitive success factors were correlated with actual successful outcomes in past Newgrounds collabs.

In order to reconcile these results with previous research, I compared and contrasted the results of these studies with empirical studies of leadership and success factors in OSS development. While there were many common ideas, there were also important differences, such as the greater degree of

evolution in OSS planning, that could be attributed to the different domain requirements of software development versus animation production. I developed this idea further by discussing implications for theory, where I emphasized the need for deriving generalizable, cross-domain principles of successful online creative collaboration. I proposed the importance of experienced, technically skilled leaders and frequent communication among members as two possible general principles, though more research is necessary to validate these and identify others. I also suggested that scope could be a crucial variable to consider when doing cross-domain comparisons, noting that mature OSS projects were generally more complex and broader in scope than collabs. Finally, I discussed several implications for the design of systems supporting successful online creative collaboration, including scaffolding for organization, promoting effective leadership traits, and reflecting on activity dynamics.

In the next chapter, I describe the design and launch of Pipeline, a web-based tool for supporting and transforming leadership in online creative collaboration. The design of Pipeline was influenced by the empirical results and design implications presented in this chapter and the previous one.

CHAPTER V

PIPELINE

RQ3: How can technology be designed to support and transform leadership in online creative collaboration?

In this chapter, I present Pipeline, a web-based collaboration tool for supporting and transforming leadership in online creative collaboration. In the first part of this chapter, I articulate the design goals for Pipeline by recapping a selection of the design implications presented in Chapters 3 and 4. I then explain how Pipeline fits into the broader ecosystem of existing online communities, including Newgrounds. The next section of the chapter provides a detailed description of Pipeline's major features, focusing on the project system, and how these features are informed by the aforementioned design goals and other relevant research. In the last sections of the chapter, I compare Pipeline to similar project management and peer production systems, such as Basecamp, Amazon Mechanical Turk, and MediaWiki. I provide a narrative of the development process used to create Pipeline and list some of the advertising and recruiting strategies used to build a critical mass of users. Finally, I characterize overall Pipeline usage broadly and explain my rationale for focusing on a detailed case study in the next chapter.

5.1 Design Goals

My previous studies of existing leadership practices, reviewed in Chapters 3 and 4, suggested a number of design implications for systems that support leaders of online creative collaboration. The design of Pipeline is heavily influenced by these design recommendations. In this section, I recap the design implications from previous chapters that I used as design goals when creating Pipeline.

5.1.1 Support for Redistributed Leadership

In Chapter 3, I argued that collab leaders were overburdened, and lacking adequate technological support, many collabs failed. Leaders assumed a heavy load of responsibilities in part because existing technologies made it difficult to offload work onto other members or software. I proposed

that supporting and transforming leadership with technology could ease the burden on leaders and result in more diverse, complex, and successful projects. To reify the notion of redistributed leadership, I offered two design implications in Section 3.4.2: *decentralization*, or distributing leadership tasks among a broader set of collaborators; and *automation*, or allowing technology to automate or streamline some leadership behaviors.

5.1.2 Support for Expression-Oriented Projects

I claimed in Chapter 3 that collabs were an example of online creative collaboration in expression-oriented domains, while most empirical research in online creative collaboration looks at utility-oriented domains (e.g. studies of Wikipedia and many OSS projects). I further suggested that expression-oriented collaboration has some unique requirements that differentiate it from utility-oriented collaboration, namely: *completion*, *originality*, *subjectivity*, and *ownership*. These distinctions suggest a number of design implications detailed in Section 3.4.1. Members of expression-oriented projects often seek to keep works-in-progress out of public scrutiny, so technology supporting these projects should provide privacy controls that accommodate them. The goal of expression-oriented projects is often to create something novel or original, so software should encourage new ways of working together by providing lightweight, flexible structure and avoiding constrained workflows. Expression-oriented projects often have many possible acceptable outcomes and require numerous subjective decisions to be made, so technology ought to provide mechanisms for delegating creative decisions to avoid overwhelming leaders. Finally, because many members of expression-oriented projects feel a strong sense of ownership over their work, software should allow for feedback and iteration while giving the creator ultimate control over what happens.

5.1.3 Support for Collab Success Factors

I showed in Chapter 4 that collab members look for a variety of success factors that are supported by quantitative analysis of large numbers of attempted collabs. These include leaders providing initial planning and structure, especially technical specifications; leaders having solid reputations in the community, past experience with successful collabs, and strong technical skills; and leaders and members frequently communicating and demonstrating commitment to collabs in progress. In Section 4.4.2, I proposed three design implications for supporting successful online creative

collaboration based on these findings. First, designers should help leaders provide adequate early planning and structural elements by *scaffolding the collab creation process*. Second, designers should *promote leader attributes and behaviors* shown to be correlated with success, such as collab experience and commitment, in order to signal which leaders are more likely to be effective. Third, designers should offer tools for *reflecting on activity patterns* within collabs, such as frequencies of leader replies or overall levels of communication.

To summarize, my goals for designing Pipeline included supporting redistributed leadership, supporting the unique requirements of expression-oriented projects, and supporting collab success factors. The rest of this chapter outlines the major features of Pipeline and explains in detail how they were influenced by the above design goals and other empirical research.

5.2 Relationship to Existing Online Communities

Pipeline is a web-based collaboration tool for organizing creative projects online (see Figure 12). It is not intended to be a new online community, nor a new host for finished projects. Instead, I designed Pipeline to augment, rather than replace, existing online communities. I went in this direction for at least two reasons. First, there are already a large number of successful online communities geared towards creative work, with new ones emerging all the time. It wasn't clear that a new one would be necessary. Many of these sites, such as YouTube, DeviantArt, and Newgrounds, do an excellent job of providing the social and technical supports needed for exhibiting finished work and generating discussions around them. They offer powerful tools for uploading finished products in nearly any media format; sharing that material using links, embedding, and social media; finding new content via complex recommender systems, tagging, and search engines; and discussing and rating content with threaded commenting systems, tools for voting and rating, and means of flagging inappropriate content. Providing these types of services would not address my research questions and would likely duplicate what already exists. What many of these sites lack, however, are adequate tools for supporting collaborative projects. The limitations of Newgrounds were previously discussed in Chapter 3, and many other sites (e.g. Scratch, Kongregate) promote similar types of forums as collaboration settings. Given my limited time and resources, and in order to keep my dissertation reasonably scoped, I focused on building a powerful collaboration tool that could work

with many existing online communities and content hosts.

Second, I had made contacts from my previous empirical studies of Newgrounds, both in the community and among the staff, and I hoped to leverage those connections when it came time to launch Pipeline and build a critical mass of users. Because my empirical studies of existing leadership practices in Chapters 3 and 4 were based on interviews and participant-observation in Newgrounds, I hoped to generate interest in Pipeline by explaining that its design was heavily influenced by issues and problems voiced by Newgrounds members themselves. Beyond promotional value, it seemed likely that I would maximize my chances of success by launching a system in the community where the design implications informing that system's implementation were originally derived. That is, if Pipeline was going to work well anywhere, it would most likely be Newgrounds. Finally, my intuition was that I would have a better chance of building a Pipeline user base if I avoided, as much as possible, pulling potential users away from the communities where they were already members and had existing social networks, reputations, and portfolios of work.

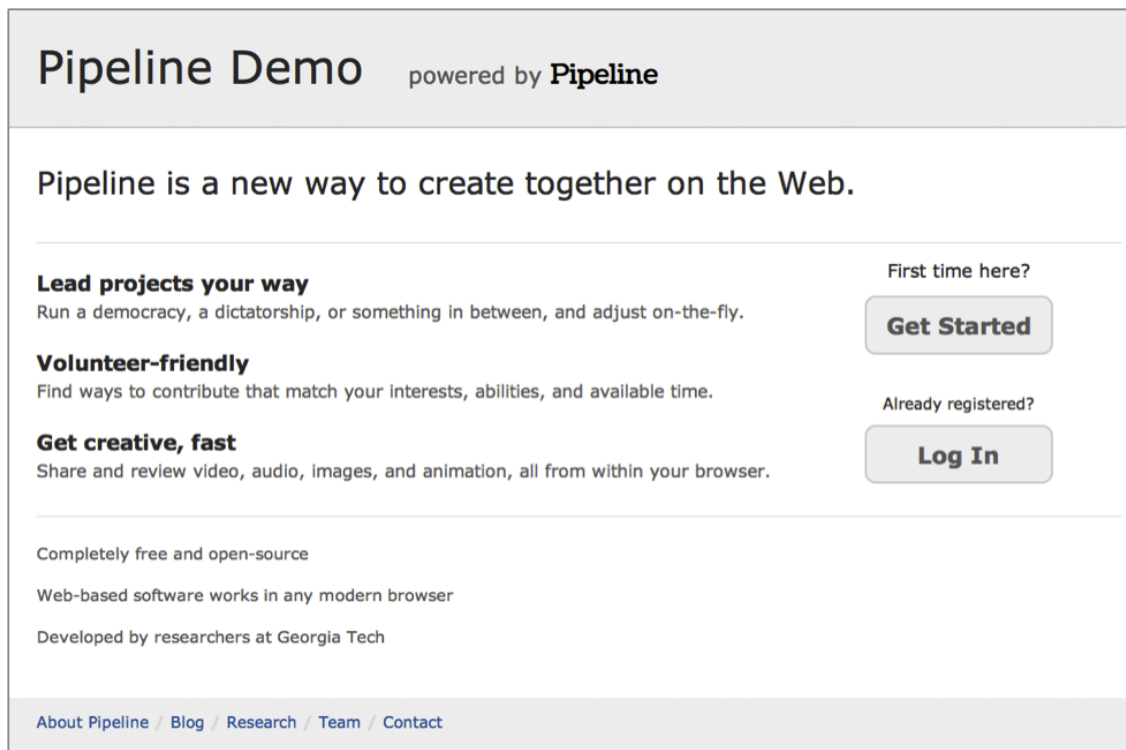


Figure 12: The Pipeline home page

Pipeline is designed to augment existing online communities like Newgrounds in several ways.

First, the tools it provides are focused entirely on collaboration and production, not hosting, viewing, or discussing finished products. The expectation is set from the beginning that Pipeline is used to create content, which will then be uploaded and shared elsewhere. Pipeline also augments existing communities by providing an entirely free, open-source option for collaboration support; the software is available for download on the popular OSS host GitHub. This means that communities can adopt, modify, and reintegrate as much of the Pipeline code base as they want, provided that they make their changes available under the GPL. This open-source license encourages widespread adoption of Pipeline while allowing for users working in different creative domains to tailor the software to their needs. By explicitly limiting Pipeline to production and making it open-source, I hoped to counter existing community's concerns that Pipeline sought to compete with them or steal away members.

Pipeline is the name of the open-source project, but I also use the phrase to refer to instances of Pipeline. For example, the Pipeline I set up for the Newgrounds community is the Newgrounds Pipeline, while other Pipelines are geared towards other communities. This model was intended to leverage users' familiarity with popular open-source content creation platforms like WordPress, which allows users to create a blog hosted on WordPress.com or, if they seek advanced customization, host their own. I hosted a number of Pipelines on a Georgia Tech web server, including instances geared towards Newgrounds, a fan fiction community, an independent film project, the Georgia Tech Technology Services Organization (TSO), and several courses at Georgia Tech. There was also a demonstration instance of Pipeline set up for interested people to test it out.

Other users set up Pipelines on their own web servers, possibly because they wanted more control over the data or settings. For example, a professor at Drexel University set up a Pipeline instance on his research lab's web server for several courses he was teaching. Other Pipelines may have been installed by individuals or organizations, but since the code is publicly available, it is not possible to track these installations. Setting up a Pipeline instance on a web server requires moderate technical skills, including basic knowledge of Apache and MySQL configurations, but can generally be done by someone with these skills in less than ten minutes. A step-by-step installation guide is included.

Each Pipeline can be customized in several ways for more effective integration with an existing

website. A configuration file allows the owner to easily change the name of the Pipeline, its base URL, and contact email address. Additionally, Pipeline supports customizable themes by allowing the owner to supply any number of CSS style sheets. Pipeline handles layout and structure in a separate, non-writeable style sheet, so the owner can focus on adjusting colors, icons, and typography. Pipeline includes two themes, one light and one dark, with the installation. Registered users can select from multiple themes on their Settings page and save their preferences.

5.3 *System Description*

In the following subsections, I review the major features of Pipeline, focusing on aspects of the project system. Where possible, I connect particular design decisions to relevant literature and the design recommendations proposed in Chapters 3 and 4.

5.3.1 Profiles

Every registered user on Pipeline has a profile page (see Figure 13). Users can personalize their profiles by uploading a picture or entering data into several biographical fields, including Age, Gender, Location, Email Address, and a generic About field for including more biographical details or relevant links. For example, many users provided links to their profiles on sites like YouTube or Newgrounds in this field. Profiles also display the date of the user's last login to shed light on which users may no longer be active.

User profiles also contain information about users' activities on Pipeline. Beneath the biographical information, Pipeline displays two lists: Projects and Tasks. These lists show the projects and tasks the user has joined, along with their statuses and the user's role in them (e.g. task leader, project creator). One purpose of these lists is to provide viewers with a glanceable sense for the user's current responsibilities. For example, if a user is currently working on five projects, a leader may think twice about inviting her to join a sixth.

A second purpose of these lists is to display users' contribution histories to facilitate evaluations of their skills and experiences. As users participate in more projects, the lists accumulate detailed histories of their contributions on Pipeline; newer projects and tasks appear at the top, but older ones remain as well. Surfacing this historical information is intended to help Pipeline users facilitate more appropriate matches when recruiting or joining projects. More specifically, as suggested in Chapter

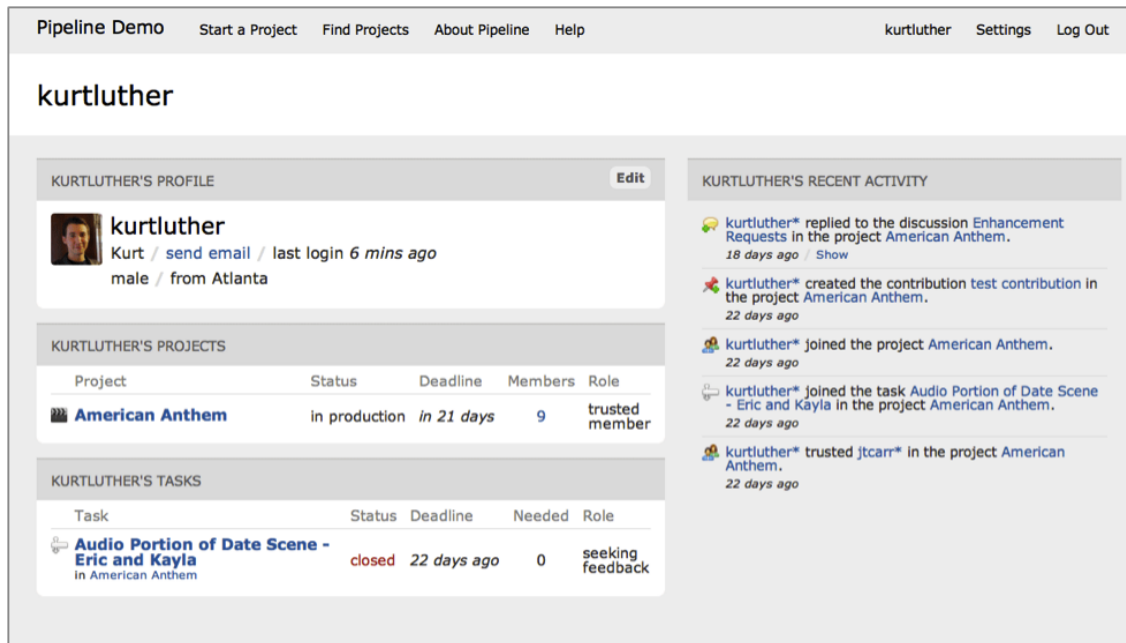


Figure 13: A user profile in Pipeline

4, it can help them identify effective leaders by surfacing traits associated with success (e.g. past collab experience).

5.3.2 Private Messages

Pipeline offers a private messaging system with which any registered users can contact each other. Private messages are integrated into the email notification system so that users can opt to receive private messages via email. Although not originally part of Pipeline's design, I added private messaging in order to capture as much project communication as possible for later analysis.

5.3.3 Dashboard

Registered Pipeline users also see a customized view of their projects, called a dashboard, when they log into the site (see Figure 14). The main section of the page lists the projects and tasks the user has joined, similar to his or her profile page. If the user hasn't joined any projects or tasks yet, the page displays a list of public projects and tasks as suggestions for the user to get involved.

The dashboard also provides an interface for accepting or declining invitations to join projects that have been sent by other users. User can read the messages included with the invitations and make a decision by clicking "Accept" or "Decline" buttons; once a decision is made, the invitations

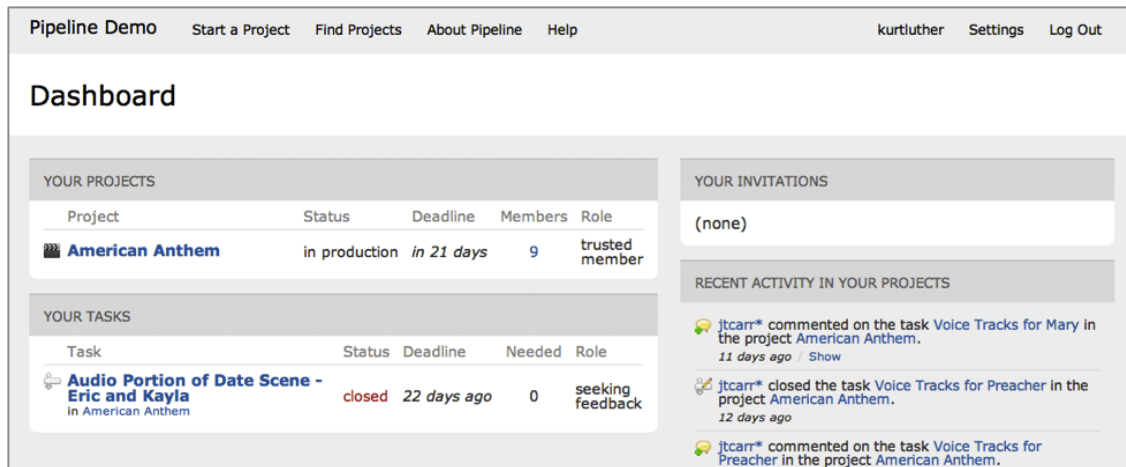


Figure 14: A registered user’s dashboard in Pipeline

are hidden until accessed from a drop-down menu.

5.3.4 Finding and Starting Projects

Pipeline’s main navigation menu includes a “Find Projects” link. This page displays a list of all public projects with open tasks, ordered by deadline. Users looking for projects to join can use this page as a starting point.

Any registered user can create a project by clicking “Start a Project” from Pipeline’s main navigation menu or several similar buttons located on other pages. The result is a process that is meant to strike an effective balance between *scaffolding* [132] the organization and planning of the project, as I recommended in Chapter 4, without imposing too many constraints or requiring a burdensome level of detail. The creation process has two phases: design and recruitment. In the design phase, the project creator provides basic information about the project (Figure 15). Users are required to provide a unique title and a pitch. The term “pitch” refers to an activity in the early stages of film production when writers briefly present a concept for a new film project, hoping to “sell their ideas,” while studio executives assess the idea and the writer’s creative potential [44]. In a similar way, collab leaders pitch their ideas to the Newgrounds community. The pitch panel on Pipeline is intended to contain the project’s major content guidelines or *theme*, a planning/structural element shown to be significant in Chapters 3 and 4.

Only the title and pitch are required to start a project, but creators are encouraged to provide

Pipeline Demo Start a Project Find Projects Help Admin kurtluther Inbox Settings Log Out

Start a Project

NEW PROJECT

Title*

The name of your project

Pitch*

Describe your project idea. What is the project about?
How will people work together?
[Some HTML allowed](#)

Specs

Dimensions: 550px by 400px
Framerate: 24 fps
Background: white
Max length: 60 sec each
Formats: AVI, MPG, Quicktime, Flash
Break your fonts
Put each contribution in a movie clip

Technical specifications for this project
One spec per line; put a colon (:) in between
name/value pairs

Rules

+Multiple contributions allowed
+Dialogue, sound effects, music
allowed
-Low quality contributions won't be
included
-No extreme violence
-No nudity
-No profanity

Rules and guidelines for this project
One rule per line; put a plus (+) in front of "do's" and a
minus (-) in front of "don'ts"

Deadline

When the project should be finished

Private

☐

If checked, this project will be hidden from everyone
except members and invitees.

Create Project

Figure 15: The first (design) phase of creating a Pipeline project

additional information. After the pitch, the interface provides fields for entering Specs and Rules. Specs, or technical specifications, are an important planning/structural element shown to be correlated with success in Chapter 4. Pipeline auto-populates some suggested specs (e.g. dimensions, frame rate, acceptable file formats) in order to scaffold the planning process, but the user can delete or modify these as needed. The Rules panel allows the project creator to list any rules or guidelines for the project; this is meant to be a catch-all for other types of planning/structural elements correlated with success (e.g. restrictions, gatekeeping and authorship policies). As with specs, Pipeline auto-populates some sample rules, such as allowing multiple contributions and music, but prohibiting violence and nudity. To facilitate comprehension, “dos” can be prefixed by a plus sign (+) and “don’ts” by a minus sign (-), which highlights the rule in green or red, respectively.

Below the Specs and Rules panels, the project creator can provide an optional deadline for the entire project using a pop-up calendar widget. Finally, the creator chooses whether to make the project public or private. Both of these options are intended to respect project members’ desire for completion, as discussed in Chapter 3. The deadline encourages a focus on reaching an endpoint, while the privacy option allows members to keep their projects hidden from the public until completed and ready for a debut. Private projects are only accessible to invited users or members. Public projects are visible to anyone—even unregistered users—and open to various types of contribution, depending on whether the user is a member.

Once the project creator makes these choices and clicks the “Create Project” button, the second phase of the creation process, recruitment, is activated. The creator is presented with an interface asking if he or she would like to invite members to the project. This request is optional and can be skipped. The creator can provide a comma-separated list of invitees by email address or Pipeline username and include a message with the invitation. The creator can also specify whether these invitees are trusted members or regular members. If the invitee is already a Pipeline user, the invitation appears on his or her dashboard. If the invitee hasn’t registered for Pipeline yet, he or she receives an email whose body includes a special URL for accepting the invitation. Following the URL takes the invitee to the Pipeline user registration page, and upon completing registration, the invitee is automatically joined to the project whose invitation he or she accepted.

After sending these invitations or skipping the recruitment phase, the project creator is redirected

to the newly-created project pages.

5.3.5 Project Features

Each project is comprised of six tabs: Basics, People, Tasks, Files, Discussions, and Activity.

5.3.5.1 Basics

The Basics tab (Figure 16) is designed to provide a quick overview of the essential information about a project. It is intended for users who are not yet members of the project but are thinking about joining. This tab displays the project's pitch, specs, and rules. It also provides a "Progress" panel which lists the project's creation date, its deadline (if one exists), and the current status of the project. Possible statuses, borrowed from professional film production, include:

Pre-production: Members are planning the project: setting up the basics, creating the first tasks, and inviting users.

In production: Work has begun. Tasks have been assigned leaders and users are starting to make contributions.

Post-production: Most contributions are in and most tasks are closed. The final product is being assembled.

Finished: The project has been completed and there's nothing left to do.

Canceled: The project was abandoned and won't be completed.

To accommodate multiple and unanticipated types of projects, these statuses are merely informational and do not affect project features.

5.3.5.2 People

Pipeline features a *trusted member system* to help creators distribute leadership within a project. Here, one of the most significant challenges was keeping the system as simple as possible while still supporting a wide variety of project types. My concern was that if I developed a system with many different roles, project members would be confused as to who was responsible for doing what. It also seemed likely that a system with numerous specific roles for members would unnecessarily constrain unanticipated types of projects. Furthermore, I worried that people would be hesitant to

Pipeline Demo
Start a Project
Find Projects
Help
Admin
kurtluther
Inbox
Settings
Log Out

American Anthem
POST-PRODUCTION

★ You are a **trusted member** of this project.

Leave Project

Basics
Tasks
People
Discussions
Files
Activity

PROGRESS
Edit

Status: POST-PRODUCTION
Deadline: 209 days ago
Started: 252 days ago

PITCH
Edit

This project is for the remastering of a dialogue track I did on Amazon Studios. The script and 59 minute track can be found here: <http://studios.amazon.com/scripts/11016>

The purpose behind a dialogue track is to give the pacing of dialogue within the story. This, in turn, drives the storyboard design.

Also, the dialogue track, sound effects, drawn storyboard, and music will be combined in a future project to create an animatic of the entire story.

This remastering effort brings in established actors and a few elite speedskaters into the mix.

The official Facebook page is:
<http://facebook.com/AmericanAnthem>
<http://facebook.com/AmericanAnthemSoundtrack>

Press:
<http://www.miningjournal.net/page/conten...I?nav=5141>
<http://www.startribune.com/entertainment...61494.html>

American Anthem is a story about a brash speedskater challenged by returning to competition if he trains a high-functioning autistic struggling to get into an Olympic speedskating program.

SPECS
Edit

Max length: 5 minutes for each voice track file
Audio File Format: MP3
Image File Format: any
Video format: mp4, if possible.

RULES
Edit

+Keep it PG-rated

-No nudity or extreme violence

+Multiple submissions allowed

+We'll include as many good submissions as possible

-Low quality submissions won't be included

You must use Pipeline during the collab

+Submit voice tracks as MP3 or WAV files.

RECENT DISCUSSIONS
New Discussion

(none)

RECENT ACTIVITY

jtcarr* edited the pitch.
227 days ago
Details

jtcarr* changed the status of this project to "post-production."
228 days ago
Details

jtcarr* edited the pitch.
230 days ago
Details

jtcarr* edited the pitch.
230 days ago
Details

jtcarr* edited the specs.
245 days ago
Details

Older Activity »

Figure 16: The Basics tab in Pipeline

adopt a system with complex permissions and access controls, making it difficult to build a critical mass of users.

To address these concerns, I designed a membership system based on the notion of “trust.” In this system, there are almost no barriers to contributing content or making changes that affect only one’s own contributions. However, members must be trusted to be given permission to perform actions that affect others members beyond one’s self. This breakdown is loosely based on the concept of *articulation work*, which has been identified as an important component of CSCW in general [128], and online creative collaboration in particular [93]. Strauss [135], quoted in Schmidt and Bannon [128], defines articulation work as follows:

“Articulation work amounts to the following: First, the meshing of the often numerous tasks, clusters of tasks, and segments of the total arc. Second, the meshing of efforts of various unit-workers (individuals, departments, etc.). Third, the meshing of actors with their various types of work and implicated tasks.”

To reify this concept for the design of Pipeline, I simplified articulation work to mean organizational-type work, such as creating new tasks or editing high-level project settings like deadlines, specs, and rules. Pipeline’s technological support for this type of articulation work is provided only to the creator and trusted members, while all member types can engage in content creation work: joining open tasks, sharing work in progress, leaving feedback on others’ work, participating in discussions, and so on. Altogether, the allocation of permissions is generous to regular members; there are relatively few activities the system prevents them from doing. The intention behind the phrase “trust” (versus administrator, moderator, etc.) is to encourage distributed leadership by downplaying the notion of trusted members as an elite class holding power over the regular members.

A comparison can be drawn to the way Wikipedia operates. Content creation is open to anyone, even anonymous and unregistered editors. However, some privileges that affect other editors, such as banning users or making changes to the software, are limited to editors with specialized roles, such as administrators and developers, who are often elected to these positions [23, 56]. Much like Pipeline de-emphasizes the power relationship between trusted and regular members, Wikipedia administrators often view themselves as “janitors” whose powers amount to being trusted with a

mop to help clean up [23]. In addition, MediaWiki, the software platform underlying Wikipedia, is remarkably unstructured, providing essentially a blank canvas for the community to fill however it wants [24]. Jimmy Wales, Wikipedia's co-founder, has described the principle behind Wikipedia's success as relying primarily on social norms and guidelines, rather than technical constraints, to help users figure out what to do [148]. One problem with technical constraints is that they often limit emergent creativity. He observed:

“What we do is we sit down and think, we're going to design a website, we think of all of the bad things people might do, and we make sure that we have controls and permission, everything to prevent people from doing the bad things, right? ... When you prevent people from doing bad things, there's often very obvious and direct side effects that prevent them from doing good things ... That's the first order of fact, that by having complex permission models, you make it very hard for people to spontaneously do good.”

Wales also noted a second problem with technical constraints: they contribute to a culture of hostility that can form when the software design expects the worst of people. In his view, “[T]his kind of philosophy of trying to make sure that no one can hurt each other actually eliminates all the opportunities for trust” [148].

Pipeline's trusted member system is meant to help leaders apply this “Wikipedia principle” to their own projects, should they choose to. As mentioned above, when a user creates a new Pipeline project, he or she can choose which members to trust, if any. On one extreme, the creator could trust only herself, potentially replicating the vertical, centralized approach to leadership observed in most previous collabs. On the other extreme, the creator could trust all project members, granting full technical permissions to everyone. In this case, the project could resemble a wiki, relying on social rather than technical controls to influence member behavior. Beyond these extreme options, project creators could also trust any subset of members, from a small group of close friends to all but a handful of novices, for example. This is the central idea behind my claim that Pipeline can *support and transform leadership* in online creative collaboration. It is designed to support traditional (vertical) leadership structures, but also allow for leadership to be transformed, or redistributed, more

broadly. Trusted status can be granted or revoked at any time, allowing for real-time adjustments of leadership distribution throughout the project’s lifespan.

The People tab (Figure 17) displays two lists of users: Members and Banned Users. The Members list includes the creator, trusted members, and regular members; the creator is listed first, while the remaining members are listed alphabetically by username in order to deemphasize any hierarchical connotations of trusted member status. Throughout the project, an asterisk (*) is appended to the usernames of trusted members to indicate their status in an unobtrusive way (cf. badges, shields, medals, etc. seen on many sites). Trusted members viewing the Members list may see buttons labeled “Trust” (or “Untrust”) and “Ban” (or “Unban”) next to each username. Trusted members may trust/untrust and ban/unban any user except the project creator.

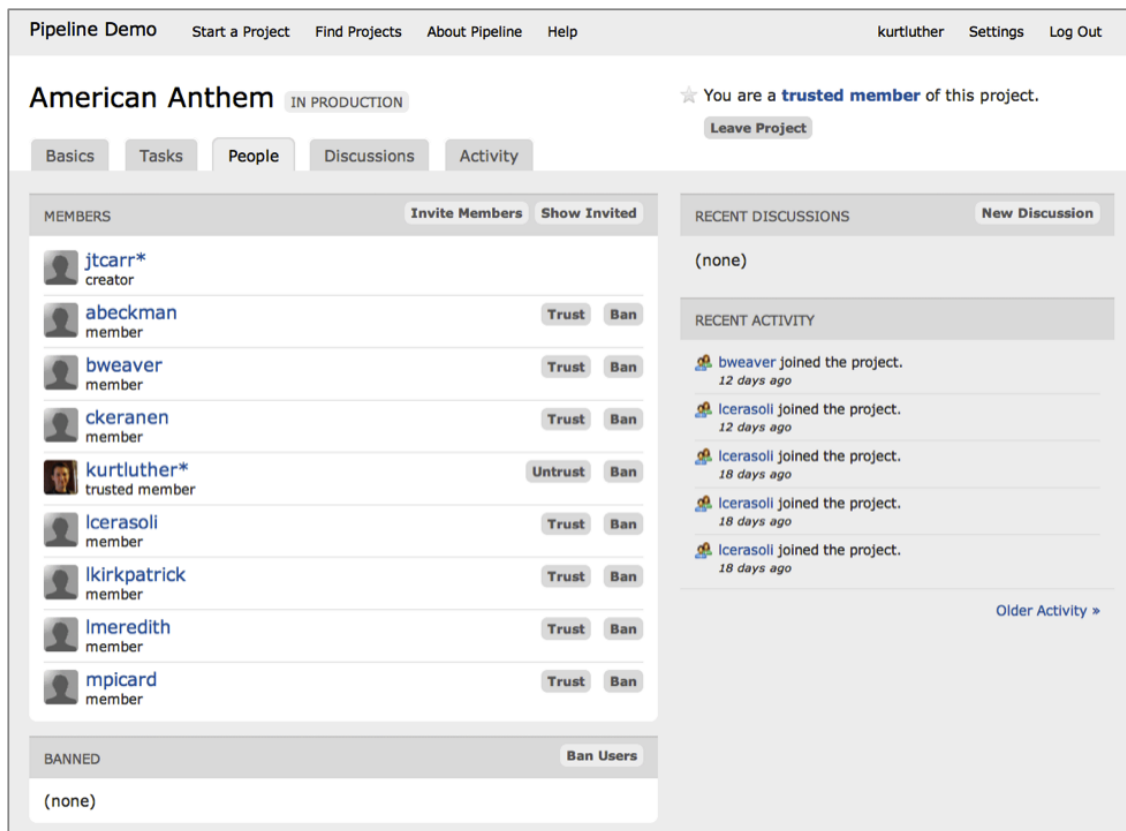


Figure 17: The People tab in Pipeline

The Members list also provides an interface for managing invitations. Any member of the project can invite users to the project. Trusted members see an additional option on the invitation interface: a “Trusted” checkbox. Sending the invitation with this box checked causes the invited

user to automatically become a trusted member upon accepting the invitation. The “Trusted” box is intentionally checked by default to encourage more trusted members and, I hoped, more broadly distributed leadership. The interface also allows members to view previous invitations and their outcomes.

The other list on the People tab shows users who are banned from the project. In public projects, banned users are simply prohibited from contributing to the project in any capacity; they can still view the project because public projects are visible even to unregistered users. Banned users are unable to either view or participate in private projects.

5.3.5.3 Tasks

Tasks are the primary mechanism of dividing up and accomplishing work in Pipeline. The Tasks tab (Figure 18) has two possible views, depending on whether the user is registered or not. Registered users see two lists of tasks: “Your Tasks,” a list of tasks the user has joined or led, and “More Tasks,” a list of tasks in the project which the user hasn’t joined. Both lists display the status of the task and order them chronologically according to the tasks’ deadlines. The “Your Tasks” list also displays the member’s role in that task (e.g. contributor or leader).

Pipeline’s task management system was designed to be simple, lightweight, and flexible in order to foster originality, as discussed in Chapter 3, and accommodate a wide range of projects and types of work. Only trusted members can create tasks. New tasks have four requirements: a title, leader, status, and instructions. The title and instructions are entered into text boxes, while the status has just two options: open and closed. The task leader is the person responsible for making sure the task gets done (as opposed to the person assigned to complete the task). This design decision is meant to encourage decentralized leadership and provide an endpoint for subjective decision making, as described in Chapter 3, but not at the expense of members’ free choice. Most Pipeline users are volunteers, and being able to self-select for tasks is both an important motivator and a highly efficient mechanism for dividing up work in online collaboration [11]. Hence, the design of Pipeline encourages members to claim work for themselves rather than assigning work to others. There is no explicit software support for assigning work to project members; instead, members find work by browsing a list of open tasks and joining those that appeal to them. Any trusted member

Pipeline Demo

[Start a Project](#)
[Find Projects](#)
[About Pipeline](#)
[Help](#)

kurtluther

Settings

Log Out

American Anthem

IN PRODUCTION

★ You are a **trusted member** of this project.

Leave Project

Basics

Tasks

People

Discussions

Activity

YOUR TASKS

New Task

Task	Status	Deadline	Needed	Role
<div>Audio Portion of Date Scene - Eric and Kayla</div> <div>Create the necessary dialogue tracks to support a portion of the date ...</div>	closed	22 days ago	0	seeking feedback

MORE TASKS

Task	Status	Deadline	Needed
<div>Speedskating POV Video</div> <div>Need elite speedskaters to use the VIO POV 1.5 I got them to do some m...</div>	open	9 days ago	∞
<div>Voice Tracks for Devin</div> <div>Provide all voice tracks for a speedskater named Devin Williams.&#x2026;</div>	open	in 6 days	0
<div>Voice Tracks for Hanna</div> <div>Provide all voice tracks for a figure skater named Hanna Stout.&#x2026;</div>	open	in 6 days	1
<div>Voice Tracks for Kayla</div> <div>Provide all voice tracks for a short character named Kayla Saint Denis...</div>	open	in 6 days	1
<div>Voice Tracks for Mary</div> <div>Provide all voice tracks for the director of the USOEC named Mary Brig...</div>	open	in 6 days	0
<div>Storyboard Portion Of Date Scene</div> <div>Need someone to do the storyboard portion of the date scene based on t...</div>	closed	21 days ago	0
<div>Voice Tracks for Preacher</div> <div>Provide all voice tracks for a short character named Preacher.</div>	closed	in 6 days	0

RECENT DISCUSSIONS

New Discussion

Enhancement Requests

last reply 18 days ago by kurtluther*

RECENT ACTIVITY

jtcarr* commented on the task Voice Tracks for Mary.

11 days ago / Show

jtcarr* closed the task Voice Tracks for Preacher.

12 days ago

jtcarr* commented on the task Voice Tracks for Preacher.

12 days ago / Show

jtcarr* commented on the contribution New Batch.

12 days ago / Show

jtcarr* commented on the task Voice Tracks for Mary.

12 days ago / Show

Older Activity »

Figure 18: The Tasks tab in Pipeline

can lead a task but the default is the task creator’s own username.

Tasks also have some optional attributes. The creator can specify the number of people needed for the task and specify a deadline. It is also possible to attach any number of files to the task, for example, to provide supporting material illustrating the task’s written instructions. Figure 19 shows an example task.

Tasks are comprised of pieces of content called contributions (Figure 20). To work on a task, members join the task and make contributions in it. Once the member joins the task, his or her username appears next to the task information under a list of “Task Members” and the number of people needed (if specified) decreases by one. Contributions require a title, a textual description, and a status (working, in progress, or finished). As with the task itself, contributions can include an arbitrary number of file attachments, which will often be the content requested by the task. However, the inclusion of various status types and the intentionally ambiguous term “contribution” is meant to encourage iteration, progress reports, and updates, not just submission of finished work products.

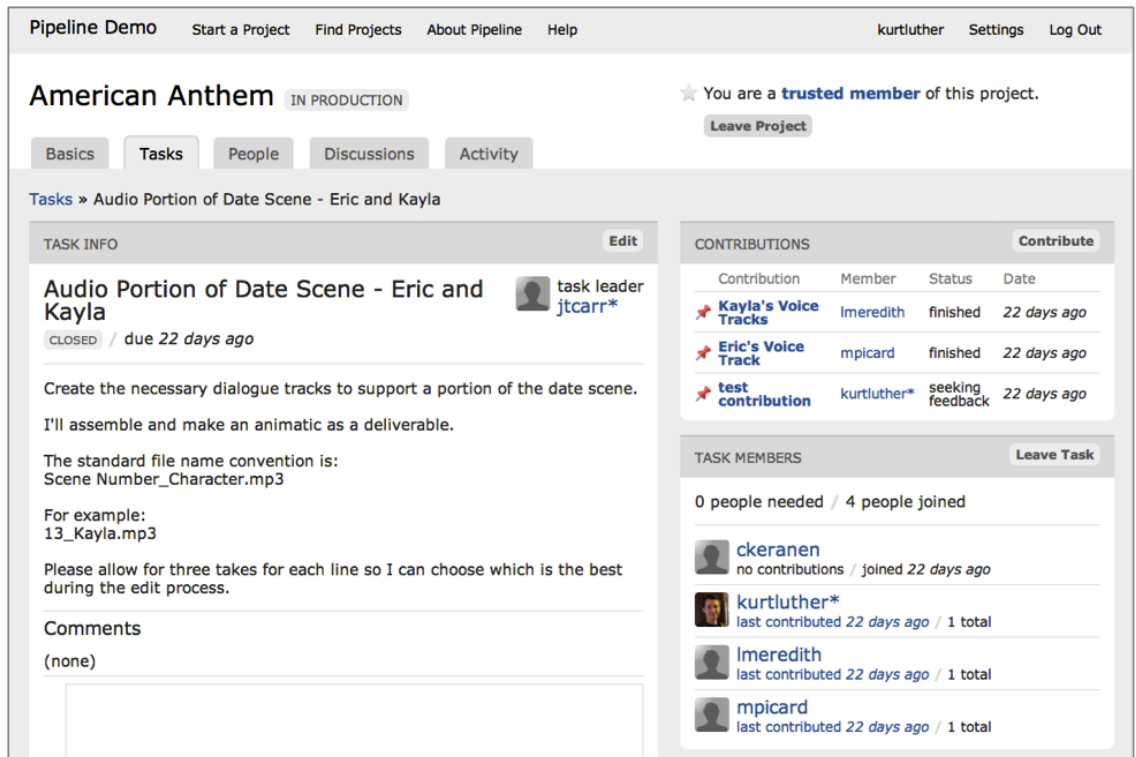


Figure 19: An example task in Pipeline

If a member submits multiple contributions to the same task, Pipeline links them together visually, allowing members to quickly grasp the progression of the member's work and identify the most recent version.

To encourage exchanges of feedback and critique, both tasks and contributions can receive comments. The Pipeline comments system supports one level of threading, so that members can easily respond to individual comments rather than appending to a lengthy list. Additionally, comments on contributions are linked to a specific version of that contribution, so that stale feedback does not appear alongside new iterations. If the project is public, any registered users—including those who aren't project members—can comment on tasks and contributions, to encourage diverse feedback. Commenting in private projects, as with all types of contribution, is limited to invited users and members.

Finally, it is notable that contributions can only be modified by their creators; neither the project creator nor trusted members have control over other members' contributions. This design decision is meant to accommodate the strong feelings of ownership that artists often feel towards their work,

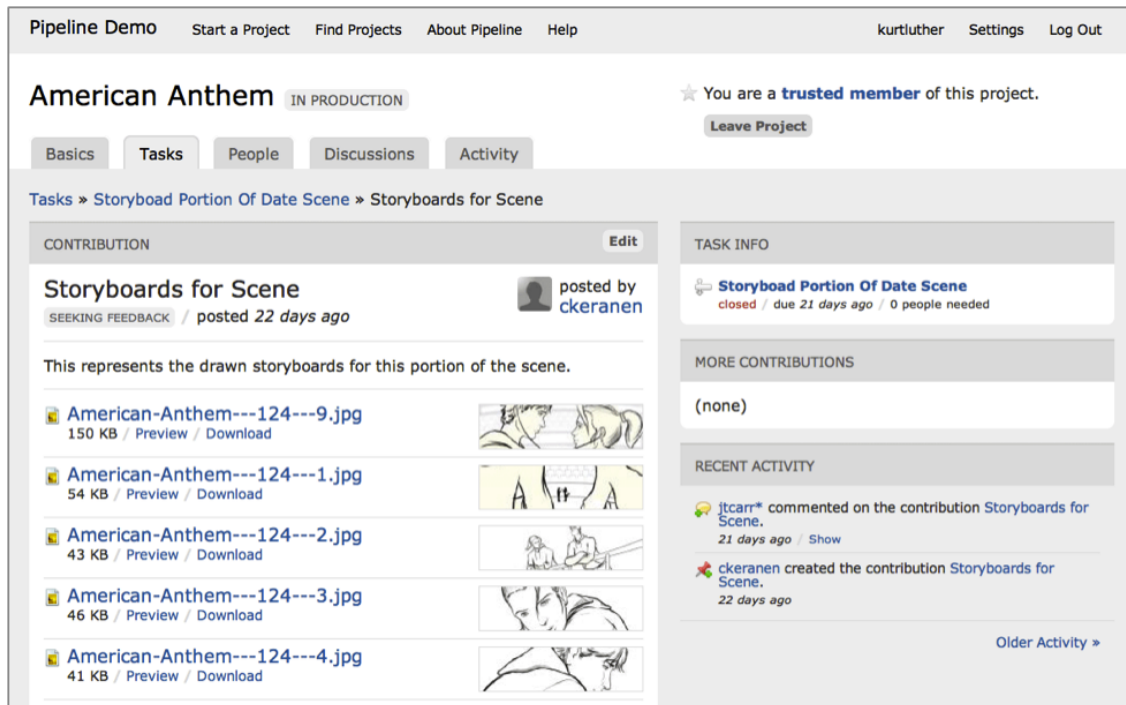


Figure 20: An example contribution to a task in Pipeline

even within online creative collaboration, as described in Chapter 3. Members who have suggestions or critiques to offer are free to leave comments or make their own contributions illustrating an alternative.

While the previous section identified some philosophical overlap between the design decisions underlying Pipeline and Wikipedia, this section reveals some important distinctions. In Wikipedia, multiple editors frequently contribute to the same article, which can result in “edit wars” in which editors who disagree constantly revert each other’s changes [145]. Pipeline avoids this problem by preventing members from directly modifying other users’ work. Also, it is notable that in Wikipedia, many regular editors perform articulation work, not just administrators [93]. While regular members can do some types of articulation work in Pipeline, the software explicitly supports trusted members in this capacity.

5.3.5.4 *Files*

Pipeline supports file uploads in most popular media formats. This includes images, videos, Flash animations, audio files, and text documents. Pipeline provides tools for browser-based media consumption to encourage users to upload and share files. For example, the software automatically generates thumbnails for visual media such as images, videos, and Flash animations. It also automatically recompresses video and audio uploads into streaming formats to enable quick previews, though the raw file is always available for download. Pipeline uses an open-source browser-based media player, Flowplayer,¹ to play streaming media and Flash animations.

The upload/playback system described above is used for file attachments to tasks and contributions. The Files tab (Figure 21) presents a list of all files uploaded within the project in reverse chronological order. Each item in the list can be downloaded or previewed and displays relevant metadata, such as the uploader, upload date, and the associated task or contribution.

5.3.5.5 *Discussions*

Pipeline provides a forum-style discussion area to supplement the task management system. The intention behind discussions was that project members may want to ask questions or raise issues that span multiple tasks or are broader than just the current task list. To meet these needs, Pipeline augments the task-level comments system with tab-level and project-level discussions.

To start a new discussion, the user provides a title and body content. Each discussion gets its own page (Figure 22), and users can reply to discussions in a manner similar to most online forums. Trusted members can lock discussions to prevent new replies.

Discussions can also be categorized, allowing the user to specify whether it is a tab-level or project-level discussion. The categories are tab names: Basics, People, Tasks, etc. Categorizing a discussion as “Basics,” for example, would cause it to be listed in a small panel called “Recent Discussions” on the Basics tab’s sidebar. This would be appropriate for starting a discussion about the project’s specs or rules, for example, because the discussion appears adjacent to the content in question. The People and Tasks tabs have similar “Recent Discussions” panels. The Discussions tab lists all discussions in the project, including their titles, creators, reply counts, and categories (if

¹<http://flowplayer.org/>

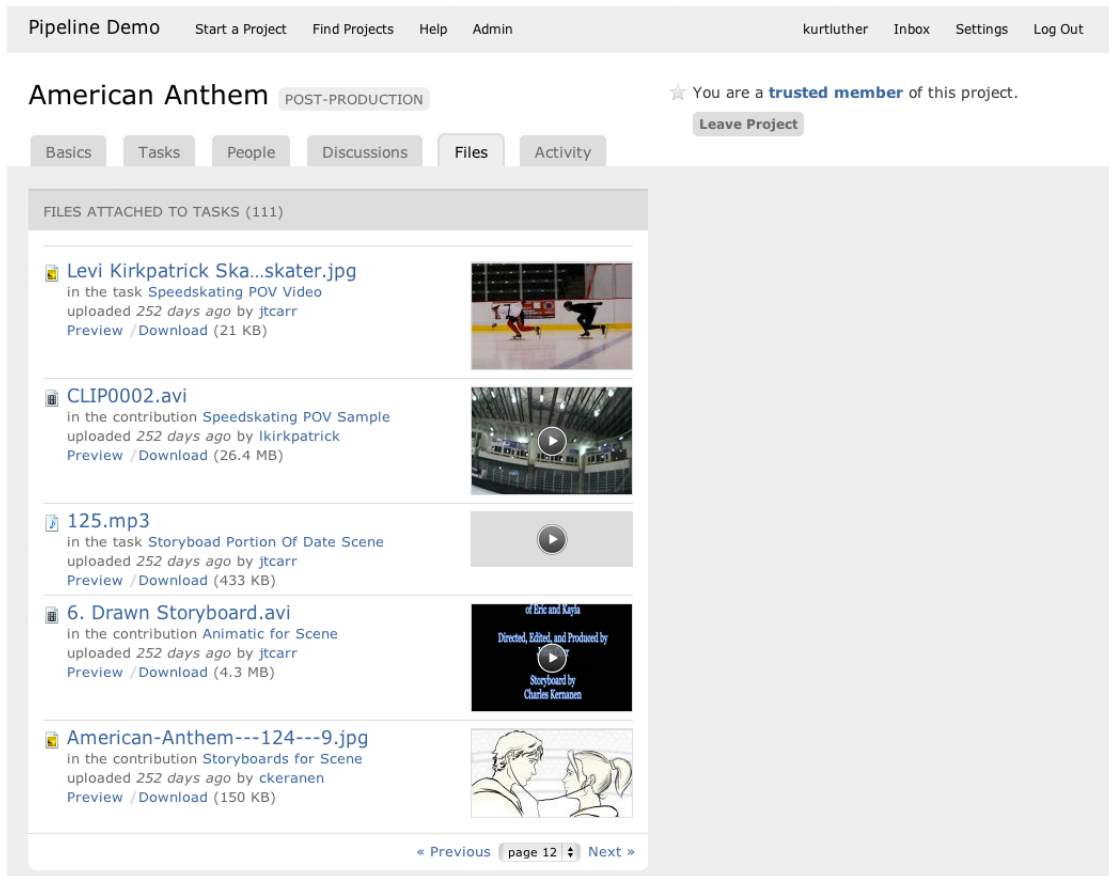


Figure 21: The Files tab in Pipeline

categorized). If the discussion is not categorized, it is assumed to address a topic broader than any one tab—a project-level discussion.

5.3.5.6 Activity

Pipeline keeps comprehensive, fine-grained histories of user behavior. More than 40 types of events are stored, including users creating or editing projects, tasks, contributions, file uploads, discussions, and comments; users joining or quitting projects and tasks; and users inviting, banning, or trusting other members. Pipeline’s MySQL database also stores sufficient metadata for each event to allow a project’s complete history to be reconstructed.

One benefit of these histories is to aid my research efforts. In fact, they provided a major source of data for evaluating Pipeline, which I will describe further in Chapter 6. Additionally, Pipeline shares this information with users. As I explained in Chapters 3 and 4, leaders are often overburdened to the point of failure, and one particular challenge they struggle with is informing

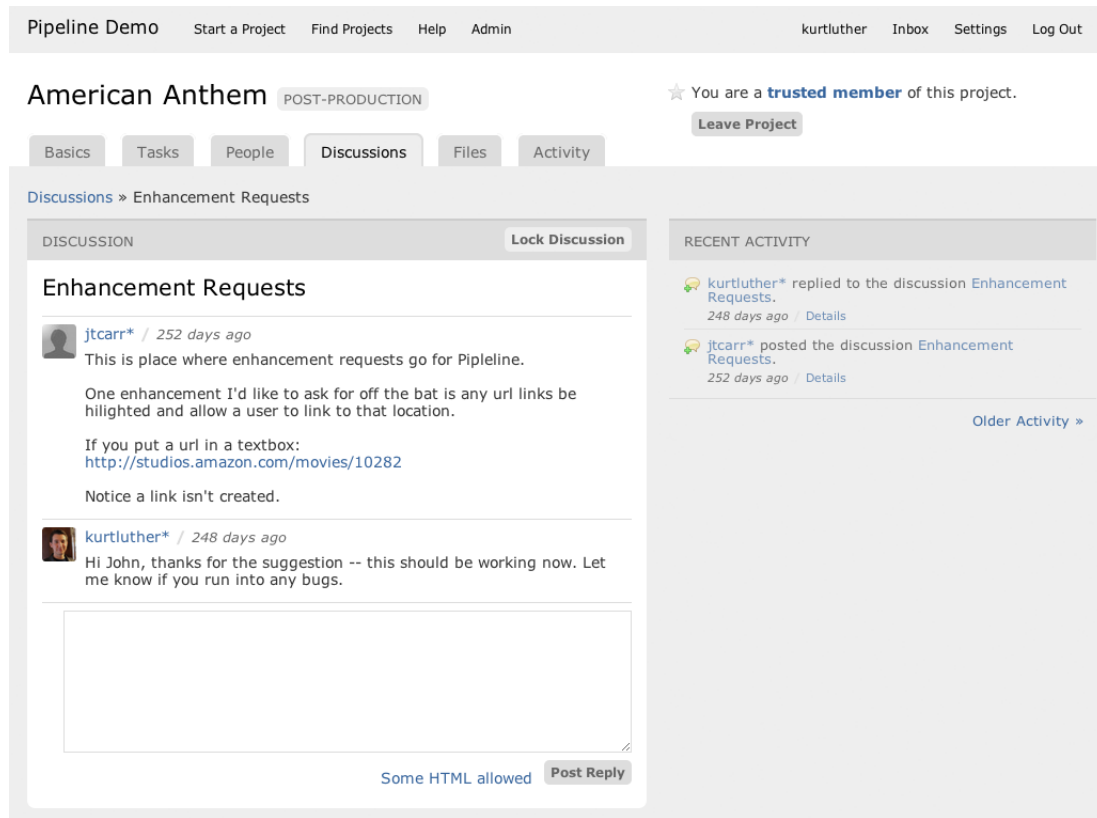


Figure 22: An example discussion in Pipeline

and monitoring collab members. Other research shows that group awareness is critical to successful collaboration, but it can be difficult and time-consuming to maintain, particularly when members are geographically distributed, as in online creative collaboration [68]. In Chapter 4, I showed that frequent and sustained activity among leaders and members is correlated with success, and suggested tools for reflecting on activity dynamics as a possible design implication. Pipeline seeks to automate some of the more tedious aspects of group awareness previously handled by leaders by making member behavior more *socially translucent*—that is, increasing the visibility, awareness, and accountability of users’ actions [48].

To accomplish this, Pipeline displays lists of member events in “Recent Activity” feeds, which appear as sidebars on the dashboard, user profile pages, and most project pages. The feed are context-sensitive, showing only events related to the current page. For example, the page for a contribution shows only events related to that contribution, while the page for a task shows events related to that task or any contribution to that task. For most event types, users can zoom in on

an event’s details to reveal, for example, the complete text of a comment or a before-and-after visualization (“diff”) of an edit to a task’s instructions. Each project also includes a dedicated Activity tab where members can filter and explore the project’s complete history (Figure 23). From the Settings page, users can also set up customized email notifications for when certain event types occur, such as new comments on their contributions, or changes to a task they joined. Finally, Pipeline takes into account when users last logged in and highlights events in the feeds that have occurred since that time.

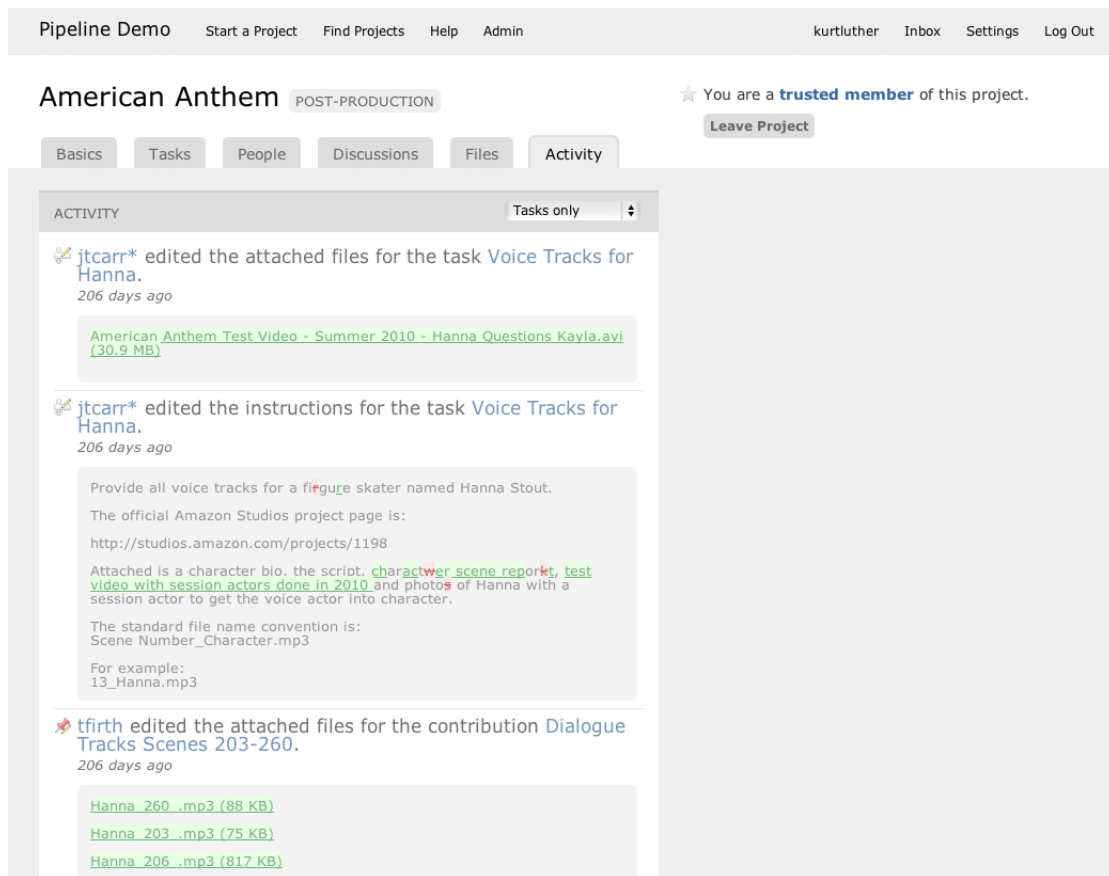


Figure 23: The Activity tab in Pipeline, filtered to show only Task-related events

It is worth noting that while most user actions are logged, some events are hidden from activity feeds to protect users’ privacy (e.g. events related to private messages). The goal with social translucence is not complete transparency but rather effective use of constraints, such as the balance between privacy and visibility, and helping users understand these constraints [48]. To this end, Pipeline uses a simple privacy model: all project members (creator, trusted, regular) see exactly the

same set of events.

5.4 Comparing Pipeline to Similar Systems

Pipeline integrates concepts from both project management tools and software support for peer production. In this section, I briefly summarize some of the key similarities and differences between Pipeline and other related systems.

5.4.1 Project Management Tools

Software support for project management has a long history, and recent years have seen an explosion of new, web-based collaboration tools. While a comprehensive review of these tools is beyond the scope of my dissertation, I describe a range of popular examples below: Asana,² Basecamp,³ Podio,⁴ Teambox,⁵ and Wreckamovie.⁶

Pipeline shares a number of basic features with these systems. In most of them, the standard unit of organization is the *project*. Members join projects and work on tasks. There are typically multiple places to share files, post comments, and have discussions. Most systems track member behavior and display histories as activity feeds. While the terminology can vary from one system to the other (e.g. “projects” vs. “workspaces” or “activity streams” vs. “daily progress”), the functionality of these basic features have much in common.

5.4.2 Scope

One key difference between Pipeline and most of these systems is its scope. Pipeline seeks to provide a kind of marketplace for online collaboration, a destination where anyone can start new projects or join existing ones. Consequently, the software seeks to help users learn about what other members are doing. Projects can be made public so that anyone can view, comment on, and even join them. The “Find Projects” and “Dashboard” pages list these public projects to attract members, and profiles list each user’s project history.

²<http://asana.com/>

³<http://basecamp.com/>

⁴<https://podio.com/>

⁵<http://teambox.com/>

⁶<http://www.wreckamovie.com/>

In contrast, most other project management systems keep users focused on their own projects, with little or no support for interacting with other projects or members. Projects and their members are “siloe,” and the websites that host them are treated as infrastructure, not marketplaces or communities. In one typical design pattern, the home page for a logged-in user is a list of projects, with no way to see other activity on the site. Projects are generally private such that only invited members are aware of them. Some systems allow projects to be encompassed by higher-level organization tiers, but these are also private and invite-only.

Possibly, the reason for these differences in scope and features is Pipeline’s assumption that project creators are unlikely to know many of their collaborators beforehand. Most project management systems appear to make the opposite assumption—that collaborators are friends or members of the same traditional organization. For example, Asana organizes projects around “your company’s name,” while Podio does the same with a user’s “employee network.” Furthermore, since some project creators will use Pipeline to find collaborators, the software provides tools for helping creators “sell” their projects (e.g. the pitch) and helping potential members evaluate creators (e.g. project histories in user profiles).

5.4.2.1 Permissions

Another key difference between Pipeline and other project management systems involves permissions. In systems like Basecamp and Teambox, “admin” powers are fairly limited and deal almost exclusively with user management—specifically, who can appoint/demote admins, or add/remove users from a project. The default configurations in Asana and Podio lack admins altogether. These permissions schemes makes sense given the assumptions mentioned above: projects are private and members are familiar and potentially connected via formal organizations.

In contrast, the permissions system in Pipeline is designed to accommodate projects in which some or all members are unknown to one another. Consequently, Pipeline’s counterpart to “admins,” called trusted members, have more expansive powers. In addition to user management, trusted members are granted exclusive permissions to do other types of articulation work, including creating and leading tasks and editing high-level project settings. In one scenario, a project creator can “trust” regular members with additional technical privileges as they prove themselves to be reliable

and trustworthy. Alternatively, creators who trust all members by default essentially replicate the permissions systems seen in most project management systems.

5.4.2.2 Cost and Customizability

A final key difference between Pipeline and other project management systems is cost and customizability. With respect to cost, Pipeline has been released as free, open-source software under the GPL. Most other systems charge monthly or annual fees. Generally, more projects and members mean higher fees, which can present a serious obstacle for amateurs and discourages large projects. However, these systems generally bundle hosting and bandwidth costs with their fees, while anyone setting up Pipeline instances outside the Georgia Tech servers would bear the responsibility for these. With respect to customizability, Pipeline's open-source license allows for unlimited modifications to its code base. Systems like Podio and Teambox provide modular "Apps" that can be installed with one click, but some of these (e.g. Podio's "Administration" app) require additional monthly fees.

5.4.3 Peer Production Tools

In addition to project management tools, Pipeline also builds on ideas from software tools designed for supporting peer production. In this section, I focus on three of the most popular examples: MediaWiki, Github, and Amazon Mechanical Turk.

5.4.3.1 MediaWiki

MediaWiki⁷ an open-source wiki platform used by Wikipedia, Wikia, and many other popular wikis. Like Pipeline, it provides a range of collaboration tools, including support for multimedia file uploads, detailed histories of user contributions, and dedicated discussion areas. As one of the most popular wiki platforms, MediaWiki excels at providing the infrastructure that allows for many wiki-style collaborations to succeed. It supports one of the most unstructured forms of online collaboration, relying entirely on the contributions of users to create and organize content in a meaningful way. Pipeline is designed to support a range of collaboration approaches and leadership styles. When all members of a Pipeline project are trusted, the system resembles MediaWiki in many

⁷<http://www.mediawiki.org/wiki/MediaWiki>

ways, relying mainly on social, rather than technical, permissions to guide behavior. However, even in its most wiki-like configurations, Pipeline provides more structure than MediaWiki's defaults. The encoding of projects, tasks, and contributions is meant to provide lightweight scaffolding and streamline basic operations at the expense of some flexibility. These concepts also help the system accommodate a broader range of collaboration styles, including both wiki-like and more traditional top-down approaches, using the same underlying architecture.

5.4.3.2 *Github*

Github⁸ is an online host of open-source software development projects. Like Pipeline, it seeks to provide a place where users can come not only to start projects but also find projects to work on. To that end, Github's web-based user interface provides rich support for social networking, allowing users to follow projects of interest and see what others are doing. Each project has its own wiki and issue tracker, a type of lightweight task management system, to help users collaborate and make progress. The key difference between Github and Pipeline is that Github is exclusively focused on supporting software development projects. While any user can contribute bug reports and edit the wiki through the web interface, the primary activity on Github is contributing code, which is done by making "commits" using off-site client tools. In contrast, Pipeline aims to support a wide variety of creative projects, including movies, games, animations, artworks, and writings. It is geared towards projects with a substantial multimedia component that require artistic and technical people to work together. Thus, Pipeline strives for breadth rather than depth, prioritizing accessibility and versatility. Github serves a more specific community—developers of open source software—particularly well.

5.4.3.3 *Amazon Mechanical Turk*

Amazon Mechanical Turk (AMT)⁹ is an online marketplace for crowdsourcing paid tasks. On AMT, a person who creates tasks for others to complete is called a requester. Each task, called a HIT, can be claimed by any one of AMT's thousands of geographically distributed workers (also called "turkers"). HITs are generally simple and require only a few seconds to complete, and the

⁸<https://github.com/>

⁹<https://www.mturk.com/mturk/welcome>

payment is correspondingly low—usually just a few cents each. Pipeline shares with AMT the idea of allowing participants to self-select their tasks, rather than task assignment, which is more common in project management systems. They also share the idea of opening tasks to anyone who is online, the notion of tasks as a cornerstone of collaboration, the separation of task creators from task completers, and support for large-scale collaborations. AMT differs from Pipeline in that AMT workers are typically distanced from the requester. Work is modularized to the point that workers rarely know the purpose of their tasks. They have no way of communicating with other workers and complete HITs mainly to make money [78]. In contrast, Pipeline’s design emphasizes communication, collaboration, and shared goals. The software assumes that users are intrinsically motivated and seeks to help them form groups, share ideas and feedback, and work on personally meaningful projects.

5.5 Development Timeline and Launch

I began imagining a leader-oriented collaboration tool in 2008, as I completed the empirical study of collab leader challenges described in Chapter 3. I developed a paper prototype of the system (called Sandbox at the time) as part of my thesis proposal in May 2009. My original plan was to work closely with the Newgrounds community as I designed Pipeline. These intentions were complicated by the realities of working with an online community which was also a small business. In early 2009, I learned through connections I had made with the Newgrounds staff that the website was undergoing a major redesign, and among the new features was a set of collaboration tools, fully integrated into the Newgrounds architecture, to be known as the “project system.” As I had already laid the groundwork for developing Pipeline, two possibilities were apparent at the time: I could finish Pipeline and attempt to compete with Newgrounds’ official project system, or I could attempt to somehow get involved in the project system and merge it with my ideas for Pipeline. The approach I ultimately took combined both of these ideas. In the summer of 2009, I interned with Newgrounds and worked on developing collaboration tools and the project system. However, my work was delayed from a public release by several years while the rest of the redesign was completed; the redesign and project system finally launched more than two years later, in February 2012.

During the intervening years, I continued and ultimately completed developing a functional release of Pipeline. This decision was motivated by my uncertainty as to when the Newgrounds project system would be made public (and allow me to collect usage data), my desire to reach a potentially broader set of communities through open-source software (the Newgrounds project system was proprietary), and the increased freedom brought about by designing a system that was not tied to a particular community, infrastructure, or business model.

Following my internship at Newgrounds in 2009, I returned to Georgia Tech and began assembling the team that would work on Pipeline. For the fall semester of 2009, I worked with an HCI master's student, Chris Howse, to prototype many of the major components of Pipeline (Figure 24), including the overall look-and-feel, an HTML- and CSS-based layout for most project pages, and a PHP-based templating engine called Soup for separating content and presentation. I created a gallery of screenshots of this prototype (via Flickr) and emailed the link to my interviewees from the empirical studies of leadership in Chapters 3 and 4, requesting their thoughts. Several responded with comments which I used to iterate on the design.

Following Chris's graduation in 2009, I worked with a undergraduate Computer Science (CS) major, Kevin Ziegler, to develop the back-end architecture of Pipeline. During the spring semester of 2010, Kevin and I designed Pipeline's MySQL database and fleshed out the software's core structure, which is based on the Model–View–Controller (MVC) design pattern. We also began using Subversion (SVN), a popular revision control system, and Trac, a lightweight bug tracking system hosted by Georgia Tech TSO. I suspended work on Pipeline during the summer of 2010 while I interned with the User Experience team at YouTube in San Bruno, California.

When I returned in the fall of 2010, I worked with a CS master's student, Boris de Souza, to continue development and produce a functional prototype (Figure 25). In the spring of 2011, I installed a beta version of Pipeline, nicknamed Pipeline 1.0, on a Georgia Tech web server. I then announced it in the Newgrounds collaboration forum, requesting beta testers to help identify major bugs and feature requests. After several weeks of analyzing usage data and feedback from testers, Boris and I took down the beta version of Pipeline and began planning version 2.0. Boris completed his work on Pipeline at the end of the spring semester.

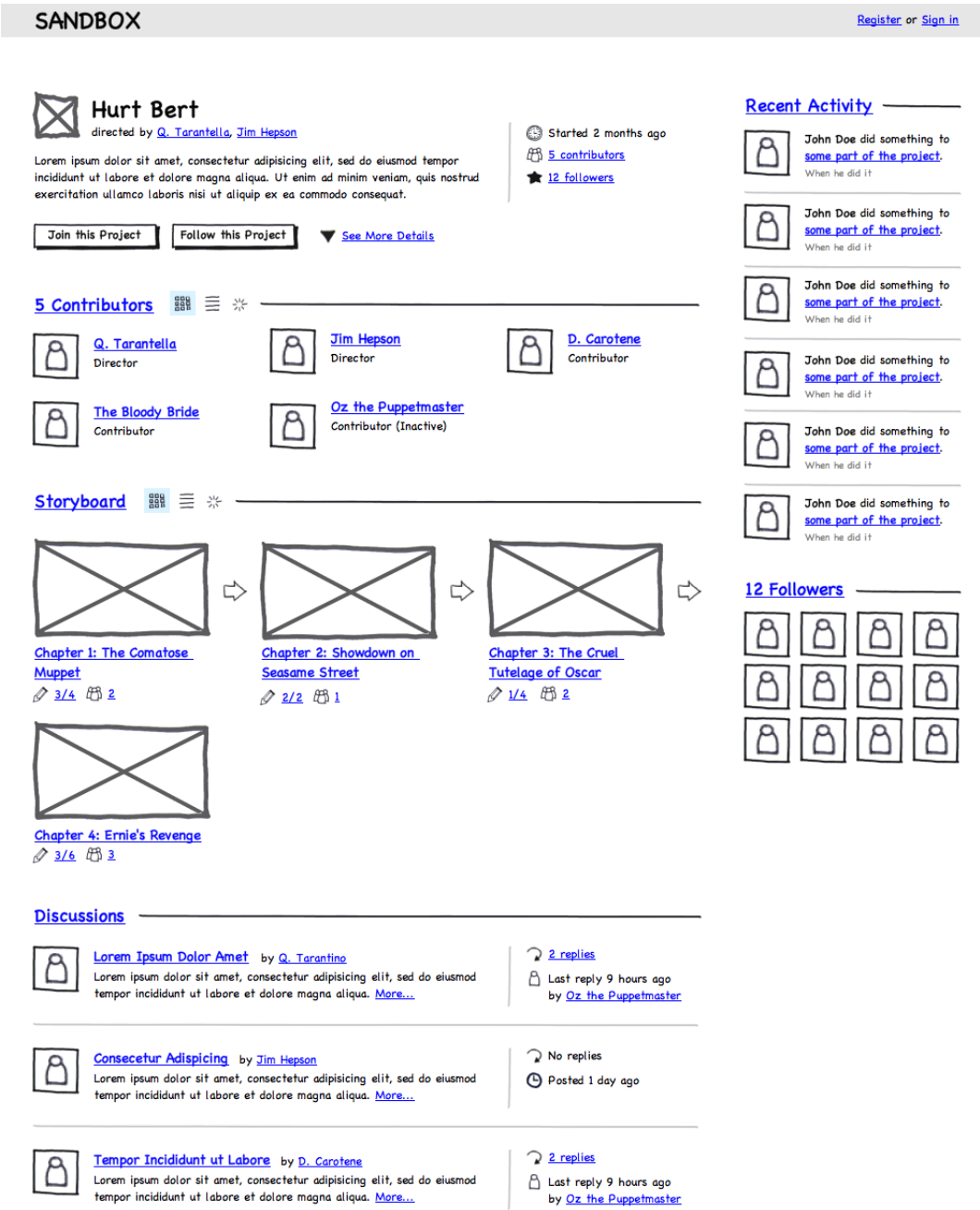


Figure 24: An early mockup of Sandbox, the predecessor to Pipeline

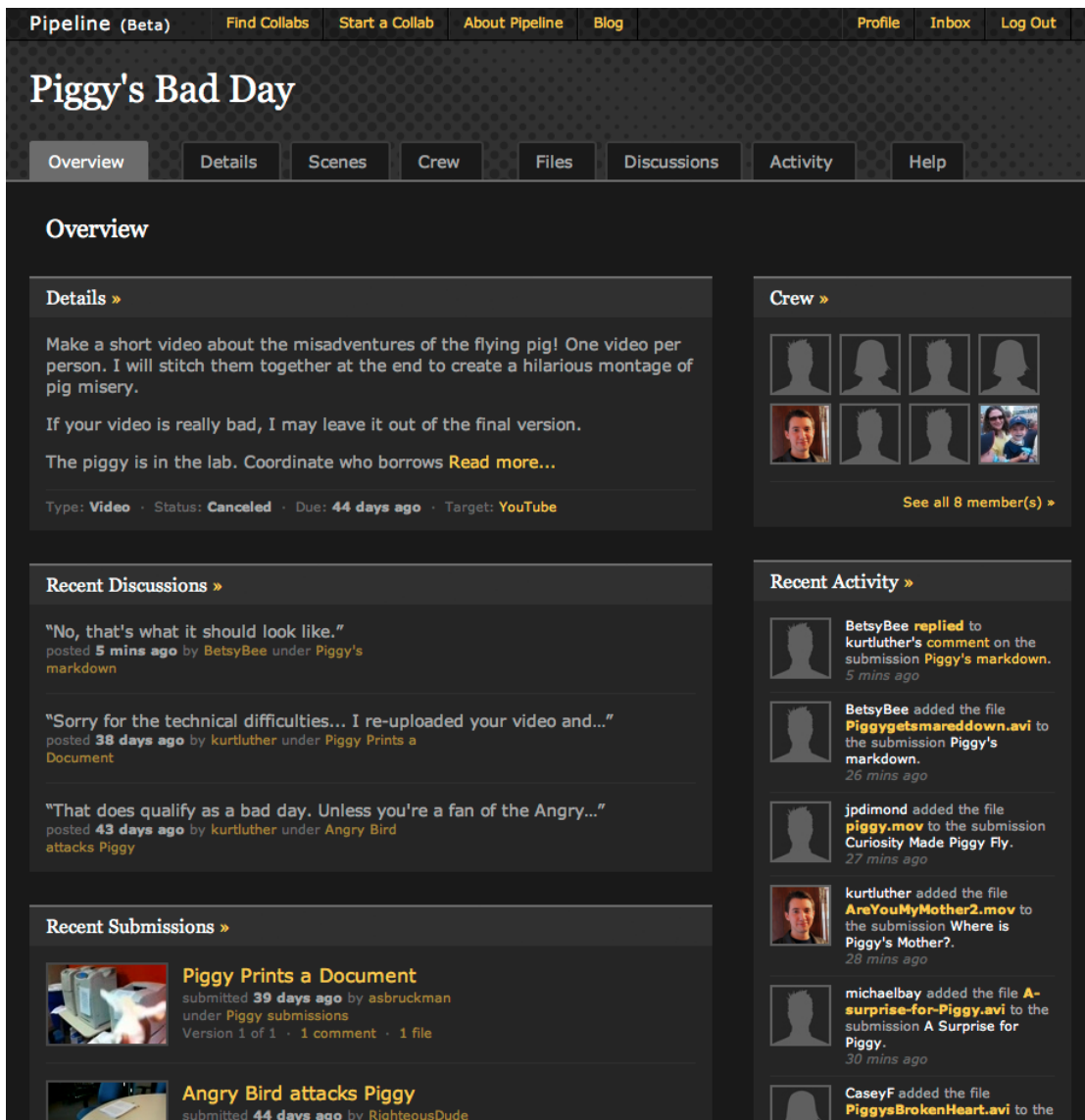


Figure 25: The Overview tab for a project in Pipeline 1.0

Over the summer of 2011, I completed a major redesign of Pipeline. One of the most significant changes was a broadening of the target user base. Rather than designing for the Newgrounds community, I reconceived Pipeline as a tool that could support many types of creative communities. Practically, this meant abstracting various features of Pipeline and allowing for greater customization. For example, I added a configuration page making it easy for someone installing a Pipeline to customize its name, URL, and color scheme. I also expanded the variety of media formats that users could upload.

I launched this new version of Pipeline, nicknamed 2.0, in October 2011, several months prior

to the Newgrounds redesign, allowing me to temporarily sidestep the issue of competing with the official project system. Unfortunately, due to concerns about competition and distracting from the redesign, the Newgrounds staff were unable to directly support or promote Pipeline. In November 2011, I released the Pipeline source code on GitHub.¹⁰ Since then, the Pipelines installed on the Georgia Tech web server have attracted more than 350 registered users and almost 90 projects, including Flash movies and games, films and videos, transmedia story development, and even Minecraft texture packs.

5.6 Advertising and Recruiting Strategies

In parallel with these development-oriented activities, I also conducted extensive advertising and recruiting efforts to promote the Pipeline software, build a community of interest, and attract new users and projects. These efforts can be grouped into three broad categories: 1) general promotion meant to raise the overall profile of Pipeline, 2) targeted promotion geared towards online creative communities, and 3) academic promotion. Casey Fiesler, a Ph.D. student in Human-Centered Computing, and my advisor, Amy Bruckman, assisted with many of the efforts described below.

My general promotional efforts were intended to raise awareness about Pipeline and reach new, unanticipated user groups. These efforts included more than 20 announcements and news updates posted to the Pipeline Development Blog,¹¹ regular updates of the Pipeline fan page on Facebook,¹² and a semi-weekly newsletter named “In the Pipeline” emailed to all registered Pipeline users. I also created an informational/marketing website for Pipeline¹³ which included a customized logo (Figure 26), live demo, features list, screenshots, and information about the Pipeline team and research/publications.

My targeted advertising/recruiting efforts for Pipeline took place in online creative communities such as Newgrounds, Kongregate, DeviantArt, and Vimeo. In all of these communities, I posted threads in the sites’ discussion forums announcing the release of Pipeline and encouraging members to try it out and explore the source code. For Newgrounds, the site of my preliminary

¹⁰<https://github.com/kluther/Pipeline>

¹¹<http://pipeline-gt.blogspot.com/>

¹²<http://www.facebook.com/pages/Pipeline/215713931833750>

¹³<http://pipeline.cc.gatech.edu/>



Figure 26: The Pipeline logo

fieldwork informing the design of Pipeline, I took extra steps to engage with the community. In addition to posting threads about Pipeline, I sent individualized messages to creators of new collabs on Newgrounds, as well as leaders of collabs in progress, inviting them to try Pipeline. I also partnered with a prominent member of the Newgrounds community, Austin Breed, to co-sponsor a game development competition called “Game Jam 6,” in which teams of artists, programmers, and musicians competed to make the best game in 96 hours or less. Teams that chose to use Pipeline for the competition were eligible to win three \$100 prizes.

Within the academic community, my team raised awareness about the Pipeline software and notable projects via invited presentations/demonstrations at the MIT Media Lab (October 2011), University of Minnesota (January 2012), Carnegie Mellon University (March 2012), Purdue University (April 2012), Google Research (April 2012), and University of Pittsburgh (April 2012). I also facilitated the integration of Pipeline into courses taught by colleagues at Georgia Tech, including two large undergraduate-level computer science courses and two mid-size graduate-level computer science courses. Students in these courses have independently chosen to use Pipeline for group projects in other courses, such as a video assignment in an undergraduate English course. Finally, Pipeline is being used in courses taught by Sean Goggins, a faculty member in the College of Information Science and Technology at Drexel University.

5.7 Characterizing Pipeline Usage Broadly

As suggested above, my original intention with Pipeline was to build a collaboration tool that attracted a significant user base from the Newgrounds community. I had studied this community in depth and used those findings to inform Pipeline’s design. However, as mentioned earlier, the Newgrounds staff’s commitments to completing their redesign and promoting their own collaboration

tools made it difficult for them to support and advertise Pipeline as well. Consequently, I broadened my Pipeline advertising efforts to include other online communities as well as academic communities like Georgia Tech. I also attempted to generate interest from the Newgrounds community directly by hosting several competitions for cash prizes and partnering with an existing community-organized competition, the Game Jam.

These efforts paid off in directing a small but steady stream of new users and projects to the Pipeline servers. In the first month of Pipeline's official release (November 2011), Pipeline drew over 50,000 page views. Anecdotally, it seemed that my advertising and recruiting efforts, while time consuming, generally paid off with activity on Pipeline. However, without a critical mass of users, this activity was not yet self-sustaining. When my team wasn't actively working to increase awareness of Pipeline, activity slowed to a trickle.

Nevertheless, many people signed up for and used Pipeline, and it is worth taking a closer look at what they did. In the rest of this section, I characterize Pipeline usage broadly, focusing on the five most active Pipelines on our Georgia Tech server. These were Newgrounds (geared towards the Newgrounds community), Demo (a demonstration Pipeline open to anyone), American Anthem (a Pipeline set up for an independent filmmaker), and two Pipelines used for students at Georgia Tech. As much as possible, I exclude my own Pipeline usage and that of my colleagues from the following analysis, which reflects the data as of August 2012.

5.7.1 Total Projects and Users

Overall, there were 365 accounts registered across all five Pipelines: Demo (204), Newgrounds (87), Georgia Tech (61), and Anthem (13). They collectively created 86 projects: Demo (67), Georgia Tech (9), Newgrounds (8), and Anthem (2).

5.7.2 Project Privacy

The majority of Pipeline projects were created as private projects (65%, or 56 of 86). These projects were visible only to members and invited users. The remaining projects were public projects visible to anyone visiting the Pipeline site. As mentioned above, most project management tools require projects to be private and invite-only. However, public projects are the norm in the Newgrounds community, so the default option in creating a Pipeline project is to keep it open to the public. This

design decision may partially explain why a substantial minority of projects are not private.

5.7.3 Project Activity

The Pipeline server logs help describe the overall activity levels in Pipeline projects. Across all five Pipelines, the server captured 2,939 user activities or “events.” Event types are described above in Section 5.3.5.6. At the project level, the average number of events per project was 34.4 (StDev=128.8). Over half of Pipeline projects (49 of 86, or 57%) had only one event. The most active project, an outlier with 1,155 events, was the “Holiday Flood” project on the Newgrounds Pipeline. The other four most active projects, averaging between 110 and 150 events each, were entries in the Game Jam 6 competition organized on the Newgrounds and Demo Pipelines. Figure 27 depicts total events per Pipeline project.

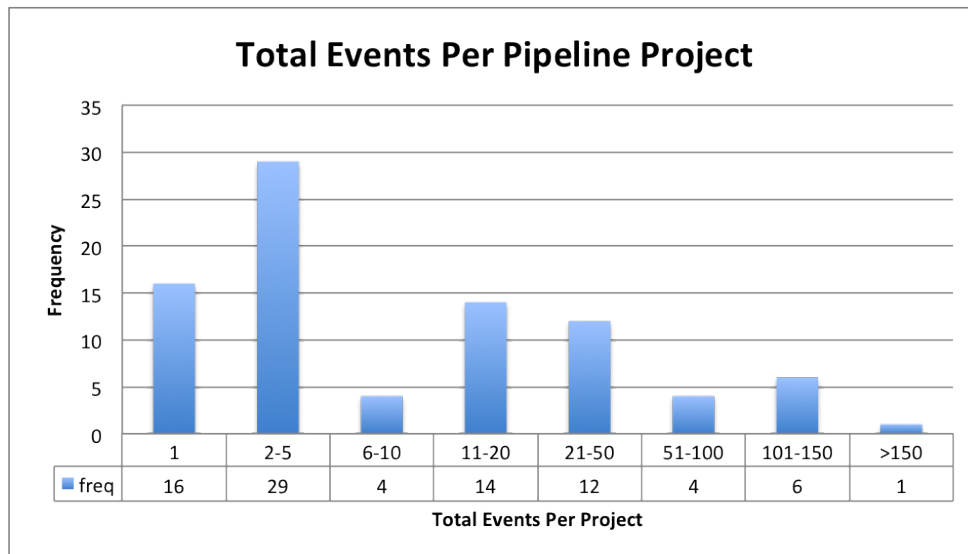


Figure 27: Total events per Pipeline project

5.7.4 Project Members

Analyzing membership patterns within projects can shed light on how Pipeline was used. For these analyses, I focused on project creators, trusted members, and regular members, and excluded banned users. Across all five Pipelines, the average number of members per project was 2.6 (StDev=3.3). Nearly half of projects (41 of 86, or 48%) had only one member, and 90% of projects (77 of 86) had five or fewer members. Once again, the “Holiday Flood” project was an outlier, boasting the

highest overall member count at 26. Figure 28 depicts total members per Pipeline project.

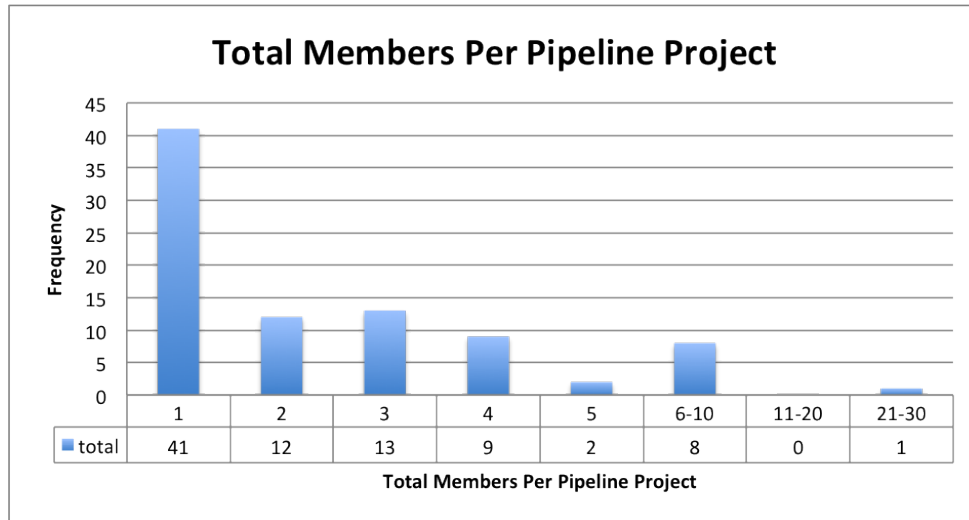


Figure 28: Total members per Pipeline project

I also looked at what proportions of members in each project were trusted. For these analyses, I aggregated the project creator and trusted members together as one group, and regular members as a second group. Because projects have different numbers of members, it is more meaningful to focus on proportions of trusted members, rather than total numbers. I also excluded projects with only one member, since the project creator is always trusted.

On average, 75.4% of members in a given Pipeline project were trusted. Again, this analysis only includes the 45 projects with at least two members. This result suggests that most members of Pipeline projects are trusted. To further investigate this result, I produced a histogram showing the proportion of trusted members for every Pipeline project. The histogram (Figure 29) shows that in more than half of Pipeline projects with at least two members (58%, or 26 of 45), at least 81% of members were trusted. In other words, in more than half of all Pipeline projects, the vast majority of project members were trusted. This result suggests that Pipeline's default settings, which trust invited members unless the user specifies otherwise, may have been influential.

5.7.5 Project Types

As mentioned above, Pipeline is targeted broadly at supporting online creative collaboration, especially projects with a substantial multimedia component. As I broadened the Pipeline advertising

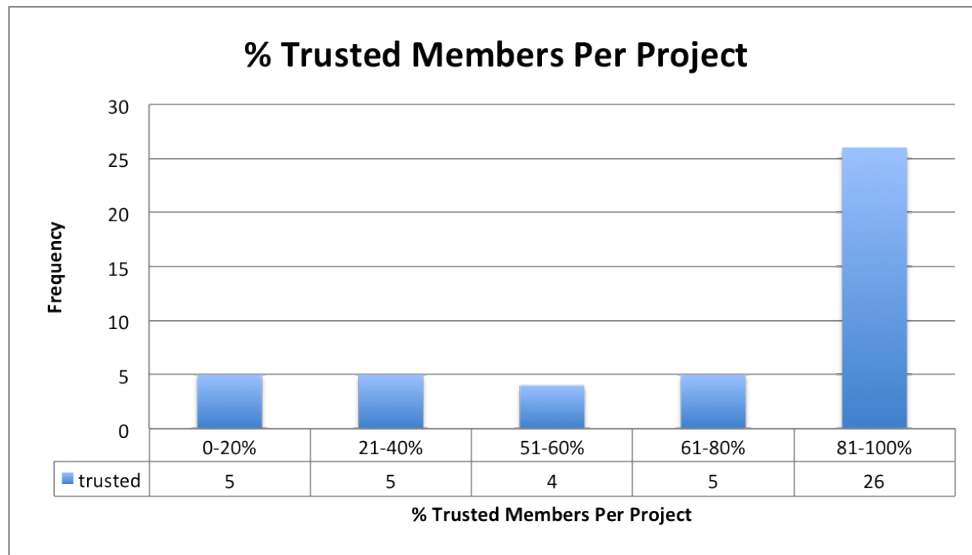


Figure 29: Percent of trusted members per Pipeline project

efforts, the software attracted a rich variety of project types. While it is not always possible to determine the goal of a Pipeline project from its description, it is worth noting a few examples the speak to the breadth of domains supported by Pipeline.

Not surprisingly, the majority of projects created on the Newgrounds Pipeline sought to produce Flash-animated movies and games. Fifteen of these were created as entries in Game Jam 6 competition that I co-organized with Austin Breed, a prominent member of the Newgrounds community. Beyond games and movies, members of the Newgrounds community also used Pipeline to collaboratively produce other forms of visual artwork. One group of nearly 30 artists from around the world organized “Holiday Flood,” a collection of 24 Christmas-themed artworks described in detail in Chapter 6. Another group created dozens of pixel-style artworks as part of a project to create a Newgrounds-themed texture pack for the popular video game Minecraft.

Beyond the animated movies, games, and artworks generated by the Newgrounds community, Pipeline was also used for several film and video projects. One of these was “American Anthem,” an independent feature film directed by John Carr as a collaboration between cast and crew in Minneapolis and Portland, Oregon. Carr used Pipeline extensively to develop pre-production materials for “Anthem,” which was later greenlit for production by Forest Whitaker’s JuntoBox Films [141]. Pipeline was also used by students in several Georgia Tech courses to organize a series of short video projects and a transmedia storytelling project.

5.7.6 Project Success

Given the extensive discussion of success in Newgrounds collabs in Chapter 4, it is important to address issues surrounding the definition and measurement of success in Pipeline projects. In studying Newgrounds collabs, I learned through interviews that most members defined success in terms of completion. In order to measure this success, I searched the Newgrounds Flash Portal and discussion forums for evidence that collabs were completed.

Defining and measuring success in Pipeline is somewhat more complicated. Because Pipeline supports a wide variety of creative projects, including many organized by users outside of the Newgrounds community, these users are likely to reflect a similarly diverse range of attitudes towards success. While some users may define success in the same way as Newgrounds members (i.e. completing a project), others may not. For example, all of the Georgia Tech students who used Pipeline for their group projects completed those projects, yet it seems likely that most would measure their success in terms of the grades their projects earned, rather than mere completion. In contrast, John Carr's "American Anthem" projects on Pipeline were never fully completed, yet the materials they produced helped him get the film greenlit—a significant achievement. These examples suggest that for many Pipeline projects outside of the Newgrounds community, success and completion are not always synonymous.

Even if we disregard this diversity and impose a single definition of success on every Pipeline project, measuring this success proves to be equally difficult. Unlike Newgrounds collabs, which are almost exclusively organized in the forum threads where they originate, members of Pipeline projects often make significant progress outside of Pipeline. Consequently, the level of activity or nature of the discussion in a Pipeline project is often a poor indicator of the project's outcome. For example, the winning entry in Game Jam 6, "Love's Cadence," was created by a team that used Pipeline only modestly, preferring Dropbox and Skype. The finished game was a remarkable success, yet the little-used Pipeline project would suggest otherwise.

This difficulty extends to another potential indicator of project success—Pipeline's Progress panel. Each Pipeline project has a progress marker or status, which trusted members can update throughout the project's lifespan. In an analysis of all five Pipelines, 70 of the 86 projects (81%)

had the default status, “pre-production.” Of the remaining 16 projects, six were marked “in production,” four were marked “post-production,” three were marked “finished,” and three were marked “canceled.” These numbers suggest that the Progress panel is also unreliable as an indicator of success; for example, most of the “pre-production” projects are likely canceled, and at least six completed Game Jam projects have unchanged statuses. Trusted members of these projects may have been unaware of the Progress panel, forgot to update it, or decided it was not worth the effort.

5.8 Moving Forward

The above sections point to a number of challenges in doing research with Pipeline. Recruiting and advertising within Newgrounds proved to be more difficult and less fruitful than anticipated, prompting me to broaden the potential user base to a variety of communities and domains. The resulting diversity of projects are more difficult to compare with Newgrounds collabs, and identifying successful examples among the is tricky. However, analyses of the existing Pipeline data suggest some promising opportunities for evaluating Pipeline in a meaningful way. My approach, described in detail in the next chapter, will be to present a detailed case study of one Pipeline project, “Holiday Flood.” As mentioned above, Holiday Flood was organized by members of the Newgrounds community, making comparisons to other Newgrounds collabs more readily apparent. In addition, the project’s leaders clearly articulated their goals and achieved them, providing a compelling example of a Pipeline success story. Finally, as noted in the previous analyses, Holiday Flood represents both the largest (in terms of members) and most active Pipeline project, suggesting an interesting outlier or edge case for which the case study approach is especially well suited.

5.9 Chapter Summary

In this chapter, I presented Pipeline, a web-based collaboration tool geared towards leaders of online creative collaboration. In the first section, I outlined the design goals for Pipeline, which were derived from design implications presented in Chapters 3 and 4. These goals included support for redistributed leadership (via decentralization and automation), support for the unique requirements of expression-oriented projects (attending to completion, originality, subjectivity, and ownership), and support for the collab success factors identified in Chapter 4 (scaffolding organization, promoting effective leader characteristics, and reflecting on activity dynamics). In the next section, I

positioned Pipeline in relationship to existing online communities like Newgrounds. I explained that Pipeline is designed to augment, rather than replace, these online communities, by providing collaboration support for creating content that is ultimately hosted elsewhere. The next section presented a detailed description of the Pipeline system. Pipeline includes a number of features common to social media and project management tools, such as user profiles, private messages, and a dashboard. However, Pipeline projects are supported by a number of unusual features, including the trusted member system and contribution-based task management system. In the final sections of the chapter, I positioned Pipeline relative to similar project management and peer production tools. I also recounted the Pipeline development process, describing how my relationship with the Newgrounds community and staff influenced the design and launch of Pipeline in key ways. I listed a number of advertising and recruiting strategies used to attract users to Pipeline, including social media, a development blog, a marketing website, and a competition on Newgrounds, as well as presentations in various academic venues. Finally, I characterized Pipeline usage broadly and explained my rationale for focusing on a detailed case study.

In the next chapter, I present this case study, which describes Holiday Flood, a six-week artistic collaboration organized using Pipeline. I discuss how Pipeline succeeded in supporting and transforming leadership in a real-world context, and suggest ways it could be improved.

CHAPTER VI

HOLIDAY FLOOD

RQ4: How can technology be used to support and transform leadership in online creative collaboration?

In this chapter, I investigate the question of whether Pipeline, the web-based collaboration tool I designed, can help support and transform leadership in a real-world example of online creative collaboration. The design of Pipeline is informed by theories of distributed leadership (reviewed in Chapter 2), design implications from empirical studies of existing leadership practices (reviewed in Chapters 3 and 4), and iterative testing with real users (reviewed in Chapter 5). However, it is not yet clear that this design is effective at achieving its goal. Software is frequently used in markedly different ways than its designers intended. Moreover, Pipeline is not an end to itself, but rather a means by which to better understand how to make online creative collaboration successful. By launching Pipeline “in the wild” and studying its use in naturalistic settings, we can gain valuable insights into how my design choices play out in the real world, how they affect the way people work together online, and how the result of such collaborations is more or less successful, creative, or complex.

This empirical study of Pipeline’s usage focuses on one successful project, Holiday Flood, a six-week online collaboration between nearly 30 artists from around the world. In the next section, I describe the research methods I used for this analysis, which takes the form of a detailed case study. I then present the case study, starting with a description of Holiday Flood’s outcome: a collection of illustrations and corresponding interactive art gallery. Following this, I provide a rich description of the process by which Holiday Flood was organized, framed in terms of the challenges for leaders identified in Chapter 3. I then discuss how Pipeline support and transformed leadership in Holiday Flood, using Yukl’s [160] five leadership behaviors for managing work as an organizing structure. I also discuss the tension between maintaining privacy and audience interest that became clear over the course of Holiday Flood. Finally, I present implications for theory and design. The theoretical

implications center around the notion of redistributed leadership. The design implications focus on the importance of supporting formal leaders, emergent complexity, and closed collaboration.

6.1 Methods

I present the results of this chapter in the form of a case study. Case studies are stories about interesting or unusual phenomena. They are empirically grounded in real-life settings, richly descriptive, and focus on a single event or situation. They typically include both qualitative and quantitative data sources but neither is required; doing “case study” research refers to the individual unit of analysis, not the choice of methods [54]. Case studies are valuable for formulating new hypotheses as well as testing existing ones [53].

A case study approach is especially helpful for this research because my goal is to gain a deep understanding of the ways in which Holiday Flood members used Pipeline to redistribute leadership. My analysis will be guided by the integrated framework of distributed leadership and distributed cognition that I proposed in Chapter 2. Specifically, distributed leadership theory illuminates the distribution of leadership behaviors across the group, while distributed cognition theory helps me attend to the distribution of cognitive processes across people and artifacts.

It is worth noting that DCog-based research, with its focus on cognition in the wild, has frequently taken the form of detailed case studies of real-world phenomena (e.g. [60, 69, 73, 76]). I take a similar approach in this chapter, using primarily qualitative methods to provide a rich description of the process by which leadership was distributed in Holiday Flood. I collected and analyzed three sources of data: activity logs from the Pipeline project where Holiday Flood was organized, discussion about Holiday Flood in the Newgrounds Art Forum, and in-depth interviews with active members of Holiday Flood.

6.1.1 Pipeline Server Logs

The main source of data for this case study was the set of server logs for Holiday Flood’s Pipeline project.¹ Pipeline logged a total of 1,155 events for Holiday Flood between November 9, 2011 (project start) and December 25, 2011 (project end). This count omits non-project-specific events,

¹<http://pipeline.cc.gatech.edu/ngtest1/projects/2-holiday-flood/activity>

such as users registering for Pipeline, sending private messages, or updating their profiles. It also omits 15 events generated by the researchers (mostly related to Pipeline bug reports and feature requests). Each event includes the ID of the user who performed the event, the IDs of associated items (like tasks, files, or other users), associated data (e.g. the old and revised versions of some edited text), and a timestamp.

Because this chapter reports on a case study, I used the Holiday Flood data primarily for qualitative log file analysis [19]. I also conduct several small quantitative analyses, described later in this chapter, to follow up on questions raised by the qualitative analysis.

6.1.2 Newgrounds Art Forum

The Newgrounds forums provided a secondary source of data for this research. The creator of Holiday Flood announced the Pipeline project, recruited members, and posted occasional updates in a thread in the Newgrounds Art Forum.² From November 9 to December 27, 2011, this thread accumulated 144 replies and, as of May 2012, more than 5,100 views.

6.1.3 In-depth Interviews

A final source of data for this study was a series of in-depth, semi-structured interviews [129] with the five most active Holiday Flood members. I interviewed the project creator (Renaë) twice, first when the project was halfway done, and again when the project was finished. I also interviewed four other members after the project was finished. Interviewee names and demographics are listed below in Table 11.

Participants were interviewed either via Skype or instant message, whichever they preferred, and were not compensated for their time. Skype interviews were audio-recorded with participants' permission and fully transcribed. Interviews lasted an average of 105 minutes each (min: 35, max: 167), for a total of 627 minutes (10.5 hours). My questions focused on participants' experiences with the Holiday Flood project, including the role of leadership, division of labor, feedback and communication patterns, attitudes towards the finished product, and benefits and drawbacks of using Pipeline.

²<http://www.newgrounds.com/bbs/topic/1280296/1>

Since many of my participants view themselves as artists, it is potentially unethical to deny them credit for their work by anonymizing them [18]. Throughout this chapter, I refer to participants by their Pipeline usernames, with two exceptions. I use interviewees' real names instead of their usernames if they requested it. I also do not name participants who dropped out of Holiday Flood, to avoid embarrassing them.

6.2 Results

The story of Holiday Flood's success is worth telling *per se*, but it also sheds light on how Pipeline supported redistributed leadership in a real-world example of online creative collaboration. In the following sections, I first describe the result of Holiday Flood, and then present a rich description of the process by which it was created.

6.2.1 The Holiday Flood

On the morning of December 12, 2011, a 19-year-old artist with the username Ashman submitted an illustration of a drummer to the Newgrounds Art Portal. Later that day, another drummer illustration appeared, authored by a different young artist, ZaneZanesorrow. At the time, few visitors to the Portal made note of these artworks among the dozens of others submitted that day.

By Christmas Eve, 28 artists from around the world had submitted 24 artworks (two per day) illustrating the lyrics of "The Twelve Days of Christmas," a traditional carol. Each artwork incorporated a special thumbnail image and was tagged with the same obscure keyword: "ohf11" (Figure 30). Viewers who noticed and clicked on this tag discovered that the thumbnails were actually puzzle pieces. This action aligned all the puzzle pieces in the proper sequence, revealing a hidden message: a large, festively illustrated "Season's Greetings" poster, complete with the signatures of all 28 artists. Thus, the Holiday Flood artworks comprised not only a visual interpretation of the "Twelve Days of Christmas" song, but also a kind of digital Advent calendar. Traditionally, these calendars anticipate the arrival of Christmas with a collection of doors on a card, one opened each day, revealing parts of an image or story.

Finally, on Christmas Day, "Operation Holiday Flood," an interactive art gallery, appeared in

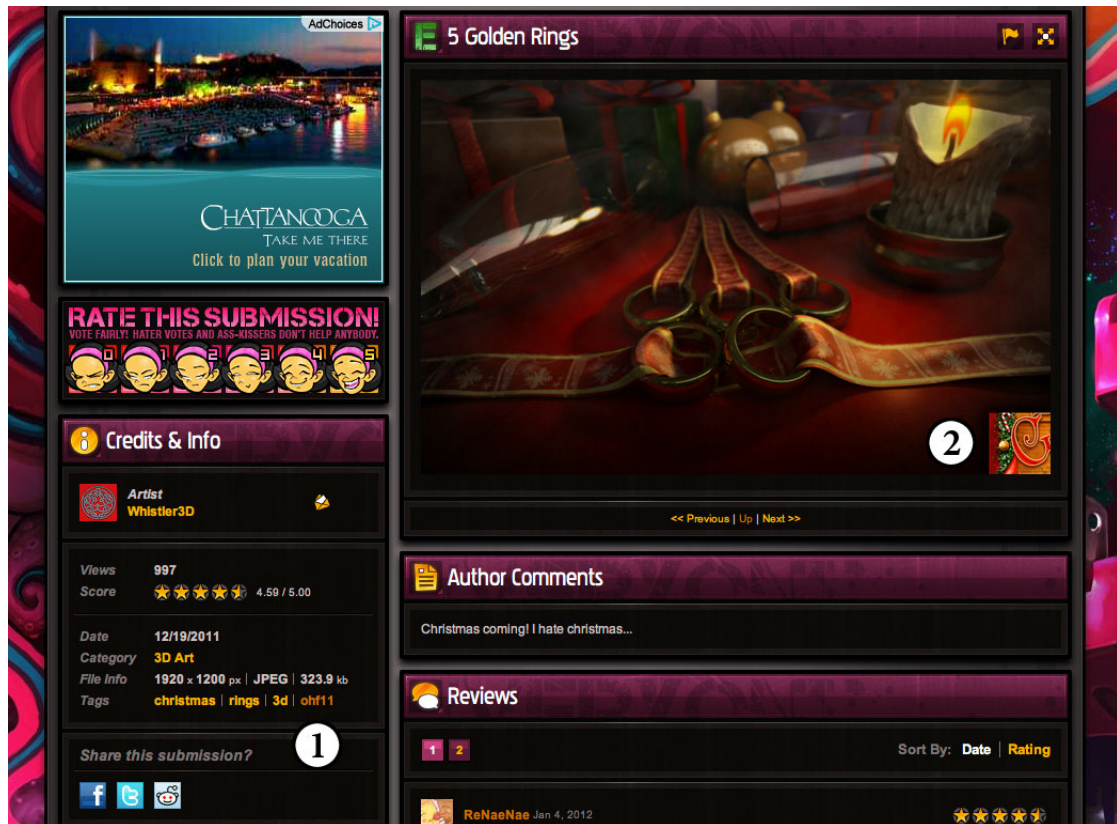


Figure 30: Flood tag (1) and thumbnail (2) for “5 Golden Rings” by Whistler3D

the Newgrounds Flash Portal.³ It was a compilation of all 24 artworks, complete with a custom arrangement of the classic song (Figure 38).

In many ways, Holiday Flood was a success. Artists completed and submitted their works within their 12-hour windows, the thumbnails lined up correctly, and the interactive gallery was finished by Christmas Day, all according to plan. The Newgrounds community responded well to their efforts: most artworks received high ratings and positive reviews, and the gallery won an award for being one of the top-rated submissions on December 25.

6.2.2 Previous Floods

Since October 2010, two moderators of the Newgrounds Art forum, Renae (username: ReNaeNae) and Robert Westgate (username: TurkeyOnASTick), had organized a series of events called “Flood the Portal Fridays.” In a typical flood, Renae or Robert would announce a theme (e.g. frogs,⁴ facial

³<http://www.newgrounds.com/portal/view/586537>

⁴<http://www.newgrounds.com/bbs/topic/1294845>

hair⁵), a specially created thumbnail image, and a time frame, usually the first Friday of each month at 6:00 PM EST. Artists were invited to create an artwork based on the theme, submit it within the specified time frame, and include the provided thumbnail image. The result was a “flood” of new artwork to the Art Portal, unified by the theme, thumbnail, and a custom tag. For example, “Flood the Portal Fridays 11,” organized by Robert, used a dragon theme and the flood tag “ftp11” (Figure 31). The floods were a lightweight form of collaboration intended to build a sense of community among Newgrounds artists and encourage submissions to the Art Portal.

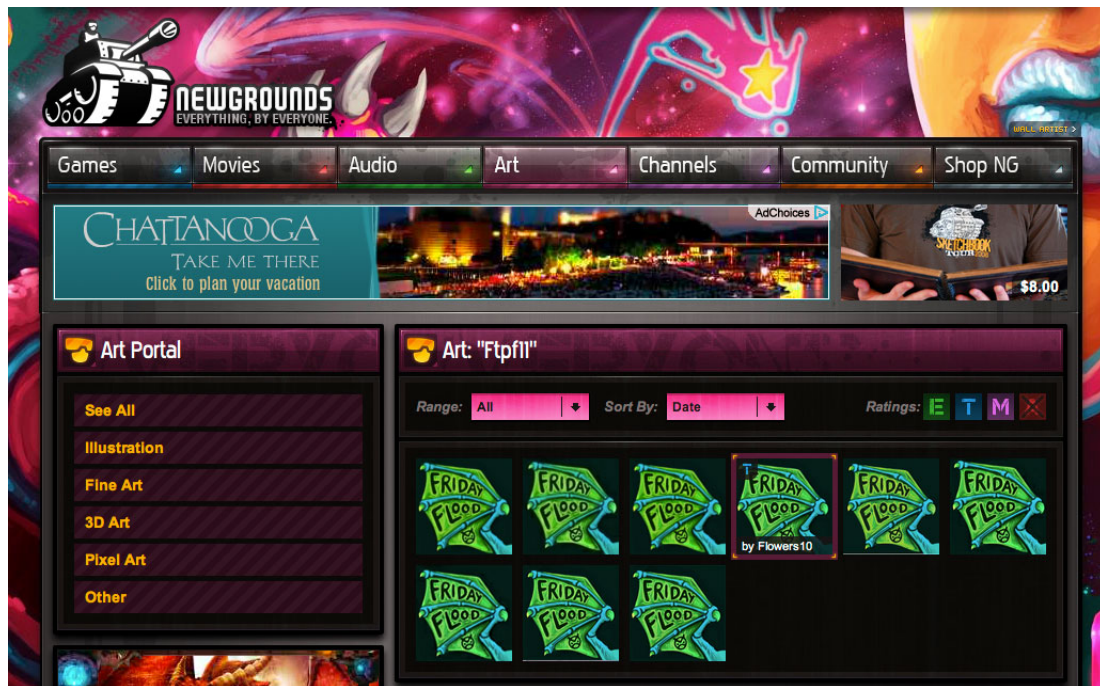


Figure 31: Flood the Portal Fridays 11 (2012)

As the end of 2011 approached, Renae wanted to organize a new, more ambitious type of flood. Meanwhile, I had just released Pipeline to the public, and Renae had been an early beta tester. She decided (without prompting from me) to use Pipeline to organize the new flood, which would be called “Holiday Flood” and based on a Christmas theme.

6.2.3 Organizing The Holiday Flood

Since many behaviors are associated with leadership, it is helpful to focus on a set of leadership behaviors that have seen prior research attention, in order to facilitate comparisons and identify

⁵<http://www.newgrounds.com/bbs/topic/1302647>

redistribution of leadership. I describe the Holiday Flood creative process in terms of the same eight challenges for leaders identified in Chapter 3: structuring and proposing the project; recruiting, directing, motivating, replacing, and attributing the artists; and integrating the artworks. As with the study of Newgrounds collabs, this organization corresponds roughly to the narrative of the creation process.

6.2.3.1 Structuring the Project

Renae's plan for Holiday Flood was more complex than previous floods in several ways. Previous floods were openly publicized on the Art Forum, but Holiday Flood would be, as much as possible, organized in secret. Instead of encouraging as many people as possible to participate, the number of participants would be limited. Holiday Flood would occur in a particular sequence, not just at a particular date and time. Rather than being identical, the artworks' thumbnails would be unique puzzle pieces that, when fitted together, revealed a hidden holiday greeting poster. Finally, Holiday Flood would not only be released as individual submissions to the Art Portal, but also collected together in an interactive gallery for the Flash Portal.

6.2.3.2 Proposing the Project and Recruiting the Artists

One of the first issues Renae encountered was how to recruit members for a secret project. She wanted to recruit from the Newgrounds Art Forum without spoiling the surprise for those who opted out. The simplest option might have been to privately invite a group of familiar artists, but Renae wanted Holiday Flood to be open to the entire community, at least initially. Her solution was to frame Holiday Flood as a kind of secret mission. On November 9, she created a thread in the Art Forum titled, "Operation Holiday Flood 2011," describing a "*top secret*" project for which she needed to recruit a large number of "*agents*" (Figure 32). Anyone who betrayed the mission's secrets would be punished severely, she joked, adding, "*This is Christmas dammit! We're not messing around!*"

Simultaneously, Renae created a private project on Pipeline as a counterpart to the public thread on Newgrounds. Private projects on Pipeline are visible only to members, providing a space for Holiday Flood artists to work in secret. Renae instructed interested users to create Pipeline accounts and post their usernames in the public thread. She then sent invitations to the Pipeline accounts listed



Figure 32: Recruiting for Holiday Flood in the Newgrounds Art forum

in the thread, on a first-come, first-served basis. Within a few days, Renae had recruited almost 30 artists, and she had to turn away several others.

Table 11 lists the members of Holiday Flood, omitting any drop-outs. I include the real names of interviewees who waived anonymity. The project creator is indicated by a double dagger (‡), trusted members by a dagger (†), and interviewees by an asterisk (*).

Demographic information comes from user profiles. This information was provided optionally and is therefore incomplete. It was also self-reported, so its accuracy should be treated with some skepticism. Pipeline profiles obscure the birthdates of minors (anyone younger than 18) to protect their privacy, so I likewise removed the ages of minors from this table. Because not all members provided age information, the minors can't be inferred from the blank spaces. According to the self-reported data, Holiday Flood members were mostly males in their 20s. They represented at least 12 countries on 5 continents, with the majority concentrated in North America and Europe.

Renae gave “trusted” status to two members of Holiday Flood beyond herself. The first was Robert, her fellow Art Forum moderator and frequent flood organizer. Renae also trusted BlueJay, a 23-year-old artist from the Netherlands.

When Renae invited other artists to the project, she deliberately unchecked the “Trusted” box in the invitation, which was intentionally checked by default. This suggests that Renae explicitly

Table 11: Members of Holiday Flood

Username (Real Name)	Gender	Age	Location
Ashman	M	19	
bakeroflongo	M	30	USA
BlueJay†*	M	23	Netherlands
cosmicdeath	F	28	USA
dagove	M	21	Norway
FelistheIdiot	M	18	
Fifty-50	M		Philippines
Kashi19	F		
Kinsei	M	23	
Larkatosa	F	18	Sweden
LegolaSS	M	23	
Luwano*	M	26	
MajesticBob	M	32	
Meroll		18	
MiddleFingerRings	M	19	Australia
RAMATSU	M	19	
Redeemer	M	19	Estonia
ReNaeNae (Renae)‡*	F		USA
secretagent10	M	18	
Sockembop	M	26	Canada
Spagneti	M		USA
test-object	M	20	Belgium
ThePsychoSheep	M	18	Bulgaria
TheWorsleyBear	M	25	
TurkeyOnASTick (Robert Westgate)†*	M	26	UK
Whistler	M	24	Argentina
ZaneZansorrow	M	19	USA
ZombieMonkey (Gabriel)*	M	18	Canada
‡ = Creator, † = Trusted Member, * = Interviewee			

chose to limit the number of trusted members in the project, as it required more effort to enact this restriction. Indeed, Renae later requested that the checkbox be unchecked by default, as she had accidentally left it checked several times and had to manually untrust the invitee. This action often confused the member and awkwardly called attention to the change of status. Later in this chapter, I discuss Renae and Robert's perspectives on trusted membership and the decision to offer it so sparingly.

6.2.3.3 Directing the Artists

For Holiday Flood to succeed, four major tasks needed to be completed. The 24 artworks, two for each of the 12 Days of Christmas, had to be claimed by artists and created. The hidden holiday greeting poster had to be created, divided into 24 “puzzle piece” thumbnails, and reintegrated into the finished artworks. The finished artworks needed to be submitted in a particular sequence at particular dates and times. Finally, all of the artworks, as well as original music, needed to be collected and integrated for a Flash gallery.

Creating the Artworks Renae created a task on Pipeline titled “CLAIM YOUR PART!” For the task’s instructions, Renae had divided up the 12 Days of Christmas into 24 slots, two for each day. She asked the artists to each claim one of the slots, on a first-come, first-served basis, and create an artwork based on that slot’s theme.

Renae took a straightforward divide-and-conquer approach to this task, intending each slot to be claimed by one artist. Yet three slots were each claimed by pairs of artists working in a partnership. In “Buurds” and “Three Calling Birds,” one artist drew the line art, and the other colored it in. For “Buurds” (Figure 33, top) one of the Four Calling Birds artworks, Fifty-50 provided the Angry Birds-inspired line art and Larkatosa colored it. “Three French Hens” by CosmicDeath and Kashi, which shows a hen bearing the three colors of the French flag and the word “trois,” was also a line art-coloring partnership.

The third partnership, “Captain Sauron” (Figure 33, bottom) by MajesticBob and Kinsei, was more complex than the others. A collage of tangible and digital artwork, the final product combined a digital illustration and a custom-built picture frame. The illustration depicted characters from *Lord of the Rings* wearing rings from the *Captain Planet* television show, while the picture frame included handcrafted copies of the rings shown in the illustration. While MajesticBob was responsible for the tangible portion of the artwork, both partners contributed to the digital portion. He explained:

“I hand made the rings and the frame. Kinsei did the Picture. I cropped and fitted the pic into the frame and I did the color streams and [Photo]shopped the wind ring ... Kinsei cleaned up the background and [Photo]shopped the rest of the rings.”

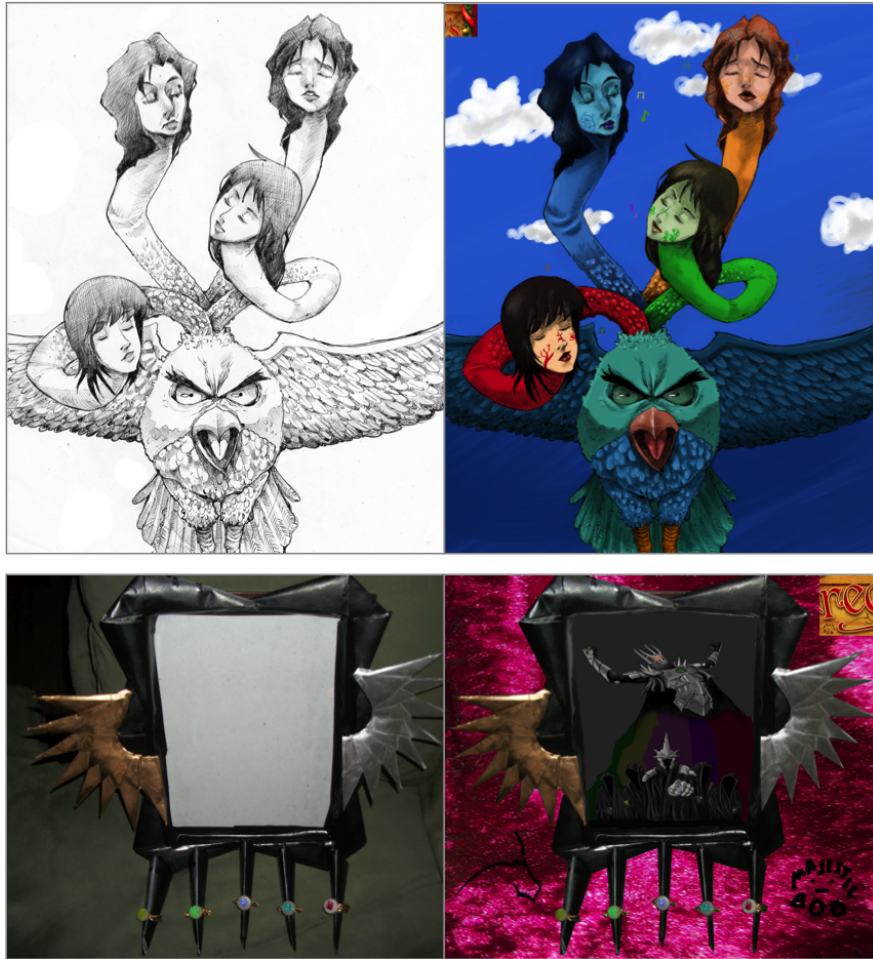


Figure 33: Two examples of partnerships in Holiday Flood

After all the artwork slots were claimed, Renae created another task called “WIPs,” a.k.a. works-in-progress, with a deadline of December 12 (12 days before Christmas Eve). In this task, she encouraged artists to share drafts of their artworks and critique other members’ work. This task served multiple purposes. It gave artists an opportunity to improve their work prior to submission, but it also provided progress updates, signaling which artists were more or less likely to make the deadline. Only about half of artists shared a WIP before posting their completed artworks.

Creating the Poster and Thumbnails In addition to creating the 24 artworks mentioned above, Holiday Flood also required a Season’s Greetings poster, which would be divided up into puzzle pieces, one for each artwork. Renae created a task for the poster at the start of Holiday Flood, around the same time as the task for creating the artworks.

Initially, the poster task was ill-defined. No one had decided what the poster was supposed to look like, aside from Renae's vague instructions: *"a greeting card type thing ... with all of our signatures on it."* Also, no one had volunteered to work on it. After some discussion within the task, Gabriel (username: ZombieMonkey), a 18-year-old Canadian artist, made the first rough drafts. He posted several versions on Pipeline, receiving detailed feedback from Renae and Robert after each.

After about a week, Robert felt that Gabriel's work had progressed as far as it could, and asked him to share his source files on Pipeline. Robert then used those source files to create a series of revisions that were generally agreed to be improvements. Gabriel himself admitted that *"[Robert] took my image and just made it so much better looking. I mean, it just looks so good now. Mine was a little bit cartoony and he just made it look so beautiful."* Robert spent nearly three weeks working on the poster, but as the Holiday Flood deadline approached, he found himself lacking the time to complete it. He recalled:

"I polished it further and further until I couldn't really work on the image any more because I had my own stuff to do. All of those files were on Pipeline and then [Renae], because she wanted to polish up the image further, she took those files from Pipeline and edited that image further to be the finalized design."

Figure 34 depicts five stages in the evolution of the poster. From left to right, Gabriel created the first two versions. Robert continued the development with the next two versions. Renae elaborated on Roberts concept to create the final version on the far right.



Figure 34: Evolution of the “Season’s Greetings” poster

The last step was to collect the artists' custom signatures so they could be superimposed onto the poster. Robert created a new task requesting every member to submit an image containing his or her

signature. Once all signatures were submitted, Renae used Photoshop to divide up the poster into 24 equal-sized puzzle pieces, or “thumbnails,” and overlay a signature onto each (Figure 35). She then attached all the thumbnail files to a new task, so that artists could incorporate them into their finished artworks. As artists confirmed downloading their thumbnails, Renae manually checked them off the list by editing the task description.

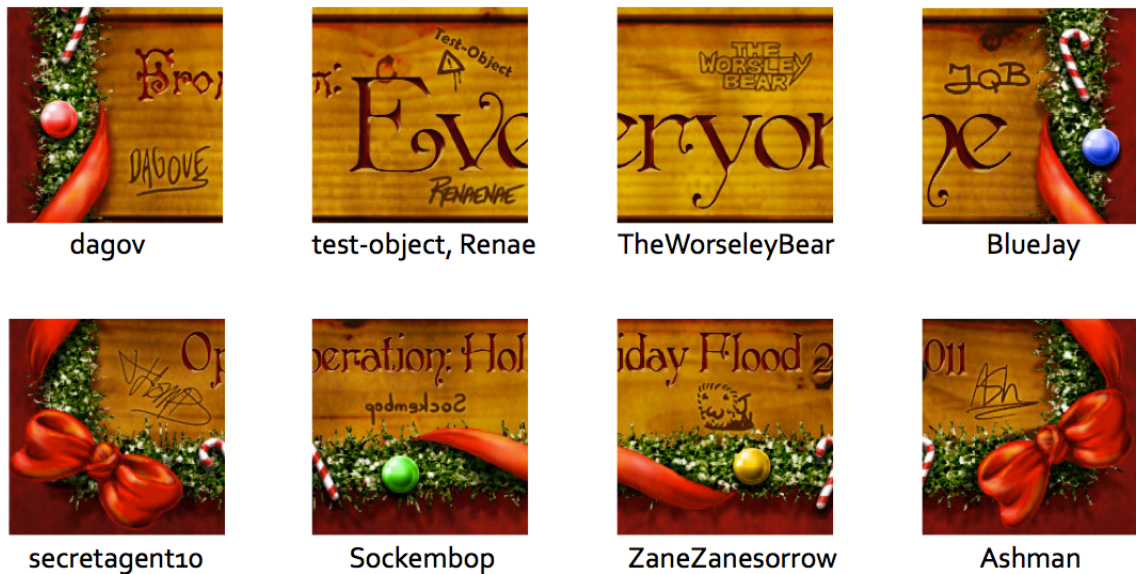


Figure 35: Eight of the 24 thumbnails overlaid with artists' signatures

Deploying the Artworks With the artworks and their corresponding thumbnails completed, the next task was to release them on a particular schedule. Each of the 24 artworks needed to be submitted, or “deployed,” within a 12-hour window. There were several possible failure modes. If an artist submitted late, the artwork wouldn’t appear on the correct Day of Christmas. If an artist mixed up the order or didn’t submit at all, the thumbnails wouldn’t line up properly. The geographic distribution of artists, living in numerous time zones across a dozen countries, added to the challenge.

To assist with deployment, Renae created a task called “Deployment Schedule.” For each of the 12 days, it listed who was responsible for submitting. As artists submitted, Renae or Robert updated the task, writing “CHECK” next to the artists’ names and linking to their submissions on Newgrounds (Figure 36). This process gave artists a clear, updated reference as to who was done

and who was up next.

The screenshot displays a task page for 'DEPLOYMENT SCHEDULE' with a task leader 'ReNaeNae*'. The page is divided into two main sections: 'TASK INFO' and 'TASK MEMBERS'.

TASK INFO:

- DEPLOYMENT SCHEDULE** (task leader: ReNaeNae*)
- Status: CLOSED / due 25 days ago
- Schedule & Thumbnails!**
- Each person will have a 12 hour 'window' to submit. The goal is to NOT have 2 flood icons next to each other (meaning side by side... can't control above and below). So the more time between uploads the better... but not so much that the next person ends up late :P
- Person in the #1 spot should try to go before NOON NG time.
- The second person has until 11:59 PM NG time.
- If ANYONE has an issue with their date/time PLEASE let me know right away!!!!
- LINK = Submitted!!!**
- It's not required, but it would be great if we all leave reviews!!
- Twelve drummers drumming**
(24) 1. December 12 - **Ashman** - CHECK!!
(23) 2. December 12 - **ZaneZansorrow** - CHECK!!
- Eleven pipers piping**
(22) 1. December 13 - **Sockembop** - CHECK!!
(21) 2. December 13 - **secretagent10** - CHECK!!
- Ten lords a-leaping**
(20) 1. December 14 - **BlueJay** - CHECK!!
(19) 2. December 14 - **TheWorsleyBear** - CHECK!!
- Nine ladies dancing**
(18) 1. December 15 - **test-object** - CHECK!!
(17) 2. December 15 - **dagove** - CHECK!!
- Eight maids a-milking**
(16) 1. December 16 - **LegolaSS** - CHECK!!
(15) 2. December 16 - **FelistheIdiot** - CHECK!!
- Seven swans a-swimming**
(14) 1. December 17 - **Luwano** - CHECK!!
(13) 2. December 17 - **Meroll** - CHECK!!
- Six geese a-laying**
(12) 1. December 18 - **MiddleFingerRings** - CHECK!!
(11) 2. December 18 - **Redeemer** - CHECK!!

TASK MEMBERS:

- 19 people needed / 5 people joined
- Kashi19** (no contributions / joined 37 days ago)
- LegolaSS** (no contributions / joined 43 days ago)
- MajesticBob** (no contributions / joined 38 days ago)
- MiddleFingerRings** (no contributions / joined 42 days ago)
- ZombieMonkey** (no contributions / joined 43 days ago)

CONTRIBUTIONS:

- (none)

RECENT ACTIVITY:

- ReNaeNae* closed the task **DEPLOYMENT SCHEDULE**. 24 days ago
- ReNaeNae* edited the instructions for the task **DEPLOYMENT SCHEDULE**. 25 days ago / Details
- ReNaeNae* edited the instructions for the task **DEPLOYMENT SCHEDULE**. 25 days ago / Details
- Ashman replied to a comment on the task **DEPLOYMENT SCHEDULE**. 26 days ago / Details
- Luwano replied to a comment on the task **DEPLOYMENT SCHEDULE**. 26 days ago / Details

[Older Activity »](#)

Figure 36: Manually tracking progress in the Deployment task

6.2.3.4 Motivating and Replacing the Artists

Because Holiday Flood was a volunteer project made up mostly of amateurs, “real life” often intervened, and people had to prioritize school or work. Several approaches proved useful for motivating artists to continue to make time for Holiday Flood.

Several tasks, such as artists claiming their parts or deploying their artworks, would automatically track progress as artists posted contributions. However, the leaders would also manually track progress for the group by manually updating the descriptions of these tasks to include each new contribution (Figure 36). While these manual updates usually provided no new information, they served another function: demonstrating the leader’s interest in, and commitment to, the task’s progress, which in turn could motivate participation. Robert explained:

“[It was] very helpful for everybody really, just to make sure that people are contributing and that there is some active progression on the site. Not only because it’s a clear sign that the leader is very much motivated with the project, but that other people also have that motivation as well.”

Some Holiday Flood members were also motivated by receiving feedback on their work. Gabriel said, *“I always like getting feedback . . . it’s fun knowing what people can point out and try to fix them, basically.”* For Luwano, *“the comments on Pipeline kept the motivation up”* for him. Some members sought to increase their chances of getting feedback by commenting on others’ work and posting frequent updates of their own.

Some artists would inevitably drop out of the project, presenting a problem for Holiday Flood’s leaders, who needed to identify and replace drop-outs prior to the deadline. To help smoke out drop-outs, Renae organized two “roll calls” within Holiday Flood, one on November 18 and another on December 5. Her instructions were simple: all members were required to reply to her “roll call” discussion thread within a few days or else they would be banned from the project. In total, four members who failed to reply to the roll calls were banned and then replaced.

Two of Holiday Flood’s drop-outs involved the Twelve Drummers Drumming slot. One artist claimed this slot almost immediately, but then told Renae that he was overwhelmed with work and wasn’t sure he’d be able to fulfill his commitment. A short while later, he signed up for another project on Newgrounds. Renae promptly banned him from the Pipeline project. *“He said he didn’t have time, then promptly offered to design someones album cover,”* she explained.

Renae replaced this artist with a second artist. Just four days before the Flood was supposed to start, this artist also dropped out of the Twelve Drummers Drumming slot. As this was the critical first artwork of the Flood, some members panicked. Renae, who was in her own words, *“freaking out,”* posted on the Newgrounds forum, *“The project has taken a critical hit . . . the entire operation is now in danger.”* But Holiday Flood had been shrouded in secrecy for weeks, so finding an external replacement on such short notice proved to be challenging. ZaneZanesorrow, a current Holiday Flood member who had already signed up for Two Turtle Doves, stepped up to the plate and claimed the open slot. Within a day of the second drop-out, he posted a WIP called “Emergency Drummers” (Figure 37). *“It saved the whole project, basically,”* recalled Gabriel.

Tasks » WIPs » Emergency Drummers

CONTRIBUTION

Emergency Drummers

SEEKING FEEDBACK / posted 40 days ago

posted by **ZaneZansorrow**

<http://www.newgrounds.com/dump/item/f1bf...c9672>


In the upcoming emergency with the 12 drummers I'm working on emergency back up drummers.

May God, baby Jesus, Easter Bunny, Santa, Nazi Santa, and Michael Jackson be on our sides.


Finish Update (til i get dah thumbnail):

@Luwana: :{O

@Jay Q bee: This is the first time I manage to get red, blue, and yellow out there while still holding out the color mood. I think this makes a fine accomplishment for myself :3




12 drummerssmallsize.jpg
uploaded 39 days ago by ZaneZansorrow
Preview / Download (587 KB)




12 drummers.jpg
uploaded 40 days ago by ZaneZansorrow
Preview / Download (3.1 MB)

Comments



BlueJay* / 39 days ago
Great Job, Lovely colors!




Luwano / 40 days ago
Holy shit, Zane, that looks awesome so far! Thanks for backing it up. You may just have saved the whole mission, who knows?!





TASK INFO

WIPs
closed / due 48 days ago / 3 people needed

MORE CONTRIBUTIONS

Contribution	Member	Status	Date
 2 Turtle pidgeon	ZaneZansorrow	old	60 days ago

RECENT ACTIVITY

-  **ZaneZansorrow** edited the attached files for the contribution **Emergency Drummers**.
39 days ago / Details
-  **BlueJay*** commented on the contribution **Emergency Drummers**.
39 days ago / Details
-  **Luwano** commented on the contribution **Emergency Drummers**.
40 days ago / Details
-  **ZaneZansorrow** created the contribution **Emergency Drummers**.
40 days ago

[Older Activity »](#)

Figure 37: “Emergency Drummers” by ZaneZanesorrow, replacing two drop-outs

6.2.3.5 Integrating the Artworks

With all of the artworks complete and deployment underway, the interactive art gallery could now be created. Originally, BlueJay had volunteered for this task, and Renae had made him a trusted member in order to lead it. As the deadline approached, Renae became concerned by his lack of progress. She explained, “*I got nervous waiting on him so I just ended up doing it myself.*” After announcing this intention on Pipeline, BlueJay responded in a public comment, “*Does this mean I’m not making the Flash anymore?*” He explained that he had been busy with work and school and offered to “*coop*” with Renae, but she either missed or declined this offer.

Renae took the lead developing the gallery, and in the last few days before Christmas, she posted frequent updates in a task called “Flash Submission,” and artists responded with rapid feedback and bug reports. While Renae later evaluated this feedback “*good*” and “*helpful*,” a few artists found their comments disregarded or even mocked. For example, Larkatosa wrote some introductory text

which Robert dismissed with a perfunctory “Vomit.” She replied, “A *more detailed explanation than ‘Vomit’ might be good*,” but none was offered. After several more rejections, she posted a comment expressing her frustration:

“I try to do the only thing I could be called remotely good at. Writing. And it ends up not being needed (or good). Well I’ll let you awesome multi-skilled people do the work while I go sit in a corner silently weeping over being useless.”

Gabriel also found his suggestions for the Flash ignored and, like Larkatosa, blamed himself and the quality of his ideas. “*I think I helped give some ideas for the actual Flash, which weren’t taken, because they were pretty bad, come to think of it now.*” Notably, Larkatosa and Gabriel were among the youngest (both 18 years old) and least experienced members of the project.

Renae had invited bakeroflongo, a 30-year-old musician from the United States, to provide a custom arrangement of the “Twelve Days of Christmas” song. After adding his music to the Flash gallery, Renae submitted the finished product to Newgrounds on Christmas Day (Figure 38).

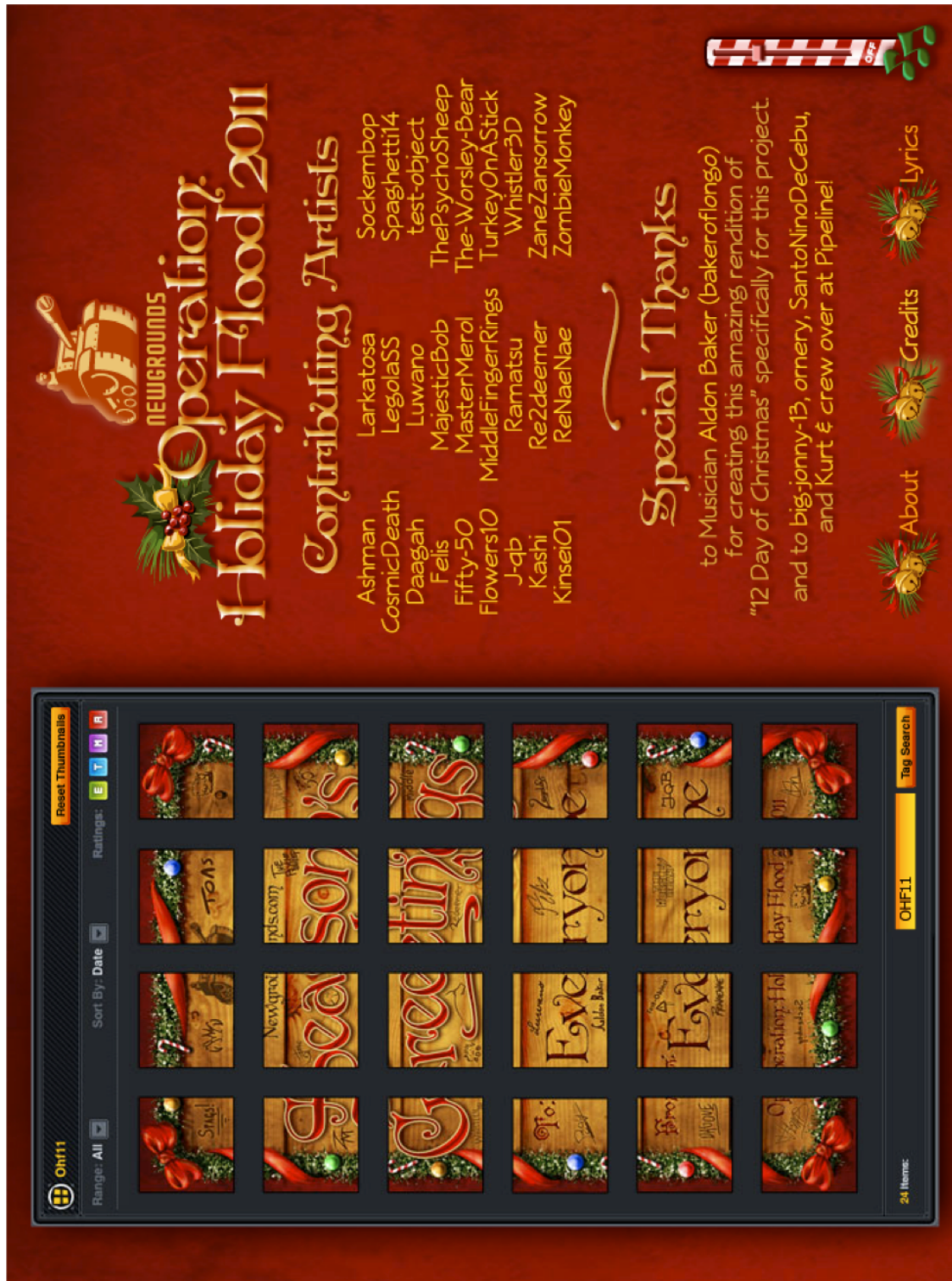


Figure 38: Main menu for the "Operation Holiday Flood" Flash gallery

6.2.3.6 *Attributing the Artists*

As described in Chapter 3, the Newgrounds multi-author system allows up to 10 users to be credited as co-authors for a Flash submission. Collab members employ a variety of strategies for determining who earns the coveted co-author slots when there are more than 10 collaborators. For Holiday Flood, Renae originally suggested a private vote. She posted:

“I don’t want to start a situation where people are saying ‘so-and-so deserves it because . . . ’ and then have people getting hurt/mad/insulted or whatever, so I think it’d be best if people give me their picks/reasons via pm [private message]. I’ll take all of them into consideration when making the final decision.”

Renae also mentioned that only five slots were up for voting, because she had already chosen five co-authors whom she felt *“have already earned a spot.”* They were herself, Robert and Gabriel (for helping with the poster), bakeroflongo (for composing music for the gallery), and ZaneZanesorrow (for the *“drummer rescue”*).

Despite this plan, Renae ended up selecting all 10 of the co-authors *“either by the quality of their piece or how involved they were in the project as a whole.”* Part of the reason was she only received two vote-related private messages, possibly because few members noticed her request buried in the comments on one of the Flash-related tasks. While only 10 artists were co-authored, all artists who contributed to Holiday Flood were listed in the credits of the gallery itself.

6.3 Discussion

Holiday Flood was a successful project, but how much of its success can be attributed to Pipeline? In the following discussion, I discuss ways that Pipeline supported and transformed leadership in Holiday Flood, focusing on five major leadership behaviors identified by Yukl [160]. I also discuss important trade-offs between privacy and audience interest that revealed themselves through the Holiday Flood case study.

6.3.1 Supporting and Transforming Leadership

Holiday Flood had two formal leaders, Renae and Robert, who played highly influential roles in the project’s success. They employed a leadership style in Holiday Flood that was generally centralized

and inherited many traditional leadership practices from previous floods and collabs. This is not surprising, as the project was organized entirely by members of an online community entrenched in a long tradition of centralized leadership and minimal communication among members. Holiday Flood was every member's first experience with Pipeline, and to completely abandon both the familiar technological platform (forums) and the familiar leadership model (top-down) was to invite disaster. As Becker [10] notes, conventionality serves a useful purpose in artistic collaboration by reducing risk and taking advantage of shared knowledge. In addition, the precise time constraints and secrecy requirements of Holiday Flood may have lent themselves to the efficiency of a more top-down leadership model.

On the other hand, Holiday Flood was anything but a traditional Newgrounds flood. The project was not only a remarkable success, achieving its creators' goals and earning high praise from the community, but the result was far more complex and interdependent than previous efforts. In order to unpack this success, and reconcile it with the often-problematic centralized leadership style that Robert and Renae adopted, we need to understand the role that Pipeline played in Holiday Flood. Because Pipeline was designed to support and transform leadership in online creative collaboration, the following discussion focuses on how the software may have supported traditional top-down leadership or transformed leadership by redistributing it across the group.

As reviewed in Chapter 2, there are many different interpretations and theories of leadership. I structure the following discussion in terms of the five major leadership behaviors for managing work described by Yukl [160]. These task-oriented behaviors—planning, problem solving, clarifying, informing, and monitoring—reflect the broader theoretical view of leadership as a process of initiating structure for followers. This list of behaviors is not exhaustive; for example, many scholars recognize relationship-building behaviors (also called “consideration”) as equally important. However, these five behaviors provide a valuable starting point for analyzing the logs and interview data regarding leadership in Holiday Flood. In the following subsections, I briefly define each leadership behavior, describe its role in Holiday Flood, and discuss the evidence that Pipeline may have supported or transformed it.

6.3.1.1 Planning

According to Yukl, planning is "deciding what to do, how to do it, who will do it, and when it will be done" [160]. The activity of planning is generally a cognitive one, though the leader may involve others in the planning process. Thus, it is easiest to identify planning when the leader is actually implementing the plans. Planning takes many forms, including strategic and operational planning. Of particular relevance to Holiday Flood are two sub-types: action planning, defined as "determining how to implement a strategy or carry out a project in an effective manner," and contingency planning, which is "the development of procedures for reacting . . . to unavoidable problems and crises." In contrast to problem solving (discussed below), planning is not reactive and has a long-term orientation [160].

Holiday Flood's leaders had extensive experience planning previous floods and collabs, and they brought this experience to bear on Holiday Flood. For example, Robert noted that contingency planning (in his words, "*risk management*,") was an important practice he had developed over the years:

"To be honest, whenever I handle projects, I tend to think of these problems early on, anyway, and try and come up with, well, risk management really. Try and work out how to control and mitigate those problems rather than encounter them and cry because we didnt think it would happen."

Some leadership behaviors like this one are likely more attributable to Robert and Renae's experiences than any affordances of Pipeline. Yet, there is evidence that Pipeline had a major impact on the planning process. Both leaders emphasized that Pipeline's technological support emboldened them to plan a much more complex, elaborate flood. Robert explained:

"Renae wanted to do something for Christmas, and also have something a bit more . . . big and momentous, because it is Christmas time. . . . And also because this type of project needs a bit more management on the site, because you've also got to look after the order of the thumbnails coming into the art portal, as well as trying to make sure people actually come up with work, rather than doing absolutely nothing. So basically that project needs a lot more management, and that's why we brought Pipeline into it."

Renae agreed:

“The Holiday Flood was all planned and plotted . . . it’s the reason we needed Pipeline. [I] doubt it would have worked out any other way.”

These quotes suggest that Holiday Flood’s leaders felt that Pipeline made it possible to organize a new type of flood, one that was too difficult or ambitious to attempt previously. Traditional floods are among the least interdependent forms of collaboration; like “themed” collabs, the content created by one participant has no bearing on others. As Renae observed:

“With regular floods, it’s just for fun . . . nothing more comes of it than covering the page with the same thumbnail, so . . . it’s not that big of a deal if you skip out.”

In contrast, much of the collaboration in Holiday Flood was highly interdependent, with the added complication that everything had to be completed by a certain deadline. The entire process was filled with potential bottlenecks due to dependencies. Renae couldn’t submit the Flash gallery until the artworks were deployed. Each artist couldn’t deploy her artwork until the previous one had done so. Artists couldn’t deploy at all until their artworks were completed, meaning each had its thumbnail incorporated. Renae couldn’t give artists the thumbnails until she had their signatures, and she couldn’t create the thumbnails until she finished the poster, which had been conceptualized by Gabriel and developed by Robert. If any of these steps had been omitted or seriously delayed, Gabriel explained, *“the whole thing would’ve been ruined,”* a sentiment shared by all of my interviewees.

Several features of Pipeline may have supported these more elaborate plans. The “Start a Project” interface was designed to use scaffolding to help leaders include key structural/planning elements in their new projects. This tool, coupled with each project’s Basics tab, communicated the most important information about the project to members. Robert recalled, *“At the start of the project, [Renae] outlined how she was going to run the project, which was a simple idea which needed to be fleshed out.”* Following this, the leaders used Pipeline’s task system to implement these “actions plans,” in Yukl’s words, and share them with members. The general consensus was that implementing similar plans on the Newgrounds forums would have been very difficult or impossible. In Luwano’s words:

“To be honest [Holiday Flood] would simply not have been possible without [Pipeline]. Getting 24 people to draw their pics would have been possible on NG, but arranging all the thumbnails and setting up the schedule would not have been possible there.”

Some of Pipeline’s benefits are real, but others could have been imagined. The perceived advantages of Pipeline may have catalyzed a high level of enthusiasm among members and a desire to attempt something elaborate. The evidence suggests that Pipeline contributed significantly to the success of this complex creative collaboration, but more projects must be studied to tease apart the perceived and actual benefits provided by the software.

6.3.1.2 Problem Solving

The leadership behavior of problem solving “involves identifying work-related problems, analyzing them in a systematic but timely manner, and acting decisively to implement solutions and deal with crises” [160]. Unlike planning, which has a long-term orientation, problem solving is about dealing with emergencies and other situations that occur unexpectedly and require immediate attention. Leaders who are effective problem solvers are especially apt at being decisive and taking responsibility for a problem rather than avoiding it or “buck-passing” (making somebody else responsible) [160].

Overall, Holiday Flood’s leaders encountered few emergencies and minimized the need to engage in problem solving. Potentially, this was the result of the leaders drawing on their past experience and engaging in effective contingency planning. However, some problems did arise and the leaders dealt with them successfully. The most frequent and recurring emergencies were drop-outs. When artists claimed a slot for one of the Twelve Days of Christmas and then failed to deliver, Renae and Robert worked to quickly find replacements. Early in the project, they responded to drop-outs by inviting new members recruited on the Newgrounds forums. However, when the artist responsible for Twelve Drummers Drumming dropped out four days before deployment was scheduled to begin, the impending deadline created additional pressure. As mentioned above, Renae took responsibility by posting a breathless plea for help on Newgrounds. Rather than a new recruit, however, it was an existing member, ZaneZanesorrow, who quickly drew up an “Emergency Drummers” artwork. Thus, both a leader and a regular member ultimately shared responsibility for solving the

problem.

In the above examples, Renae responded by working to find others to claim open slots. Other times, Holiday Flood's leaders solved the problem by doing the work themselves. One of the best examples of leaders solving problems directly involves the Season's Greetings poster. When Gabriel became too busy to complete the poster, Robert and Renae stepped in and made the necessary improvements themselves, in a process of collaborative iteration. Pipeline's support for file sharing, commenting, and multiple versions facilitated this form of direct problem solving, as the leaders could download and modify Gabriel's work-in-progress without even contacting him. If Gabriel was too busy to finish the artwork, he was likely also too busy to share his work materials. Without Pipeline, it may have been more expedient for the leaders, unable to gauge his progress, to start over with someone else.

6.3.1.3 *Clarifying Roles and Objectives*

Clarifying, according to Yukl, "is the communication of plans, policies, and role expectations" [160]. He identifies four major sub-types of clarifying behaviors: (1) defining job responsibilities, (2) setting performance goals, (3) assigning tasks, and (4) providing instructions for doing a task [160].

Defining Job Responsibilities Pipeline helped leaders define job responsibilities most significantly through the trusted member system. The software gave trusted members access to tools for supporting articulation work, while regular members were limited by the system to content creation. The evidence suggests that overall, this division of labor worked well for Holiday Flood. Regular members enjoyed the creative freedom they sought while trusted members retained the authority to keep the project focused and organized. In BlueJay's opinion, "*[S]tuff might have gotten cluttered if everyone could start tasks etc.*"

Leadership theory emphasizes the importance of clarifying roles, but Holiday Flood provides an example of a context where it was sometimes useful to allow for multiple interpretations. The notion of "trust" provided a valuable degree of ambiguity about the role of trusted members that might be harder to achieve with more traditionally power-laden concepts like "moderator" or "leader." Particularly online, where participation is often voluntary, leaders have a strong incentive to avoid

flaunting their authority. For example, Reagle's [121] theory of "authorial leadership" describes the somewhat paradoxical relationship between "benevolent dictators," such as Wikipedia's Jimmy Wales and Linux's Linus Torvalds, and the egalitarian-minded communities they lead. Similarly, Holiday Flood's trusted members did not view themselves as authoritarians despite their extra permissions, authority, and influence. Robert reflected:

"Even though I had a bit more of a major role, as a guy looking after the thumbnails or the other guy [BlueJay] who was meant to look after the Flash project, I didn't really see that role as a really significant one in the overall project. I still thought of that as on the same level as a contributor making a picture and sticking a thumbnail over top of it."

The non-leaders I interviewed concurred with this view. They found the subjective experience of participating in the project to be egalitarian and empowering and saw the leaders primarily as organizers whose goal was to facilitate progress. While they agreed that Renae and Robert had authority, they found it directed mainly at preserving the project's basic structure rather than influencing artists' creative decisions. BlueJay felt that the leaders were *"mostly making sure everyone stuck to the schedule ... kept the Pipeline a bit organized, making threads/tasks for stuff etc. [whereas] generating ideas and deciding on them was mostly done in consultation with everyone."*

Setting Performance Goals Pipeline helped leaders set performance goals primarily through the Basics tab and task management system. Early in the project, Renae described the project's overall goals in the Pitch section of the Basics tab. As the project progressed, she created tasks for all major components of the project. For eight of the nine tasks, she also supplied a deadline, which further clarified the expectations for those tasks.

Assigning Tasks As mentioned in Chapter 5, Pipeline is unusual among project management tools in that it does not directly support the assignment of tasks to members. Rather, Pipeline embraces the philosophy of peer production, which holds that one of the most effective ways to organize online collaboration is by allowing participants to self-select for tasks. This approach reduces the coordination overhead of leaders, who need not spend time assigning tasks. Instead, members

choose the work that is most appealing to them, increasing their motivations to complete it, and ideally finding an appropriate match between their skill set and opportunities to use it.

This design decision appeared to be a good match for the Newgrounds community and Holiday Flood in particular. For example, one of the first tasks Renae created was titled, “CLAIM YOUR PART!,” in which she encouraged members to sign up for artwork slots on a first come, first served basis. Members were pleased with their selections, as evidenced by excited comments on the task and the fact that all artworks were completed. Meanwhile, leaders were free to focus on responsibilities other than matching artists with tasks and dealing with those who were unsatisfied with their assignments.

Providing Instructions for Tasks The leaders of Holiday Flood provided instructions to members throughout the project. Pipeline supported this practice in several ways. Tasks were designed with several fields for including instructions, such as the number of people needed for a task, and a plain-text “Instructions” area for more detailed information.

Yukl notes that providing feedback is another important component of the leadership behavior of providing instruction [160]. In the past, formal leaders provided most or all of the feedback to collab members because the limitations of the Newgrounds forum made it difficult for members to share their work or exchange feedback among themselves. Most had to wait for audience reviews of the finished product, or they could email their files to the project’s leader and request comments.

In contrast, Pipeline provided each contribution with a dedicated area for file sharing, iteration, and discussion. Many members were able to share rough drafts and receive comments prior to the deadline, from both leaders and regular members. As a result, feedback was more evenly distributed among the group. BlueJay explained:

“In previous floods people usually provided feedback after everything had been submitted to the portal. With other art collabs the amount of feedback is usually pretty much limited to the collab organizer. For the Holiday Flood people uploaded and got more feedback on WIPs.”

BlueJay’s impression is supported by the data. I analyzed the Pipeline logs and found that members of Holiday Flood had posted 114 comments on contributions that were not their own. Of

these, less than half (50 comments, or 44%) were posted by Renae and Robert. In other words, the majority of feedback on works-in-progress was provided by regular members, not formal leaders.

6.3.1.4 Informing

The leadership behavior of informing “involves the communication of task-relevant information needed by subordinates, peers, superiors, or outsiders” [160]. A leader who is an effective informer is able to expose project members to the information they need and avoid wasting their time with information that isn’t relevant to them. The leader is essentially a curator, processing all the information that passes through the project, pulling out the bits that are meaningful to certain members, and sharing it with them in a timely fashion [160].

Traditionally, Newgrounds collabs suffered from poor informing. There was both too little information—leaders had trouble knowing what members were working on—and too much information—collab threads quickly accumulated hundreds of replies. Finding and curating information was also difficult, as important messages could be quickly buried beneath a flood of replies on other topics.

Pipeline was designed with the goal of helping to organize this information flow and supporting leaders as informers. Each project has a Discussion tab, which allows members to participate in forum-style discussions that are organized by topic, rather than as one chronological list. Renae used this feature several times to make general announcements to the Holiday Flood membership.

Other Pipeline features sought to help automate certain aspects of informing. Yukl notes that leaders can increase effective informing by “improv[ing] direct access by others to relevant information.” Pipeline is intended to support this direct access by connecting members to the content that matters to them. For example, the Tasks tab displays the user’s tasks first, and Recent Activity feeds are contextual, showing only the events that are relevant to the surrounding content. My intention was that Pipeline would automate some of this tedious informing work, easing the burden on leaders and freeing them to focus on other tasks. My inspiration for this idea was Hutchins’ analysis of DCOG in airplane cockpits, where he describes how small instrument markers called “speed bugs” do not actually help pilots remember significant airspeeds, but instead store the information so that pilots need not remember it at all, and can focus on other matters [76]. He writes, “The beauty of devices like speed bugs is that they permit these reconfigurations of functional systems in ways

that reduce the requirements for scarce cognitive resources.” Similarly, I hoped that Pipeline could provide tools that, like an aircraft’s speed bugs, reduced the requirements for scarce cognitive resources. Holiday Flood raised two issues with this line of thinking that prompted me to unpack the goal of “easing the burden on leaders,” which may have been overly simplistic.

First, many of my design choices for automating leadership behaviors in Pipeline had the unexpected consequence of actually delegating small but significant bits of work to non-leaders. For example, instead of leaders collecting members’ files and providing feedback, members uploaded their files directly to Pipeline so that anyone in the project could comment. Instead of leaders answering questions about the project’s structure, members could explore the open tasks to answer their own questions. Instead of leaders manually updating member lists, members clicked “Join” or “Leave” buttons and Pipeline updated the member list accordingly. In general, Pipeline encouraged Holiday Flood’s members to interact regularly with the site so that it could capture this activity and share it with other members in the form of recent activity feeds. Instead of automating leadership tasks, it may be more accurate to say that Pipeline was improving the social translucence of distributed leadership.

Second, there were unexpected benefits to having human leaders act as informers. For example, some leaders manually updated tasks when members made a contribution, even as Pipeline updated the task automatically. While the leaders’ manual efforts and the task system both communicated the same progress information, they were not redundant because the manual updates contained additional information: the leaders were *paying attention* to the artists’ progress. The automatic updates were quicker and more reliable, but the manual ones provided valuable motivation. Hence, it is important to consider the tradeoffs of automating leadership tasks, as sometimes even “busywork” is more effectively done by human leaders. This finding bears similarities to attitudes towards authorship in online remix communities, where manual crediting is viewed as essential even when the system automatically attributes remixed content [107].

6.3.1.5 Monitoring

Monitoring “involves gathering information about the operations of the manager’s organizational unit,” including elements such as progress, individual performance, and the success of various endeavours [160]. Monitoring provides the information to be used for the planning and problem solving behaviors described above. Yukl also notes that monitoring is “most difficult when work involves unstructured, unique tasks for which results can be determined only after a long time interval” [160].

Pipeline supports monitoring most significantly through its Recent Activity feeds, email notifications, and the underlying infrastructure that logs user behavior. As mentioned above, this infrastructure caused many member activities that previously happened off-site or went uncaptured to become socially translucent, and therefore available for other users to interpret. Additionally, the fact that Recent Activity feeds were visible to all project members, not just leaders, meant that monitoring was transformed into a more distributed leadership behavior. Leaders could more easily monitor the progress of members, but now members could also monitor the leaders and one another.

While the Recent Activity feeds helped redistribute some aspects of monitoring, other Pipeline features also supported more traditional, leader-driven monitoring. One example is the Discussion tab, which Renae used to organize two “roll calls.” In these discussions, Renae required every member of Holiday Flood to check in and post a brief update before a certain deadline—otherwise, they would be banned from the project. As described above, Renae followed through on this promise and banned a handful of unresponsive members, taking advantage of both Pipeline’s tools for communication and for cutting off communication.

6.3.1.6 Summary

In summary, the case study revealed that Holiday Flood’s leaders organized a highly ambitious project and were rewarded by success. To understand Pipeline’s role in this success, we can analyze leadership in the project through the theoretical lens of Yukl’s five major leadership behaviors. While the leaders, Renae and Robert, brought extensive leadership experience to the project and drew upon that experience, their efforts were also streamlined and emboldened by Pipeline.

For the most part, Pipeline served to *support* Renae and Robert’s top-down, centralized leadership style. Its “Start a Project” tool and Basics tab assisted with early planning and structure for Holiday Flood, while the software’s overall capabilities encouraged the leaders to strive for something more complex and interdependent. Pipeline helped leaders solve problems by providing quick access to members’ works in progress. While Pipeline’s trusted member system helped clarify roles by limiting permissions of regular members, it also provided a valuable degree of ambiguity that deemphasized power relationships. The software supported leaders’ informing behaviors by helping them communicate important information to members via discussions, and leaders also used discussions to initiate “roll calls” that helped them monitor progress.

There is also evidence that Pipeline *transformed* some aspects of leadership by redistributing certain leadership behaviors across a broader set of Holiday Flood members. Assigning tasks is an important leadership behavior identified by Yukl [160], yet unlike most project management tools, Pipeline does not allow leaders to assign tasks. Rather, Pipeline’s design draws inspiration from peer production theory and encourages users to self-select for tasks. Holiday Flood’s leaders created tasks and asked members to claim ones that appealed to them, reducing the leaders’ coordination efforts and leveraging the motivations and self-knowledge of members. Another leadership behavior identified by Yukl, providing feedback, was redistributed via Pipeline’s support for comments, file sharing, and iteration such that more than half of all Holiday Flood feedback was provided by non-leaders. Finally, the Recent Activity feeds in Pipeline helped redistribute the leadership behaviors of informing and monitoring by encouraging members to make their actions more socially translucent, and displaying this behavior in meaningful, context-sensitive ways.

Overall, the Holiday Flood case study suggested that Pipeline can be a powerful tool for both supporting and transforming leadership in online creative collaboration. However, more studies of additional projects are needed to understand its strengths and limitations, and tease apart the interrelationships between leader expertise, domain requirements, and technological support.

6.3.2 Maintaining Privacy and Audience Interest

The majority of research looking at online creative collaboration focuses on open collaboration. Contribution is open to almost anyone; content is often publicly accessible, free, and open source.

These projects are appealing to researchers, not only because of their high profile successes (e.g. Wikipedia, Wikia, Firefox) but also because they provide access to large quantities of data about human behavior in real-world collaborations. Wikipedia provides APIs and comprehensive database dumps for any interested party to analyze. Open source developers hash out decisions on public mailing lists, bug trackers, and code repositories. As more research accumulates around these open collaborations, the temptation may be to conflate online creative collaboration with open collaboration, or to assume that openness is an essential characteristic of successful online creative collaboration.

The case study of Holiday Flood challenges such assumptions. From almost the beginning, Holiday Flood was anything but an open collaboration. While recruitment was initially open to anyone in the community, once enough artists had signed up, the leaders closed off participation except to replace a few drop-outs. Leaders also carefully managed the flow of information about the project to outsiders by shrouding the recruitment process in mystery and centralizing nearly all communication within a private project on Pipeline. Thus, in terms of both participation and visibility, Holiday Flood was a closed collaboration. Although many such projects may be organized online every day, few have seen scholarly attention because by their very nature, they are private, closed off from outsiders, and present challenges to data collection.

The creation and adoption of Pipeline has given us unusual access to data about online creative collaboration that is also *closed collaboration*. Projects with artistic, expressive goals lend themselves to closed collaboration, because artists strive for completion and prefer only to release finished, polished work to the public (see Section 3.3.1.1). The example of Holiday Flood highlights some unique challenges associated with closed collaboration.

Many of these challenges focus on the leaders' attempts to manage the flow of information in and out of the project. Renae sought to recruit artists from the same community that provided her main audience. Because the goal of Holiday Flood was to create a digital Advent calendar, it was important to maintain elements of secrecy during more than a month of production. Renae's solution, framing Holiday Flood as a secret mission, successfully preserved the surprise, but not without cost. When artists dropped out, leaders struggled to replace them quickly because the veil of secrecy prevented potential artists from getting a clear picture of what the problem was and how

they could help.

Secrecy can also negatively impact audience reactions. When floods or other collabs are organized publicly in the Newgrounds forums, the frequent activity within project threads generates high visibility and exposure. Community members who see these threads every day are reminded of the project in progress, which can help build anticipation. Most activity for Holiday Flood took place in the private Pipeline project, leaving the Newgrounds thread just for initial recruitment and occasional, cryptic updates. As a result, audience interest dwindled. While the artworks and Flash gallery earned high scores, some members were underwhelmed by the number of views, which they felt didn't reflect the quality of the work or the time and effort they invested. Robert attributed some of this underexposure to the project's secrecy:

“The secretive nature of the project kind of killed it, I guess . . . [With] the forums, you can actually keep—you’ve got other people who aren’t involved in the project but might have an interest. Because this was in Pipeline, it was outside. Outside people couldn’t follow. . . . It would be nice to let people spectate but maybe allow some measures to maybe control what parts they can spectate or whatever.”

In retrospect, this outcome seems almost inevitable. Filmmakers manage a similar tension when producing a feature film almost entirely in secret while also anticipating significant audience turnout once the film debuts. A key difference, however, is that most feature films benefit from million-dollar advertising budgets and the work of professional marketing firms. Independent filmmakers are more likely to rely on word-of-mouth advertising or draw interest from a niche community, but even these films make use of social media campaigns and promotional materials like trailers, one-sheets, and press kits. Leaders of closed collaboration may wish to adopt some of these tactics or modify them for a smaller scale. Robert's suggestion, more nuanced privacy controls that allow members to expose some content in order to maintain the audience's interest, may provide a solution. I propose additional design considerations for closed collaboration in the following section.

6.4 Implications

Leadership plays a significant role in the success or failure of online creative collaboration. When leaders can effectively manage the challenges of their roles, they can lead complex creative collaborations with significant impact. These success stories include the world's largest encyclopedia, some of its most popular and useful software, and compelling, award-winning art and entertainment. However, many other promising efforts fail because leaders are overburdened. In the Newgrounds community, leaders struggled to lead geographically distributed groups and were further stymied by the limitations of generic communications tools. These difficulties contributed to a culture of simple projects and top-down, centralized leadership styles. Leaders who attempted more ambitious projects ended up dealing with many of the complications that arose themselves, with little help from technology or other members. To address this issue, I designed Pipeline, a web-based tool for supporting and transforming leadership. In this chapter, I presented a case study showing how Pipeline was used in a real-world context, a successful online artistic collaboration.

6.4.1 Implications for Theory

The major theoretical implication of this work is that technology can be designed to effectively support leadership in online creative collaboration, and in some cases, even transform leadership by redistributing across the group. In Chapter 2, I reviewed research showing that leadership can be distributed in online creative collaboration (e.g. [161, 162]). I extend this work by showing how technologies and conventions can propagate ineffective leadership distributions, and integrate theories of distributed leadership (DL) and distributed cognition (DCog) to suggest how technology might help redistribute leadership. According to Halverson [69], theories that are useful for CSCW have four important attributes: inferential power, application power, descriptive power, and rhetorical power. My proposed framework helped me *infer* that leaders could be more effective, and projects more complex, if leadership was redistributed in Newgrounds collabs. It helped me *apply* the theory of DL to online creative collaboration by informing the design considerations for Pipeline (e.g. decentralization and automation). It helped me *describe* the Holiday Flood creation process using a case study that focused on the interplay between people (formal leaders, other members) and technologies (Pipeline, Newgrounds). And finally, it provided *rhetorical* power by helping me map

observed phenomena in Holiday Flood to theoretical constructs (e.g. leader legitimacy, coordination types, social translucence).

6.4.2 Implications for Design

6.4.2.1 Designing for Trusted Members

This work also suggests several additional design implications. First, systems supporting online creative collaboration should assume formal leaders exist, but also help them redistribute leadership across the entire group as needed. In the case of Holiday Flood, Pipeline helped Renae and Robert organize a complex artistic collaboration by helping them decentralize some tasks traditionally handled by leaders, such as giving feedback, informing, and monitoring. Other projects may have the opposite problem, where leadership is too distributed to be effective and needs to be concentrated among a smaller number of formal leaders. By providing tools like Pipeline’s “trust” system that allow members to customize leadership models for each project, or even make real-time adjustments within one project, system designers will encourage a richer variety of creative processes and outcomes from users.

6.4.2.2 Designing for Emergent Complexity

Second, designers should provide simple, flexible tools to allow for complex coordination patterns to emerge in online creative collaboration. Emergence has previously been suggested as a design implication for systems supporting DCOg [14], but I argue that systems supporting DL must also foster emergence, especially in online creative collaboration, where project goals are often open-ended and large numbers of members can unpredictably join and drop out. Pipeline’s task system was lightweight and flexible enough to support a wide range of coordination patterns, including parallel, serial, and temporal coordination; collaborative iteration; and partnerships. Other collaboration architectures, such as Wikipedia’s MediaWiki software, are even less structured, relying primarily on social rather than technical restrictions to guide behavior [24, 148]. If the goal of the community founder or system designer is to foster creativity, experimentation, and risk-taking, the technology used for organizing projects should allow for unexpected uses and avoid unnecessary technical constraints.

6.4.2.3 Designing for Closed Collaboration

Third, systems that support closed online creative collaboration should help users balance the tension between maintaining privacy while the project is in progress, and generating and maintaining interest from their audiences. While Holiday Flood provided an example of members seeking complete privacy during artistic production, the unanticipated negative consequence was a lack of audience awareness when the product was released. Like Holiday Flood’s leaders, I underestimated the value of the exposure given to a popular collab thread in the Newgrounds forums. To strike a more desirable balance between privacy and exposure, the system could, at a bare minimum, reveal basic metrics or analytics about private projects in development, such as the number of members, posts per day, or visualized patterns of activity. Designers may also consider offering more nuanced visibility settings for existing content within a Pipeline project, so that members could selectively share teasers or other promotional material with the public. Alternatively, designers could designate a separate area of the project where members could post updates specifically geared towards their audience. Users could “follow” projects of interest to automatically see public updates on their Dashboards.

6.5 Chapter Summary

In this chapter, I presented a detailed case study of Pipeline’s usage, the successful artistic collaboration Holiday Flood. In this project, nearly 30 artists from around the world collaborated using Pipeline to create a series of Christmas-themed illustrations and a corresponding Flash gallery in which to feature them.

From the beginning, Holiday Flood was intended to be a more complex and original type of collab, with part of this ambition originating in the real or perceived advantages of Pipeline. I showed how Holiday Flood’s formal leaders, Renae and Robert, faced many of the same challenges as the collab leaders in Chapter 3. Traditions take time to evolve, certainly longer than one six-week project, and the leadership style expressed in Holiday Flood was generally centralized. While Pipeline helped Renae and Robert reinforce their roles as leaders, it also helped them manage their workload by offloading tasks and responsibilities onto the artists. Using Yukl’s five major leadership behaviors for managing work as a structure, I showed how Pipeline supported centralized leadership

for some behaviors, and transformed leadership by redistributing it across the group for other behaviors. Holiday Flood also highlighted a tension between maintaining privacy and audience interest which may generalize to other types of closed collaboration.

This case study suggested several implications for theory and design. From a theoretical perspective, the concept of redistributed leadership proved useful. The combination of insights from distributed leadership and distributed cognition offered inferential, application, descriptive, and rhetorical power for understanding leadership and technology use in Holiday Flood. While I found evidence that Pipeline helped redistribute leadership, designers should assume that formal leaders will be an important part of online creative collaboration and continue to support them. Designers should also consider providing lightweight, flexible tools for structuring online creative collaboration if they aim to encourage originality and emergent complexity. Finally, members of closed collaboration can benefit from tools which help them balance the competing goals of maintaining privacy and audience interest, such as selective sharing of content or public displays of activity levels within a project.

In the next chapter, I review the findings of this dissertation in terms of my research questions, state the contributions of my dissertation, and propose future directions for research in online creative collaboration.

CHAPTER VII

CONCLUSION AND FUTURE WORK

In this chapter, I conclude my dissertation and discuss future work. I begin by returning to the research questions posted in Chapter 1, showing how the research presented in my dissertation addresses each of them. I then state the major contributions offered by this research. Finally, I discuss two opportunities for future work in online creative collaboration.

7.1 Addressing the Research Questions

For this dissertation, I posed four research questions focusing on the roles of leadership and technological support in online creative collaboration:

RQ1: What are the challenges for leaders in online creative collaboration?

My qualitative study of online, collaborative animation projects (“collabs”) presented in Chapter 3 identified three major challenges for leaders: designing the project, managing the artists, and completing the project. These major challenges were then subdivided into eight more specific challenges. In *designing the project*, leaders must *structure* the collab along several dimensions. They determine an overall premise or set of general content guidelines (a theme), technical specifications like dimensions and frame rates (specs), and coordination patterns determining how work will be divided up among members and integrated later on (arrangements). In making these choices, the leaders seek to balance originality, which most collab members desire, with conventionality, which reduces risk and increases the likelihood of success. Leaders must also *propose* this project to the community from which they hope to recruit members. In the Newgrounds forums, leaders propose collabs by posting a new thread whose first post contains the structural elements described above.

In *managing the artists*, leaders work to ensure that the members they recruited will successfully complete the tasks they claimed. During this phase, leaders face several challenges which test their ability to exercise authority wisely. Since collab members are usually volunteers, they often prioritize offline responsibilities like employment or school above their collab duties. If leaders

push these members too hard, they are likely to drop out and possibly join a less demanding collab. Lacking any kind of formal contract, leaders have little recourse. On the other hand, if leaders don't press collab members hard enough, progress may be glacially slow and members are unlikely to produce their best work. Managing this tension effectively is required for leaders to *motivate* artists to complete tasks and provide *creative direction* which reconciles the leader's own vision with those of the project members. Leaders must also *recruit* appropriate members and *replace* the inevitable drop-outs in a timely manner.

In *completing the project*, leaders are faced with two interrelated challenges: integrating members' contributions into a coherent whole, and make sure members are properly attributed for these contributions. *Integration* presents aesthetic, social, and technical challenges which the leader must manage. The leader must effectively balance variety and continuity among contributions with diverse styles, using techniques like creating transitions and experimenting with different sequences. The leader also faces social challenges in that members are typically uncomfortable with others making substantive changes to their work. If modifications are needed, the leader often requests the member to implement them or simply omits the contribution. Furthermore, integration poses technical challenges for leaders when they attempt to combine files created with various techniques and software tools. They often ask members to act as beta testers to identify bugs that result from integration. *Attribution* makes additional demands of leaders, who must not only ensure contributors receive credit for their efforts, but often also decide among several possible attribution mechanisms, some more desirable—and limited—than others.

In all of the challenges mentioned above, collab leaders were significantly hindered by a lack of adequate technological support. As most collabs were organized in threads on the Newgrounds discussion forums, leaders struggled to organize a complex multimedia project using a system designed for conversation. To compensate for these technological limitations, leaders attempted to pick up the slack themselves by assuming a vast array of responsibilities. They also sought to minimize risk by organizing more conventional collabs, adopting top-down leadership styles, and dividing up work in ways that minimized interdependencies and communication among members. Despite these efforts, many leaders became overburdened, and few collabs were completed.

As collabs represent just one domain of online creative collaboration, I also compared the challenges faced by leaders of collabs versus more utility-oriented projects like Wikipedia and OSS. Collab leaders must work towards *completing* the project (culminating in a single release) or members' efforts will go unseen. Leaders also strive to create something *original*, which is fundamentally riskier. The open-ended, *subjective* nature of expression-oriented projects like movies and artworks requires leaders to make numerous, sometimes arbitrary decisions. Finally, leaders must navigate collab members' strong sense of *ownership* towards their work when seeking to make changes.

RQ2: What factors contribute to successful online creative collaboration?

In Chapter 4, I approached the question of success in online creative collaboration from two angles. First, I analyzed qualitative data from interviews with collab participants. I found that collab participants view success as completing a project, while abandoned projects are considered “failed” or “dead.” From these interviews, I also distilled five possible success factors:

H1: Successful leaders provide more initial planning and structure, especially technical specifications.

H2: Successful leaders are more prominent and respected in the community.

H3: Successful leaders have more experience with solo projects and past collabs.

H4: Members of successful collabs communicate more frequently and consistently.

H5: Leaders of successful collabs communicate more frequently and consistently.

I then framed these potential success factors as hypotheses and showed how each hypothesis was supported by leadership research in traditional settings. Specifically, trait-based leadership theories support H2 and H3, while behavioral and situational theories of leadership support H1 and H5. However, it was not yet clear if these factors also correlated with success in online creative collaboration.

I addressed this question in the second part of the chapter, in which I performed a quantitative analysis of nearly 900 attempted collabs in the Newgrounds community. Using content analysis, categorization of collab outcomes, and Mann–Whitney U-tests, I first determined that 87.4% of collabs in the corpus were unsuccessful. This result, which is comparable to OSS failure rates, provides

further evidence that success in online creative collaboration is difficult and rarely achieved. My subsequent analyses found empirical support for all five of the hypotheses listed above. To summarize, leadership traits associated with success in online creative collaboration include (1) being prominent and respected in the community, (2) having strong technical skills, and (3) having experience with successful projects in the past. Leadership behaviors correlated with successful online creative collaboration include: (1) providing initial planning and structure and (2) frequently and consistently communicating with members.

As with Chapter 3, the data gathered and analyzed for this study focused on animation projects in the Newgrounds community. Therefore, I also compared these results to the literature on success in OSS development, finding three major points of comparison. First, while successful collab leaders tend to embrace up-front, centralized planning, leaders of successful OSS projects often support the gradual evolution and iteration of the original goal. Second, both successful collabs and OSS projects are often run by leaders with proven technical skills and a history of past successes, but there is more evidence that OSS leaders also require soft skills (personality, charm, etc.). Third, successful leaders of OSS projects and collabs both tend to be frequent communicators, but commitment works differently: collab leaders maintain their authority or “go down with the ship,” while OSS leaders are vulnerable to forking.

These comparisons and contrasts suggest a starting point for developing more general theories of success in online creative collaboration. To that end, I proposed three possibilities for future exploration: (1) technically skilled, experienced leaders are more likely to succeed; (2) projects whose leaders and members frequently and consistently communicate are more likely to succeed; and (3) simpler projects require leaders to provide solid plans up front, while more complex projects require leaders to effectively evolve a project’s goals over time.

RQ3: How can technology be designed to support and transform leadership in online creative collaboration?

In Chapter 5, I introduced Pipeline, a web-based software tool for supporting and transforming leadership in online creative collaboration. My initial empirical work (Chapter 3) suggested that leaders are often overburdened because they try to compensate for a lack of adequate technological

support. My review of distributed leadership theory (Chapter 2) led me to frame this problem as a failure to *redistribute* leadership effectively. I hypothesized that if Pipeline could help leaders redistribute their responsibilities beyond themselves, they could organize more complex, creative, and successful projects.

Pipeline integrates a variety of features found in existing social networking sites and project management tools, including user profiles, a dashboard, a task management system, a discussion forum, and recent activity feeds. However, its *trusted member system* offers a novel way for leaders to configure and dynamically adjust how these features are used. Pipeline allows the project creator to “trust” a subset of members, who are given technical permissions to do certain types of articulation work [93, 128], such as creating tasks and modifying high-level project settings. Both trusted and regular members can contribute content to the project, which can only be modified by the content creator.

Project creators are intended to assign “trusted” status to members in a way that reflects their approach to leadership. One option is to replicate the leadership styles I observed in my initial empirical work, characterized by a top-down, centralized, authoritarian approach. Pipeline *supports* this leadership style by reinforcing the limited responsibilities of regular members through technical restrictions. It allows project creators to trust only a small proportion of members, or even just themselves. In this scenario, the majority of project members have the ability to claim and complete tasks, but only the creator or a small group can determine what those tasks are.

Alternatively, Pipeline can help project creators *transform* their leadership style into a more decentralized, bottom-up approach. The default settings in Pipeline encourage creators to trust each user they invite to the project. Potentially, creators could trust most or all members of a project, meaning that all of them would have permission to create new tasks, edit the project’s basic settings, and even trust/untrust other members. However, the expectation is that most members, being “trusted,” would only use these extra tools when necessary. This permissions system is based on Jimmy Wales’ philosophy behind the open participation model on Wikipedia, which relies primarily on social norms and guidelines, rather than technical constraints, to guide behavior [148]. If a trusted member acts inappropriately, Pipeline’s recent activity feed provides the necessary social translucence [48] to help other members identify the culprit and revert the undesirable actions.

In addition to these two extreme options (no trusted members or all trusted members), Pipeline allows project creators to trust any combination of members and change this configuration throughout a project's lifespan.

Beyond the implementation of Pipeline described in Chapter 5, my dissertation also presents design implications for supporting various requirements of online creative collaboration in Chapters 3, 4, and 6.

RQ4: How can technology be used to support and transform leadership in online creative collaboration?

In Chapter 6, I presented a detailed case study of one Pipeline project, a six-week artistic collaboration called Holiday Flood, to show how Pipeline helped support and transform leadership in online creative collaboration.

The case study of Holiday Flood underscored the continued importance of legitimate (formal) leaders and suggested that the longstanding tradition of top-down leadership in collabs may be slow to evolve. In many ways, Pipeline supported this traditional approach to leadership. Only three of the project's roughly 30 members were trusted. Two of them, including the project creator, self-identified as the project's leaders, a view that was widely, if not unanimously, shared by other members. Using Yukl's five major leadership behaviors for managing work, I showed specifically which behaviors were supported by Pipeline, and which were transformed by redistribution across the group. With respect to planning, Pipeline's

For the most part, Pipeline served to *support* Renae and Robert's top-down, centralized leadership style. Its "Start a Project" tool and Basics tab assisted with early planning and structure for Holiday Flood, while the software's overall capabilities encouraged the leaders to strive for something more complex and interdependent. Pipeline helped leaders solve problems by providing quick access to members' works in progress. While Pipeline's trusted member system helped clarify roles by limiting permissions of regular members, it also provided a valuable degree of ambiguity that deemphasized power relationships. The software supported leaders' informing behaviors by helping them communicate important information to members via discussions, and leaders also used discussions to initiate "roll calls" that helped them monitor progress.

There is also evidence that Pipeline *transformed* some aspects of leadership by redistributing certain leadership behaviors across a broader set of Holiday Flood members. Assigning tasks is an important leadership behavior identified by Yukl [160], yet unlike most project management tools, Pipeline does not allow leaders to assign tasks. Rather, Pipeline’s design draws inspiration from peer production theory and encourages users to self-select for tasks. Holiday Flood’s leaders created tasks and asked members to claim ones that appealed to them, reducing the leaders’ coordination efforts and leveraging the motivations and self-knowledge of members. Another leadership behavior identified by Yukl, providing feedback, was redistributed via Pipeline’s support for comments, file sharing, and iteration such that more than half of all Holiday Flood feedback was provided by non-leaders. Finally, the Recent Activity feeds in Pipeline helped redistribute the leadership behaviors of informing and monitoring by encouraging members to make their actions more socially translucent, and displaying this behavior in meaningful, context-sensitive ways.

Finally, I found evidence that Pipeline can foster online creative collaboration that is complex, creative, and successful. As mentioned above, success rates in these types of projects are low. Yet Holiday Flood was remarkably successful, recovering from a variety of obstacles, avoiding costly bottlenecks, reaching all of its major deadlines, and earning a positive reception from the community. In addition, the project itself was planned from the beginning to be far more complex than previous attempts. I observed various types of coordination, some planned and other emergent, all of which contributed to a more elaborate, impressive result.

7.2 Contributions

My dissertation offers the following major contributions:

- The introduction of *online creative collaboration* as an organizing concept for relating diverse forms of online collaboration geared towards creating new artifacts (Chapter 1)
- A rich description of existing leadership practices in domains of online creative collaboration which have seen little research attention (movies, games, and artworks) (Chapter 3)
- An empirically validated set of factors associated with successful online creative collaboration (Chapter 4)

- A comparative analysis of key similarities and distinctions between domains of online creative collaboration, along with proposed general principles based on that analysis (Chapters 2, 3, 4)
- Design implications for supporting redistributed leadership and expression-oriented projects in online creative collaboration (Chapters 3, 6)
- The Pipeline software itself, released as free, open-source software for anyone to use and modify, along with lessons learned from its development, launch, and advertising/marketing efforts (Chapter 5)
- A detailed case study illustrating a real-world example of how technology can support and transform leadership in online creative collaboration (Chapter 6)
- The development of *redistributed leadership* as a theoretical framework for analyzing the relationship between effective leadership and technological support in online creative collaboration (Chapters 2, 3, 6)

7.3 Future Work

This dissertation presents initial steps towards tapping into the vast potential of online creative collaboration, and understanding how leadership and technological support can be configured to make it more successful. However, there is much more work to do. In particular, my analysis of Pipeline’s ability to support redistributed leadership was limited to one detailed case study. While it was possible to make some generalizations from this case study [53], more work is needed to understand how leadership can be redistributed in other projects and other domains. Specifically, future work could examine how leadership could be redistributed in cases where it is currently too decentralized; how various degrees of distributed leadership affect outcome variables such as success, complexity, and creativity; and how domain-specific characteristics of online creative collaboration can moderate the benefits of distributed leadership.

This work also suggests opportunities for research with implications beyond leadership in online creative collaboration. I briefly discuss two of these opportunities below, one focusing on crowdsourcing, and the other focusing on new forms of online creative collaboration.

7.3.1 Making Connections to Crowdsourcing

In Chapter 1, I discussed some key differences between online creative collaboration, and Benkler's commons-based peer production. *Crowdsourcing* is a third concept that is frequently mentioned in discussions of large-scale online collaboration. However, like peer production, I view crowdsourcing as somewhat distinct from online creative collaboration. While there are many flavors of crowdsourcing, Jeff Howe, who coined the term, defines it as "the act of taking a job traditionally performed by a designated agent (usually an employee) and outsourcing it to an undefined, generally large group of people in the form of an open call" [114]. The canonical example of crowdsourcing is Amazon Mechanical Turk (AMT),¹ an online marketplace for crowdsourcing work. Anyone can sign up as a "requester" to create tasks ("Human Intelligence Tasks," or "HITs"), which are completed by workers (known as "turkers"). Requesters can post hundreds of identical HITs. They tend to be simple tasks (e.g. label an image) that can be completed in a few seconds, and the pay is correspondingly low (often, less than \$0.50 per HIT).

At first glance, this model suggests some stark contrasts between crowdsourcing and the examples of online creative collaboration presented in my dissertation. One difference is that crowdworkers are typically paid for their work, while members of online creative collaboration tend to be intrinsically motivated volunteers. Another difference is that crowdworkers almost never interact with one another (the basic AMT interface doesn't support it) and they rarely know the higher purpose of their work. In contrast, communication is an important part of online creative collaboration, and by definition members are working towards a shared goal. Finally, the task granularity for crowdsourcing tends to be extremely fine, requiring only a few seconds of work, whereas in online creative collaboration, modules tend to be coarser, with contributors self-selecting for entire chapters of an animation or lengthy paragraphs of an encyclopedia article.

Yet, as I've completed my dissertation work, I've come to see the distinctions between crowdsourcing and online creative collaboration as increasingly blurred. Financial compensation is not the bright line it seems to be. Many prominent OSS projects rely on salaried developers working with volunteers, and projects like *Life in a Day* and *Mass Animation* involved collaborations between

¹<http://www.mturk.com/>

professional filmmakers and amateurs. While member-to-member communication has been shown to be a success factor in collabs and OSS development, I described in Chapter 3 how collab leaders traditionally sought to minimize communication between members. This strategy often limited projects' ambitions and opportunities for emergent creativity, but it was widely practiced. Finally, while substantial contributions are possible in projects like collabs, Wikipedia, and OSS, smaller bits of work, such as correcting typographical errors and reporting bugs, are also legitimate forms of participation and help newcomers develop expertise [21, 158]. This reflects Benkler's notion of the importance of tasks that are both modular and heterogeneously granular in allowing all types of participants to make meaningful contributions [11].

Thinking of online creative collaboration as a form of crowdsourcing exposes some surprising parallels. For example, a collab leader proposing a divide-and-conquer-style project on Newgrounds is not unlike an AMT requester creating a set of HITs in which turkers make animated segments. We could even conceptualize traditional collab leadership as a form of emergent crowdsourcing, where the leader attempts to replicate the conditions of AMT without the platform's affordances for the swift creation of independent, parallelizable work modules. The features presented in Pipeline make this connection even more explicit, as trusted members use the software to literally create tasks for members to claim. Indeed, the workflow represented by a Pipeline project with a single trusted member bears a striking similarity to crowdsourcing on AMT.

Recent crowdsourcing research builds further connections between online creative collaboration and crowdsourcing, particularly with respect to system design. Dow et al. [39] describe several experiments with Shepherd, a system that allows crowdworkers to receive feedback on their work. The evidence suggests that, as with online creative collaboration, this type of feedback is beneficial. Along these lines, Bernstein et al.'s Find-Fix-Verify algorithm allows crowdworkers to validate one another's contributions [12]. Other crowdsourcing research seeks to enable more complex workflows beyond the simple divide-and-conquer approach. CrowdForge [88] provides a framework for deconstructing complex tasks into simpler ones that are easier to distribute among a large group of crowdworkers. CrowdWeaver [86] takes this idea a step further, providing a graphical user interface for the requester to design more complex workflows. In many of these projects, the goal is producing a creative artifact, such as designing an advertisement or writing a news article. All of

this work supports the general premise that certain types of interdependence can enable new, more complex, higher quality forms of crowdsourcing. In other words, this research trajectory points towards crowdsourcing increasingly resembling online creative collaboration in the future.

From my perspective, I am curious to see how elements of online creative collaboration, particularly leadership, can be relevant to crowdsourcing research. I have already suggested a similarity between leaders and requesters. As crowdsourcing workflows become more interdependent and crowdworkers increasingly interact with one another, what will be the role for leaders? The evidence from online creative collaboration suggests that either more complex goals or more coordination and communication among crowdworkers will require some form of governance to remain effective. Crowdsourcing also brings fresh challenges to the idea of redistributed leadership, questioning the extent to which leadership can be distributed in a project whose members have limited opportunities to interact. Furthermore, it will be fascinating to explore the relationship between leadership and motivation—in particular, whether extrinsically motivated collaborators (i.e. crowdworkers) allow for a more traditional, authoritarian leadership style compared to the “authorial leadership” practiced in communities of volunteers [121]. One possible approach to begin addressing these types of research questions would be to augment Pipeline’s task management system with crowdsourcing capabilities. Pipeline users could decide to make new tasks available to project members, crowdworkers, or both. If the task creator chooses crowdworkers, Pipeline could automatically post the task on a crowdsourcing platform like Amazon Mechanical Turk using its API.

7.3.2 Pushing the Boundaries of Online Creative Collaboration

Throughout this dissertation, I have emphasized the importance of considering findings from many domains of online creative collaboration, with the goal of developing broader principles and theories. In this research, I focused on a relatively small set of domains. This included encyclopedia writing (Wikipedia) and certain types of software development (OSS), which I classified as utility-oriented domains, and movie, game, and artwork production (collabs and floods), which I classified as expression-oriented domains. This is just one possible categorization which proved helpful in my dissertation for articulating some broad distinctions between the two groups. Many others are possible, with potentially far greater explanatory and analytical power, and these should be attempted.

An underlying assumption in this call to action is that other forms of online creative collaboration beyond the above examples actually exist. In fact, there is evidence of a remarkable variety of creative practices are being organized online. Some of these examples, such as the *Star Wars Uncut* and *Life in a Day* projects described in Chapter 2, have earned critical acclaim and compete with the best efforts produced by traditional collaboration. However, we know little about them—including why they are so successful—because journalists have generally been more responsive to these projects than researchers (e.g. [133, 7, 63]). With few exceptions, such as the Polymath mathematics collaboration [29] and Scratch animation collabs [81], the focus has remained on better-understood examples like Wikipedia and OSS. We must begin to actively seek out a broader range of examples, rigorously study them to understand how they succeed (or don't), and use this diverse body of scholarship to build a more complete picture of the opportunities and limitations of online creative collaboration.

A second point to be made is that online creative collaboration could be even more diverse if designers of social computing systems actively worked to contribute to new domains. Many technologies have been built by researchers to support collaboration in Wikipedia and OSS development (e.g. [92, 43]), and this important work should continue. However, the opportunity to support online creative collaboration in different domains has been left mostly unexplored. Certainly, part of the appeal of working in prominent, highly active domains is the potential for one's designs to be widely adopted and used by thousands of people. Having led the development of a popular Wikipedia reference management tool [101], I understand and relate to this appeal first-hand. However, working in an underexplored domain offers its own unique benefits: namely, the possibility of making significant impact in an area where little work has been done. To increase the likelihood of attracting a critical mass of users in these smaller areas, designers may consider partnerships with existing online communities whose members could benefit from new technologies. The discussion I present in Chapter 5 regarding my relationship with Newgrounds may prove instructive to such efforts.

Finally, this discussion raises taxonomic questions about the relationship between online creative collaboration, crowdsourcing, commons-based peer production, and related concepts. In Chapter 1, I argued that peer production was too limited for the purposes of this dissertation, and in the previous section I made the case that crowdsourcing and online creative collaboration are on

a path to convergence. As researchers and designers wrestle with these concepts, it may be helpful to learn from a related, long-standing debate over the definition of “online community.” Bruckman [20] suggests setting aside the goal of a single, all-inclusive definition. Instead, we can borrow a concept from cognitive science, category theory, which suggests thinking of elements in a set as more or less similar to prototypical examples of a category. For example, a robin is a better example of a bird than a penguin [20], and Quora is a better example of a Q&A community than Facebook Questions. Similarly, we could imagine categorizing different examples of online collaborative activity in terms of their similarity to prototype-based categories: AMT is a better example of crowdsourcing than Wikipedia, Holiday Flood is a better example of online creative collaboration than *The Johnny Cash Project*, etc. Beyond clarifying the scope of a discussion and enabling easier comparisons and contrasts, this approach could also help to surface exceptions to idealized types, highlighting opportunities for studying interesting edge cases.

Online creative collaboration has transformed the ways people work together in many domains of human creativity, but we have only begun to realize its potential. By studying what makes this phenomenon succeed and designing technologies for supporting it, we can make steady progress towards a future of work that is more rewarding, productive, and inclusive than ever before.

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VITA

Kurt Luther was born and grew up in Pittsburgh, Pa. He attended Upper St. Clair High School, graduating with honors in 2003. After his junior year of high school, Kurt moved to West Lafayette, Ind. to begin his undergraduate studies at Purdue University. At Purdue, he majored in Computer Graphics Technology and minored in Art & Design. His student activities included serving as president of the student chapter of ACM SIGGRAPH, representative of the Computer Graphics Student Council, and co-founder of the Purdue filmmaking club. He also worked as an undergraduate research assistant for the Envision Center for Data Perceptualization at Purdue. Kurt graduated with departmental honors and highest distinction in 2006. He was selected to speak as the Student Responder at his commencement ceremony.

Kurt attended graduate school at the Georgia Institute of Technology (Georgia Tech) in Atlanta, Ga. He enrolled in the Human-Centered Computing Ph.D. program and specialized in Social Computing. His Ph.D. advisor was Professor Amy Bruckman, a faculty member in the School of Interactive Computing. In 2011, Kurt was named a Foley Scholar, the GVU Center at Georgia Tech's highest honor, in recognition of his research contributions. He will return to Pittsburgh in 2012 as a postdoctoral fellow in the Human-Computer Interaction Institute at Carnegie Mellon University.

During his graduate studies, Kurt completed several internships in industry. In 2007, he interned at IBM Research in Hawthorne, N.Y., working with Dr. Jason Ellis and Dr. Wendy Kellogg of the Social Computing Group. In 2008, he interned with Dr. Scott Counts of the Social Computing Group at Microsoft Research in Redmond, Wash. Kurt also interned at Newgrounds.com in Glenside, Pa., in 2009, and with the User Experience team at YouTube in San Bruno, Calif. in 2010.