Leadership Development in Core-Periphery Organizations

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Dedicated to my dad, Lon Collier.

Much of what I learned early on about management and business I learned while busing tables at the Heritage House and watching my dad interview job candidates, coordinate schedules, keep a close watch on the inventory, and manage the staff. My dad was the first to explain supply and demand to me using simple language while I was in grade school, and later we discussed statistical regression and management principles over the dinner table.

On our way out the door to school, when I was growing up, my dad's last words were to encourage us to "study hard!". Thank you for all your encouragement through these years of studying hard in graduate school.

I have been blessed to have many great professors, but my dad will always be my favorite teacher.

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I have been blessed to work with and get feedback from several wonderful people during my time at Carnegie Mellon. Thank you to Moira Burke, Niki Kittur, Bo Choi, and Haiyi Zhu for all your help in navigating the Wikipedia dataset and the many lines of code it took to complete this work. Thank you to the Organizational Behavior and Information Systems faculty and students for feedback during seminars and for being available for questions and guidance. Several coauthors over the past few years greatly have helped in improving my research and writing including Julia Bear, Laura Dabbish, Sherae Daniel, and Ilana Daimant. Thank you to the wonderful coworkers in 242 - Sam Swift, Uriel Haran, Nazli Turan, Zach Sharek, Tat Koon Koh, and Yingda Lu who provided day-to-day feedback and a platform to bounce ideas around, as well as much needed socializing.

Thank you to the many friends and family who have supported and encouraged me along the way. My parents, and brothers and sisters - Nathan, Daniel, Tim, Jonathan, and Amanda - have been supportive and encouraging throughout my years of graduate school. Our community of friends at The Open Door have supported me, been our Pittsburgh family, and have made Pittsburgh feel like home.

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Abstract

Organizational theorists have argued that traditional notions of promotion and leadership assume a context of hierarchical positions within an organization. Many emerging organizations such as Wikipedia, open source software projects, and citizen journalism groups organize using neither markets, nor hierarchies, but rather network forms of organizing. Rather than a traditional hierarchy for leadership, network organizations rely on a core-periphery structure in which a small core of leaders have a dominant influence over the organization. Without a formal hierarchy or clear organizational roles and responsibilities, it is unclear how leaders emerge from the time they arrive in an organization as peripheral members to the time they are promoted into leadership positions. These studies aim to explore the factors that lead organizational members to become leaders in core-periphery network forms of organization.

The first study examines the production behaviors, interpersonal interactions, administrative contributions and community building behaviors that lead organizational members to become leaders. The model developed in this study using behavioral data predicts which candidates are promoted to a leadership position.

The second study uses social network analysis to examine the role weak ties, strong ties, and simmelian ties have on developing organizational members into leaders. We find that early ties to the periphery improved an editor's likelihood of becoming a leader, and later ties to current leaders improve a member's likelihood of becoming a leader. This study also finds that both strong and simmelian ties to leaders have a substantial impact on developing leaders. A qualitative analysis text content in ties with periphery members suggests ties to the periphery provide editors more production and

task based support, while ties to leaders provide editors with more support for organization building and administrative contributions.

By combining both behavioral and social network data, the combined model can predict which candidates are promoted to a leadership position with an accuracy of 86%. Implications for theory and practice are discussed.

Contents

Chapter One

Introduction

> No institution can possibly survive if it needs geniuses or supermen to manage it. It must be organized in such a way as to be able to get along under a leadership composed of average human beings.
>
> *Concept of the Corporation*
> Peter Drucker

Technology and an increasingly globalized workforce have blurred the boundary lines of traditional organizations and the careers and social patterns of the employees and volunteers within them (Arthur & Rouseau, 1996). Organizational leadership and promotion research is often examined in a context of a hierarchical organization in which organizational members compete with peers in a tournament structure for promotion to managerial and leadership positions (March & March, 1977; Rosenbaum, 1979). More recently organizational theorists have argued that traditional notions of promotion and leadership make several assumptions that no longer reflect modern workplace realities, most notably, the assumption that promotion and leadership within organizations happens with respect to hierarchical positions (Arthur, 1994). Core-periphery organizational models demonstrate one common alternative organizational model that differs from the hierarchical organizational model. Traditional organizational charts have production workers and entry level employees at the bottom and executive level employees and the CEO at the

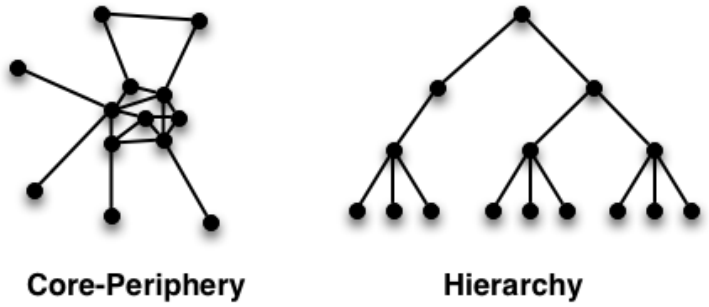


Figure 1.1: Core-Periphery vs. Hierarchical Organizational Structures

top. Core-periphery organizations are structured with a core of active, influential members at the center and less active, less influential, and somewhat unconnected members in the periphery (see Figure 1.1 for comparison).

Core-periphery models of organizing include volunteer organizations (Pearce, 1993), citizen scientist organizations, citizen journalist organizations, open encyclopedias (Kittur, Suh, et al., 2007), technical and financial support communities (Farzan & Kraut, 2012) and open source software projects (Crowston & Howison, 2006a). As Borgatti noted about core-periphery models, they are "quite prevalent in worlds systems, organizational studies, national elites, collective action, interlocking directorates, scientific citation networks, and proximity among Japanese monkeys" (Borgatti & Everett, 2000, pg. 375).

1.1 LEADERSHIP IN WIKIPEDIA

In her discussion of the core-periphery model that emerges in most volunteer organizations, Pearce (1993) describes the core leaders of the organization as the glue who hold the organization together. Peripheral members come and go regularly, core members are temporally stable. In the example of volunteer organizations, much of the communication occurs between peripheral members and core members, with little communication being done amongst peripheral

members. The knowledge and the organizational processes are embedded with core members. Organizational stability and learning depends on their commitment to the organization.

In the present study we focus on how contributors to the online encyclopedia Wikipedia develop into leaders in the organization from the time they enter the organization to the time they are promoted. As Pearce suggests, Wikipedia leaders known as Administrators play a vital part in influencing the organization through interaction with peripheral members, through their project leadership, conflict management, and institutional culture that they preserve.

> Unlike other contributors, most administrators remain with the project for an extended period of time. Many become active in policy discussions, and some will ultimately become successors in leadership roles in the project or the foundation. While new contributors will form their own views, it is vital to the project that they do so in a fashion informed by the history of the project and experiences of others, lest the institutional memory of Wikipedia as a community become compromised.
>
> -Goals of the Adminship Process, Wikipedia

1.2 LEADERSHIP EMERGENCE IN CORE-PERIPHERY ORGANIZATIONS

Recently academic researchers have called for study on leadership progression in core-periphery organization. A study exploring leadership progression acknowledged that "to date few theorists have explored empirically how progression [to a leadership position] might occur within a project, community, or network that transcends organizational boundaries" (Dahlander & O'Mahony, 2010, pg. 2). In addition, practitioners working in core-periphery organizations in an

online context have put forth a call for further understanding of leadership emergence in this context. Given the large role of leadership in creating successful online core-periphery organizations, it is no wonder that "the business community is particularly eager to find out how leaders emerge online" (Preece & Shneiderman, 2009, pg. 23).

If we knew more about how leaders emerge in core-periphery organizations we would know whether interventions would be appropriate, and which interventions would be most effective in developing leaders. If for example, leaders are "born" into the organization and only need to be identified (Panciera et al., 2009) when they arrive as peripheral members, time and resources should be invested in selection and retention of leaders (Schneider et al., 1995). On the other hand there may be production behaviors, communication patterns, community building activities, and social network connections that facilitate the development of leaders in core-periphery organizations. If leaders develop over time through participation, socialization, and mentoring relationships, time and resources should be devoted to developing promising peripheral members into leaders (Day, 2001). Early work on identifying potential leaders in a core-periphery organization and providing them with training and socialization experiences shows promising results in developing peripheral members into leaders (Farzan & Kraut, 2012).

1.3 RESEARCH QUESTIONS

This work posits that leadership and leadership development in core-periphery organizations faces unique challenges. The following research question is developed and explored in this body of work, with further more refined research questions to follow: "What experiences, behaviors, and social connections facilitate the emergence of leaders in core-periphery organizations?".

Study 1. How do production behaviors, interpersonal interactions, administrative contributions, and community building behaviors facilitate leadership

development in core-periphery organizations? How does the impact of these behaviors change over time? The first study examines the production behaviors, interpersonal interactions, administrative behaviors, and community building behaviors that lead organizational members to become leaders. Using behavioral data we explore the behaviors that facilitate leadership development in Wikipedia.

Study 2. How do social network connections influence peripheral members to become leaders in core-periphery organizations? What impact does the type of social tie (weak, strong, simmelian), the target of the tie (peripheral member, leader), and the timing of the tie (early, mid-tenure, late) have on later promotion? The second study uses social network analysis to examine the role weak ties, strong ties, and simmelian ties have on developing organizational members into leaders.

1.4 LEADERSHIP DEFINITION

The definition of leadership often varies widely as leadership is examined from multiple theoretical lenses (Yukl, 1989, 2002). The central concept across several definitions is the issue of influencing both people and the larger organization. The interest of this study is not the sole CEO leader who casts vision and does long term planning. Rather, the theoretical underpinnings and context of this study examines a group of people in positions of influence within an organization. Given the context of a leadership core of influential individuals within an organization, the definition we use for the purpose of this research is as follows:

> Leadership is the ability of an individual to influence, motivate, and enable others to contribute toward the effectiveness and success of the organization.
> (House et al., 1999; Yukl, 2002).

1.5 LEADERSHIP AS A ROLE

In some perspectives on leadership such as leader-member exchange theory (Dienesch & Liden, 2010) the "leader" is a specialized role and other members are "followers" of that leader. In other perspectives such the Shared Leadership perspective (Pearce & Conger, 2003) leadership is an influence processes or a set of activities such as managing personnel resources or managing material resources (Burke et al., 2006).

In Wikipedia as well as other core-periphery organizations, both forms of leadership are at work. In a recent study with Wikipedia as a context researchers found that roughly 2/3 of all leadership activity was performed by people who were not in designed leadership positions (Zhu et al., 2011). Clearly shared leadership behaviors are happening in our study context and in other core-periphery organizations. However, when we consider that official leaders represent only 1% of regular members and account for 1/3 of all leadership activities, we see they have a drastically disproportionate influence on other members and the organization as a whole. In addition, Zhu et al. (2012) found that leadership activities performed by elected leaders were more influential than similar activities performed by non-leaders.

While shared leadership clearly happens in core-periphery organizations, however, there are still significant benefits to (1) having formal leaders in the organization and (2) understanding the factors that contributed to peripheral members developing into formal leaders. Table 1.1 outlines several benefits to having formal leadership positions in core-periphery organizations. This study focuses on the role of formal leaders and leaves the role of shared leadership (leading behaviors of those who are not formal leaders) outside of the research scope.

Benefit	Description	Examples
Vetted, trusted Members	Give control over sensitive areas to the organization	Editing the front page to Wikipedia, blocking harmful contributors
Designated experts	Provides lasting organizational memory	Wikipedia leaders are required to have extensive knowledge of organizational policy and procedures and work to develop policy to address organizational problems
Formal title	Gives people inside and outside the organization a potential contact person	Provides public "go to" people in Wikipedia for questions
Exemplary members	Provides members with an "ideal" or "prototypical" organizational member as an example and motivation to aspire to	In Wikipedia leaders can mentor less experienced contributors.
Speedy decisions	Bureaucratic decision making processes may take undue time and burden on the organization	Leaders may delete articles immediately if they clearly do not belong in Wikipedia
Expert decisions	Crowd decision making may be less effective in areas requiring deep expertise	In the Linux community a small group of lieutenants decide on what is committed to the final product
Designated mediators	Provides people to go to when conflict escalates between members	Wikipedia leaders provide informal arbitration and use their formal title as a source of authority in mediation
Commitment	Induces long-term commitment in an organization with otherwise ephemeral members	Core-periphery organizations have porous boundaries and are easy to join and leave. Electing a leader to a formal position creates friction to that member leaving the organization, and may induce enhanced commitment to the organization
Status	Rewards social engagement and contribution with the status of a leadership title	Leadership titles can also be seen as a status symbol or a reward for hard work. Especially in organizations that may not provide financial motivation, status may be extra important as extrinsic motivation.

Table 1.1: Benefits of a formal leadership role in core-periphery organizations.

LEADERS VS. MANAGERS

Within the leadership literature scholars have debated the difference between leaders and managers (Bennis & Nanus, 1985; Kotter, 2001; Zaleznik, 1977). While most agree leadership and management are qualitatively different, few agree on the dimensions and exact nature of that difference (Yukl, 2002).

Many scholars agree, however, that to be an effective leader or an effective manager, one must be able to both lead and manage (Bass, 1990; Hickman, 1990; Kotter, 2001). While the nuanced differences between a leader and a manager may be of interest and relevant to other bodies of leadership research, this distinction is outside of the scope of the present study. I define leadership following a stream of research that focuses on leadership as fundamentally about influencing people and the organization. Managers and leaders at their core both fit my working definition of leadership, and following others in this tradition I make no distinction between the two (Yukl, 2002).

1.6 CORE-PERIPHERY ORGANIZATION DEFINITION

Despite having many research areas discover this same core-periphery network, it is somewhat surprising that until recently the notion of a core-periphery network has not been formally defined. Borgatti & Everett (2000) developed measures of core-and-periphery networks in his seminal article on the topic, and described core-and-periphery network as entailing a "dense, cohesive core and a sparse, unconnected periphery" (p. 375).

Drawing from Borgatti's work on core-periphery networks, we propose a modified definition of a core-periphery organization as follows: a core-periphery organization entails a dense, cohesive core and a sparse, unconnected periphery. The definition is intuitive and broad enough to encompass a range of core-periphery organizations including volunteer organizations, collective action groups, and online production communities.

1.7 DISSERTATION OVERVIEW

In *Chapter 2: Leadership and Influence in Wikipedia* we take a deeper dive into Wikipedia as an organization and the role of leaders in Wikipedia. *Chapter 3: Study 1 - Leadership Behaviors* develops our understanding of leadership development by examining behaviors that lead contributors to be promoted to a leadership position. Building on Study 1, in *Chapter 4: Study 2 - Social Capital* we explore the role of social capital and the communication networks that lead Wikipedia contributors to move into a leadership role. Finally, in *Chapter 5- Discussion* we discuss the broader implications of our findings from Wikipedia on leadership development in other core-periphery organizations.

Chapter Two

Organizational Processes and Leadership in Wikipedia

Wikipedia will fail in four years, crushed under the weight of an automated assault by marketers and others seeking online traffic.

"Law Professor Predicts Wikipedia's Demise"
InformationWeek, 2006
Eric Goldman

The Encyclopedia Britannica has announced that after 244 years, dozens of editions and more than 7m sets sold, no new editions will be put to paper. The 32 volumes of the 2010 installment, it turns out, were the last. Future editions will live exclusively online.

"Encyclopedia Britannica halts print publication after 244 years"
The Guardian, 2012
Tom McCarthy

2.1 STUDY CONTEXT

WIKIPEDIA is a large, open source, online encyclopedia written and edited by volunteers. Traditional encyclopedia models such as Collier's Encyclopedia, Encyclopedia Americana, and Encyclopedia Britannica were written by soliciting experts in the field such as Sigmund Freud and Albert Einstein to write articles in their area of expertise (Burr, 1911). Wikipedia by contrast allows anyone to both read and edit articles in its collection. As of June 2008 over 650,000 active editors had contributed over 2.8 million articles to the English version alone (Suh et al., 2009). Wikipedia has been in the top ten most visited sites on the internet for over six years, and a recent Pew Research study showed 42% of internet users go to it for information (Zickuhr & Rainie, 2011).

Wikipedia is written and edited by volunteers and is not supervised by a professional staff. Research on the motivations of Wikipedians (a common term to refer to regularly contributors to Wikipedia) has found the top two reasons people contribute are fun ("Writing/editing in Wikipedia is fun") and ideology ("I think information should be free"), while other motivations cited for contributions found in survey research have been altruism, reciprocity, community, reputation, and autonomy (Forte & Bruckman, 2005; Kuznetsov, 2006; Oded, 2007).

Despite predictions by some that such an open system could not be sustainable (Claburn, 2007), Wikipedia has developed innovative organizational processes, governing policies, and roles within the community that has helped it to survive and thrive (Butler et al., 2008). To better understand the role of leaders in Wikipedia, this chapter will first describe how Wikipedia functions as an organization, including production work, coordination, decision making, and policy development. Understanding the socio-technical system that both leaders and editors operate in is helpful to understand our study of emerging leaders and social capital (Bryant et al., 2005; Panciera et al., 2009).

2.2 ARTICLE EDITING AND COORDINATION

To edit an article, a user needs only to click the "Edit" button in the top right corner of the page for that article (see Figure 2.1). While anyone may alter an article page within Wikipedia, a vast majority of changes made to Wikipedia is done by registered contributors. Within the community of registered users of Wikipedia, anyone who makes changes to articles may be considered an editor. Editors in Wikipedia may add content, make changes, delete content, and change an article back to a previous version if unwanted changes are made by another editor (commonly referred to as vandalism). An editor's role in Wikipedia is characterized by developing the content, and an editor's merit is often judged by bringing an article up to quality standards in Wikipedia such as that of a "Good Article", or the gold standard in Wikipedia a "Featured Article" which will at some point be featured on the front page of Wikipedia. Featured articles go through a strenuous review process in which they are nominated, peer reviewed, revised. A voting consensus is then taken to determine whether it meets Wikipedia standards for featured work.

Minor edits such as fixing grammatical mistakes and adding citations can be done without coordination with other editors. When making significant changes to articles, coordinating with other editors is essential to avoid battles in which two editors may disagree on what should be included in the article, how the article should be structured or phrased, and what should be left out of an article (Viégas et al., 2007). To facilitate editorial coordination and discussion each article has a "Talk" page associated with it that is easily accessible. Editors coordinate on talk pages about a variety of issues in each article, ranging from notability, terminology, and citing proper sources. For example, editors working on an article about Carnegie Mellon University debated on the talk page about which programs at the university are considered "top in their fields" (see Figure 2.2). Two editors debate their position on what public opinion of each program is, and a third editor intervenes in what becomes a "flame war" to suggest

Figure 2.1: Most readers will only see the main article space in Wikipedia shown here. Behind the scenes you can discuss changes to the article, edit the article, or see the complete editing history and change the article back to a previous version.

they pick a single cut off value for what ranking they will use "in encyclopedic tradition".

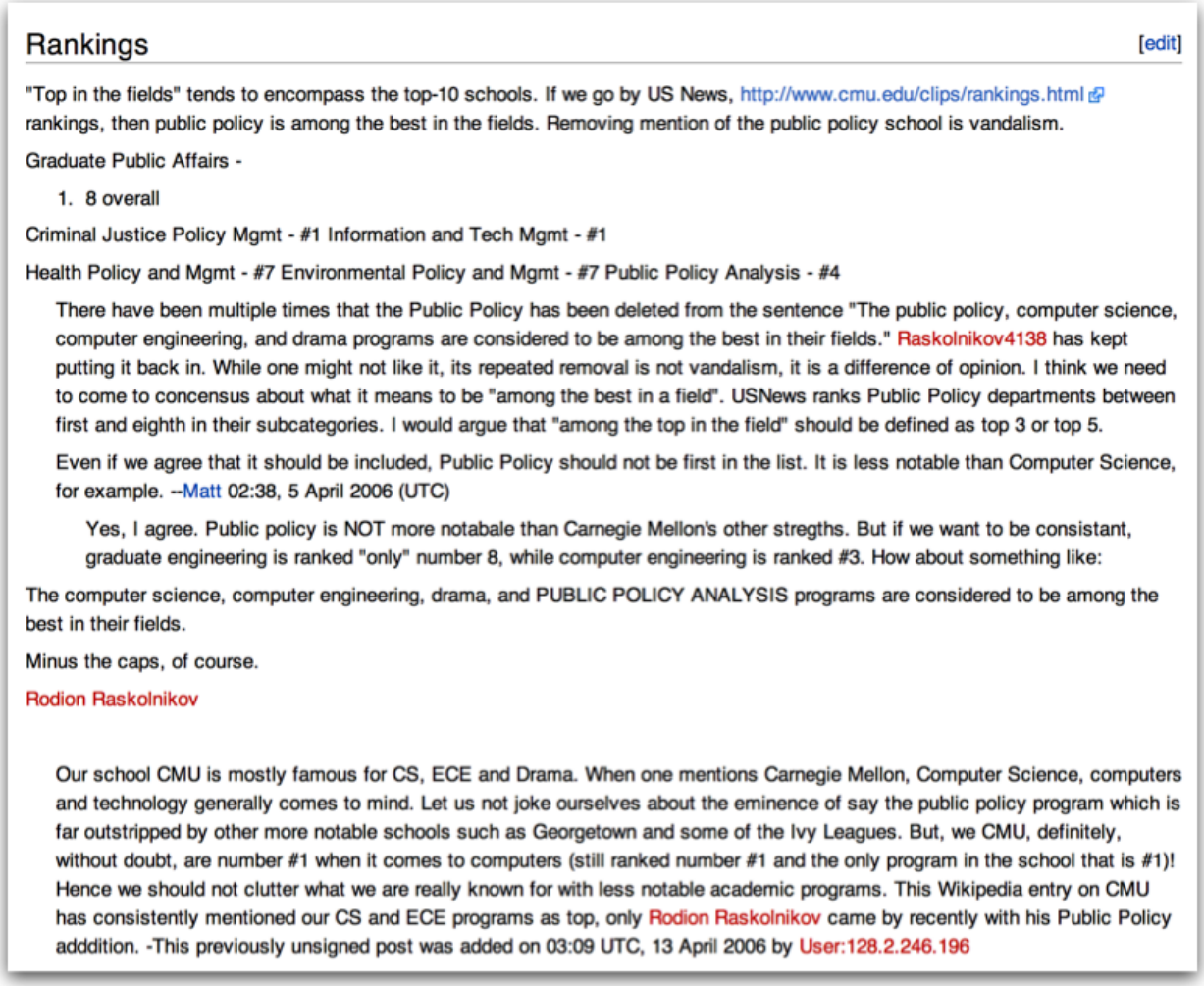
There have been multiple times that the Public Policy has been deleted from the sentence "The public policy, computer science,

> computer engineering, and drama programs are considered to be among the best in their fields." [username] has kept putting it back in. While one might not like it, its repeated removal is not vandalism, it is a difference of opinion.
> - Editor A

> When one mentions Carnegie Mellon, Computer Science, computers and technology generally comes to mind. Let us not joke ourselves about the eminence of say the public policy program which is far outstripped by other more notable schools such as Georgetown and some of the Ivy Leagues.
> - Editor B

> The article is not to tell people what they already know/is most widely known, but rather, in encyclopedic tradition, to state what is. Come to a consensus on what cut off you would like to use, or perhaps even divide into a section for each department. Please don't try to start a flame war though.
> - Editor C

As this exchange helps to illustrate, article editing and production play an early role in developing leaders by helping them develop vital conflict management skills and the understanding of organizational policies to be able be able to cite and enforce the community standards at the micro level. Skills future leaders gain doing small mediation, such as the example above, may extend to help leaders do committee work, consensus building, policy development, and leading the organization in directions that make it more welcoming for new members to contribute. When encounters such as the one above escalate, Wikipedia as an organization has a wide variety of organizational processes and roles to address the situation.



Rankings [edit]

"Top in the fields" tends to encompass the top-10 schools. If we go by US News, http://www.cmu.edu/clips/rankings.html rankings, then public policy is among the best in the fields. Removing mention of the public policy school is vandalism.

Graduate Public Affairs -

1. 8 overall

Criminal Justice Policy Mgmt - #1 Information and Tech Mgmt - #1

Health Policy and Mgmt - #7 Environmental Policy and Mgmt - #7 Public Policy Analysis - #4

> There have been multiple times that the Public Policy has been deleted from the sentence "The public policy, computer science, computer engineering, and drama programs are considered to be among the best in their fields." Raskolnikov4138 has kept putting it back in. While one might not like it, its repeated removal is not vandalism, it is a difference of opinion. I think we need to come to concensus about what it means to be "among the best in a field". USNews ranks Public Policy departments between first and eighth in their subcategories. I would argue that "among the top in the field" should be defined as top 3 or top 5.
>
> Even if we agree that it should be included, Public Policy should not be first in the list. It is less notable than Computer Science, for example. --Matt 02:38, 5 April 2006 (UTC)
>
> > Yes, I agree. Public policy is NOT more notabale than Carnegie Mellon's other stregths. But if we want to be consistant, graduate engineering is ranked "only" number 8, while computer engineering is ranked #3. How about something like:

The computer science, computer engineering, drama, and PUBLIC POLICY ANALYSIS programs are considered to be among the best in their fields.

Minus the caps, of course.

Rodion Raskolnikov

> Our school CMU is mostly famous for CS, ECE and Drama. When one mentions Carnegie Mellon, Computer Science, computers and technology generally comes to mind. Let us not joke ourselves about the eminence of say the public policy program which is far outstripped by other more notable schools such as Georgetown and some of the Ivy Leagues. But, we CMU, definitely, without doubt, are number #1 when it comes to computers (still ranked number #1 and the only program in the school that is #1)! Hence we should not clutter what we are really known for with less notable academic programs. This Wikipedia entry on CMU has consistently mentioned our CS and ECE programs as top, only Rodion Raskolnikov came by recently with his Public Policy adddition. -This previously unsigned post was added on 03:09 UTC, 13 April 2006 by User:128.2.246.196

Figure 2.2: Contributors discuss on the article talk page their definition of the phrase "top in the field" in relation to how to describe the strengths of the university in the article.

2.3 USER AND USER TALK PAGES

USER PAGES

Each registered editor to Wikipedia has a user page that serves as a public home page describing that editor. By convention, editors only write on their own user page. User pages often list information about that editor such as what topics they contribute to, what WikiProjects (groups of editors that form around a topic such as the state of Pennsylvania or an organizational task such as spell checking) an editor may belong to, and what awards they have received. Users may also reveal personal information such as their name, gender, profession, and hobbies. Figure 2.3 provides an example of a user page for the editor "Ruslik0".

In Wikipedia there is a cultural history of awarding an image of a barnstars as a thank you for a variety of contributions. For example, there are specific barnstars designed to be awarded for major contributions to an article, for welcoming new users, or for mediating the conflict. Editors display the barnstars they have received on their user page (see "The Working Man's Barnstar" in Figure 2.3).

USER TALK PAGES

Communication between editors that is not directly related to a specific article is carried out through user talk pages. Similar to a Facebook wall, editors write messages on each others user talk page and can respond to messages left on their own talk page. When an editor logs into Wikipedia they receive a notification if anyone has written on their user talk page. User talk pages are viewable and editable by anyone even if they are not a registered Wikipedia editor.

Editors award barnstars to each other on their user talk page, and then move the barnstars they receive to their user page. In Figure 2.4 we see an example

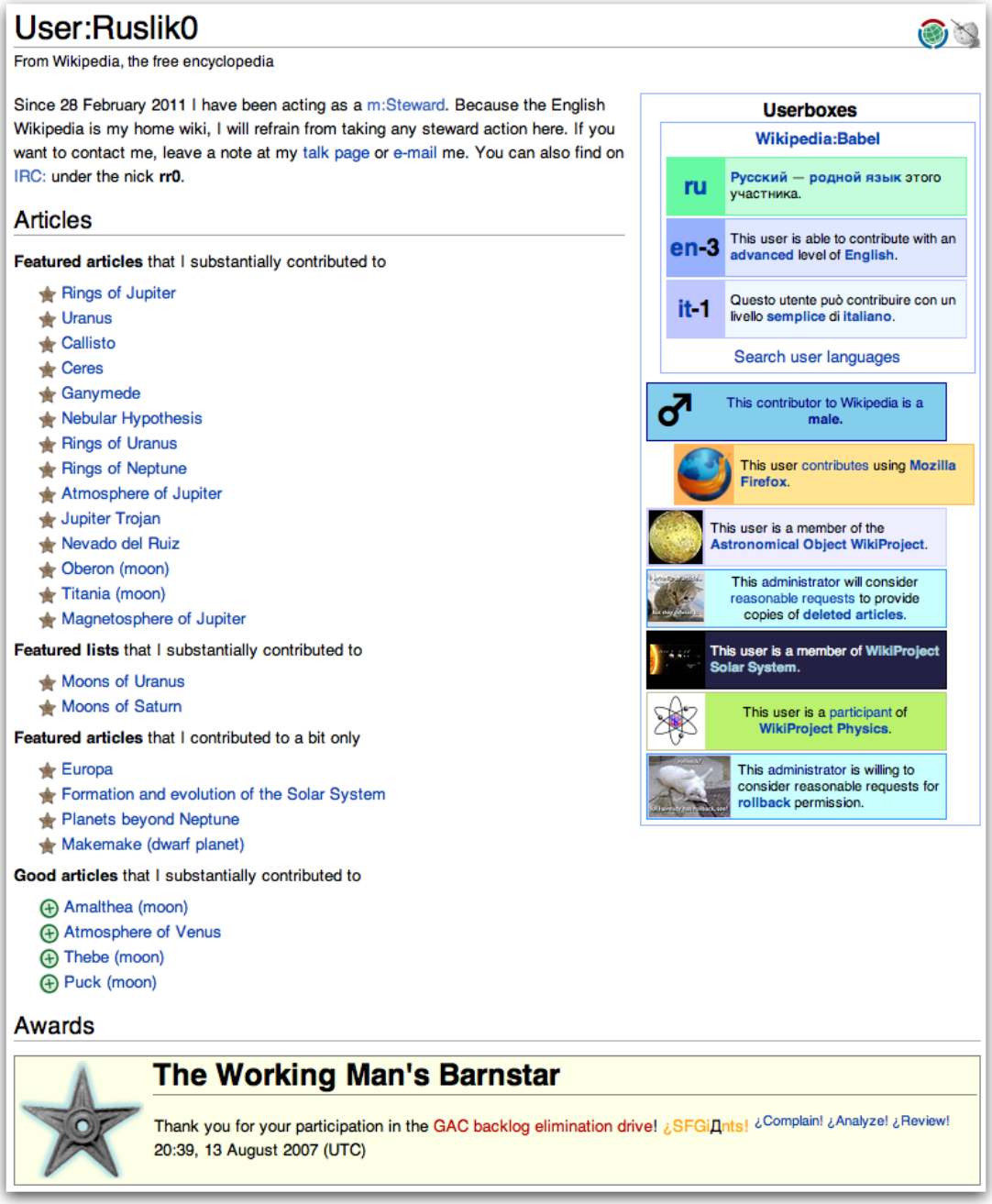


Figure 2.3: Editors may customize a "User Page" to describe themselves, their interests, and what they are working on. Editors may also display awards they have received.

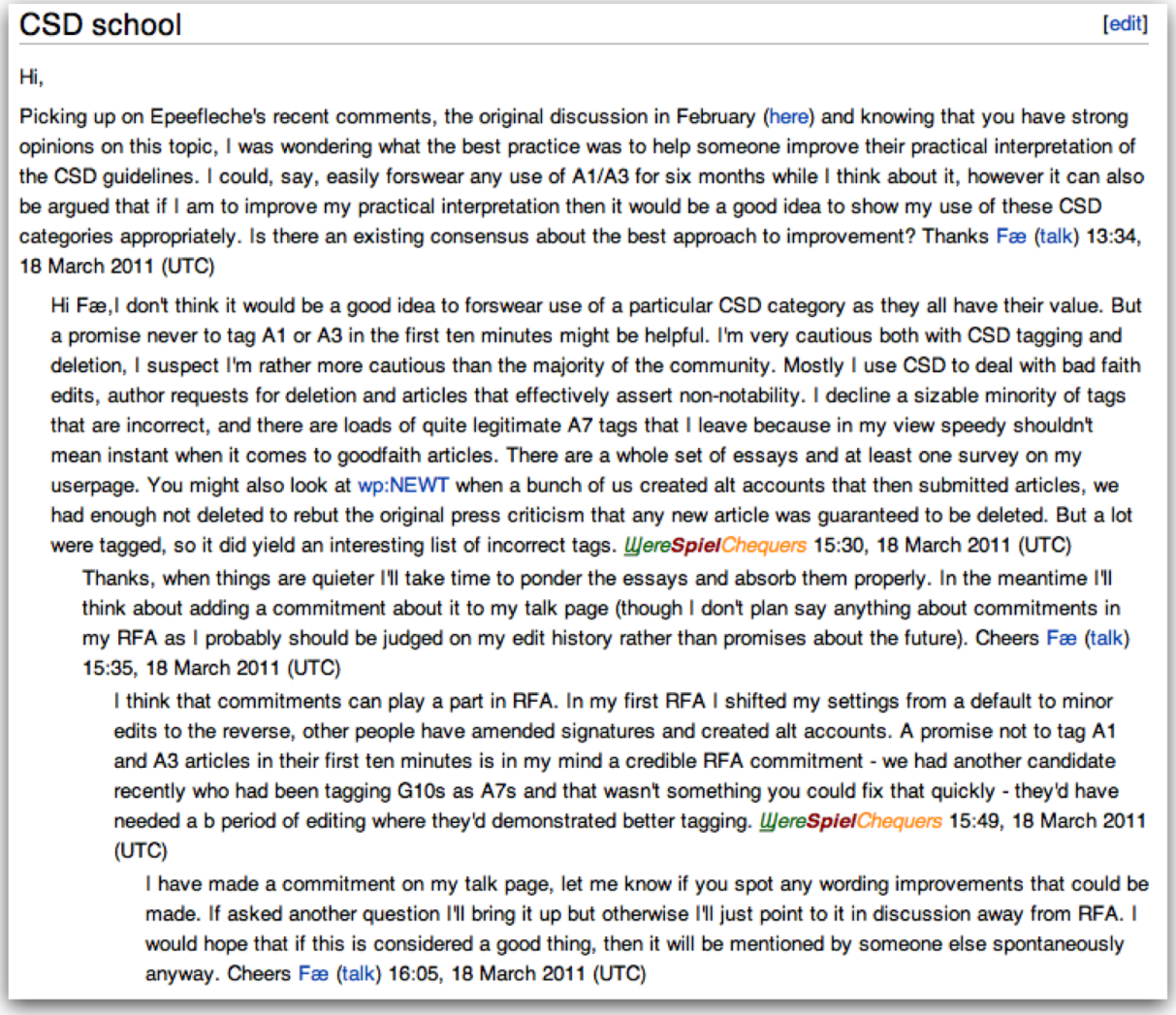
of an editor Fae writing on WereSpielChequers' talk page to ask his/her opinion about applying a Wikipedia policy (CSD = Categories for Speedy Deletion). Each time an editor writes on any talk page the edit is recorded in the revision history of Wikipedia.

2.4 ARBITRATION AND MEDIATION

When two or more editors come into a disagreement that they are unable to resolve between themselves, Wikipedia has developed a host of institutional mechanisms for dealing with conflict mediation and resolutions. Outside of individual article pages and user talk pages Wikipedia has a centralized area for the coordination and oversight of higher level aspects of the organization. When disputes between two editors arise that they cannot resolve between themselves, one or both of the editors can submit a "Request for a Third Opinion".

Wikipedia Structure	Process	Participants
Requests for Third Opinion	Informal	List of volunteers
Requests for Comment	Informal	Any volunteer
Wikiquette Assistance	Informal	Any volunteer, Administrators carry out blocks
Dispute Resolution Noticeboard	Informal	Any volunteer
Mediation Committee	Formal	Elected mediators, six of eight active mediators are Administrators
Arbitration Committee	Formal	Elected arbitrators, all twelve active arbitrators are Administrators

Table 2.1: Dispute resolution mechanisms in Wikipedia. Data as of July 2012



CSD school [edit]

Hi,

Picking up on Epeefleche's recent comments, the original discussion in February (here) and knowing that you have strong opinions on this topic, I was wondering what the best practice was to help someone improve their practical interpretation of the CSD guidelines. I could, say, easily forswear any use of A1/A3 for six months while I think about it, however it can also be argued that if I am to improve my practical interpretation then it would be a good idea to show my use of these CSD categories appropriately. Is there an existing consensus about the best approach to improvement? Thanks Fæ (talk) 13:34, 18 March 2011 (UTC)

> Hi Fæ,I don't think it would be a good idea to forswear use of a particular CSD category as they all have their value. But a promise never to tag A1 or A3 in the first ten minutes might be helpful. I'm very cautious both with CSD tagging and deletion, I suspect I'm rather more cautious than the majority of the community. Mostly I use CSD to deal with bad faith edits, author requests for deletion and articles that effectively assert non-notability. I decline a sizable minority of tags that are incorrect, and there are loads of quite legitimate A7 tags that I leave because in my view speedy shouldn't mean instant when it comes to goodfaith articles. There are a whole set of essays and at least one survey on my userpage. You might also look at wp:NEWT when a bunch of us created alt accounts that then submitted articles, we had enough not deleted to rebut the original press criticism that any new article was guaranteed to be deleted. But a lot were tagged, so it did yield an interesting list of incorrect tags. *WereSpielChequers* 15:30, 18 March 2011 (UTC)
>
> > Thanks, when things are quieter I'll take time to ponder the essays and absorb them properly. In the meantime I'll think about adding a commitment about it to my talk page (though I don't plan say anything about commitments in my RFA as I probably should be judged on my edit history rather than promises about the future). Cheers Fæ (talk) 15:35, 18 March 2011 (UTC)
> >
> > > I think that commitments can play a part in RFA. In my first RFA I shifted my settings from a default to minor edits to the reverse, other people have amended signatures and created alt accounts. A promise not to tag A1 and A3 articles in their first ten minutes is in my mind a credible RFA commitment - we had another candidate recently who had been tagging G10s as A7s and that wasn't something you could fix that quickly - they'd have needed a b period of editing where they'd demonstrated better tagging. *WereSpielChequers* 15:49, 18 March 2011 (UTC)
> > >
> > > > I have made a commitment on my talk page, let me know if you spot any wording improvements that could be made. If asked another question I'll bring it up but otherwise I'll just point to it in discussion away from RFA. I would hope that if this is considered a good thing, then it will be mentioned by someone else spontaneously anyway. Cheers Fæ (talk) 16:05, 18 March 2011 (UTC)

Figure 2.4: User talk pages allow other editors to talk directly with an editor rather than on an article talk page. Users discuss a variety of topics, including requests, suggestions, discussions of policy, or other relevant or off-topic questions.

Requests for a third opinion are a somewhat informal method for resolving disputes between two editors. The opinion of the third person is not necessarily a binding request but is often a good first step in the resolution process. Requests for third opinion are flexible lightweight and quick ways for the organization to resolve conflict. The third opinion is provided by one of the many volunteers who publicly list themselves as available to provide a third opinion.

If an issues involves more than two editors or requires more mediation than the third opinion, editors can submit a request to the dispute resolution noticeboard. Editors who volunteer to be active on the dispute resolution noticeboard publicly discuss the conflict with all involved as a group of unbiased third-party mediators. Disputes submitted are often more complex than can be resolved on an article talk page, and often involve more than two editors. This can cause the sessions on the dispute resolution noticeboard to go on for pages and pages making this method is a relatively higher cost mechanism to mediate conflict.

Similar to the dispute resolution noticeboard, a request for comment may be publicly made about a question that has come up editing an article. Requests for comment can pertain to either an article or a user. If a user is involved in questionable content is contentious or is not following Wikipedia policy "request for comment on a user" is filed. If the request for comment pertains to a particular article users can simply tag that article with a piece of code that puts that talk page on the public list for a request for comment. Anyone may participate in a request for comment, but it is often the more experienced veteran editors who participate.

If an editor is being treated in an uncivil manner they can request "Wikiquette" (a combination of Wikipedia and etiquette) assistance. Wikiquette assistance is designed solely to address uncivil behavior and "flame wars" in general user conduct. Administrators and Wikipedia will frequently watch requests for Wikiquette assistance and intervene using their special privileges to block uncivil users.

All of the previous organizational mechanisms discussed are considered informal processes by Wikipedia. By informal, they mean the resolution process that participants go through is not structured, the participants are not elected, in the decisions are not binding. If an organizational problem cannot be resolved using any of the previous informal methods, it is escalated to either the mediation committee or the arbitration committee by submitting a request for mediation or a request for arbitration respectively. Members of the mediation committee are elected by current and former members of the mediation committee. There are typically eight members of the mediation committee, currently six of the members are Administrators. Members of the mediation committee go through a formal mediation process to resolve disputes specifically about content on Wikipedia and do not address problem editors or editor misconduct.

Lastly the final stage of escalation in the dispute resolution process involves a request for arbitration to the arbitration committee. The arbitation committee typically has twelve active members, and while there is no formal requirement that committee members be Administrators, typically all memers are Administrators. As of July 2012 all members of the committee were Administrators.

The arbitration committee reviews cases on a variety of dispute types listed in Table 2.2. The arbitration committee has been the subject of research by law academics for its ability to resolve intraorganizational issues in a manner similar to the court. Hoffman & Mehra (2009) examined 283 decisions coming from the arbitration committee from 2005 to 2007 and hand coded both the types of cases the committee was examining and the remedies the committee issued. Hoffman found that in 16% of the cases the party was banned from Wikipedia, in 23% of the cases there was a subject specific remedy, in 43% of the cases in editor was banned from editing a specific article, and in 63% of the cases the committee imposed parole or probation on an editor. The arbitration committee covers a variety of issues including disruptive user behavior, issues

Category	Description	% Cases
Anti-social	Cases involving editors who are disruptive, discourteous, and uncivil	65%
Consensus	Cases involving edit waring, excessive reverting, violating revert policy	47%
Editing Policies	Cases involving violating editing policy, e.g. neutral point of view	42%
Impersonation	Cases involving using more than one account to push an agenda or point of view, misleading consensus	28%
Contempt	Cases involving violating a previous decision of the Arbitration committee, e.g. a user who is blocked/banned editing from another account	10%
Article Chaos	Cases involving ethnic, nationalistic, or other point of view debates rather than discussion of improving articles	7%

Table 2.2: Breakdown of the types of cases examined by the Arbitration Committee. Categories based on 283 decisions from 2005 to 2007 that were hand coded for content (Hoffman & Mehra, 2009). Case categories are not mutually exclusive, and typically involve more than one category.

with coming to consensus on articles, and the violation of Wikipedia policies. For a more detailed breakdown of the types of cases handled by the arbitration committee see Table 2.2.

2.5 POLICIES AND GUIDELINES

In order to keep 650,000 editors aligned with the goals of the organization, Wikipedia relies on the body of policies and guidelines collectively developed and enforced by the community. As of September 2007 Wikipedia had 44 pages devoted to official policy and 248 pages categorized as Wikipedia guidelines

(Butler et al., 2008). Policies and guidelines are continually being revised and added to. In the same 2007 data set Butler et al. found 45 pending proposals for new guidelines and policies, and 200 rejected proposals. Even a policy as simple as "ignore all rules" has 500 words to explain the policy, and 8,000 words discussing the policy, and has been changed or 100 times in less than a year. Table 2.3 gives some summary examples of the key content policies Wikipedia relies on for article revisions.

Wikipedia makes a minor distinction between policies and guidelines. For the purposes of this study policies and guideline are developed and enforced in a similar manner, so they will be referred to interchangeably.

> **Guidelines** are sets of best practices that are supported by consensus. Editors should attempt to follow guidelines, though they are best treated with common sense, and occasional exceptions may apply
>
> **Policies** have wide acceptance among editors and describe standards that all users should normally follow.
>
> -Butler et al. (2008, pg.2)

APPLYING AND ENFORCING POLICES

For policies to be effective in Wikipedia they need to be applied and enforced throughout the organization. Policies regarding the content of articles such as the policies listed in Table 2.3 are often cited on the talk pages for articles as a reason for making a change. For example, an editor on the University of Pittsburgh talk page sites three article content policies to support his or her point that the article needs to be changed:

Policy	**Description**
Neutral point of view	Editing from a neutral point of view (NPOV) means representing fairly, proportionately, and as far as possible without bias, all significant views that have been published by reliable sources.
Verifiability	In Wikipedia, verifiability means that people reading and editing the encyclopedia can check that information comes from a reliable source. Wikipedia does not publish original research. Its content is determined by previously published information rather than by the personal beliefs or experiences of its editors.
No original research	Wikipedia articles must not contain original research. The term "original research" is used on Wikipedia to refer to material-such as facts, allegations, and ideas-for which no reliable, published sources exist. This includes any analysis or synthesis of published material that serves to advance a position not advanced by the sources.
Notability	Wikipedia's concept of notability applies this basic standard to avoid indiscriminate inclusion of topics. Article and list topics must be notable, or "worthy of notice".

Table 2.3: Examples of Wikipedia policies and guidelines.

> your current wording is much more acceptable than the previous versions which seemed to violate WP:POV, WP:SYN, and WP:WEASEL

The three policies cited referred to keeping a neutral point of view, not synthesizing research to advance a position, and am not using "weasel words" such as "many scholars state" or "it is often reported" to support a position. Applying and enforcing policies requires the editor to both know the wide array of Wikipedia policies and know when it is appropriate to apply particular policy to a particular situation. For example, knowing when to apply policies about verifiability varies from situation to situation. In some cases it is acceptable to cite a blog or a non-peer-reviewed source for information (such as TV shows, musical groups, and celebrity information), in other cases only a well-regarded print publication or peer-reviewed journal is an acceptable source (claims about history, science, or scholarly work)

Similar to to the verifiability policy, notability policy can be challenging to interpret and may require those in leadership positions to intervene. For example, in one very public case the wedding dress of Kate Middleton was under discussion as to whether it was notable enough to have an article written about it (Bosch, 2012). With 85% of Wikipedia editors being male (Collier & Bear, 2012; Glott et al., 2010; Lam et al., 2011), notability may have a gender skew to it. For example there are articles written about over 100 linux distributions and an article written about notable phrases from the Simpsons. Yet, two editors had the following to say on the talk page of the wedding dress of Kate Middleton [1]:

> This is frankly trivial, and surely isn't notable enough to be on Wikipedia. Request deletion.
> - Editor D

[1] http://en.wikipedia.org/wiki/Talk:Wedding_dress_of_Kate_Middleton

> I strongly agree! The sheer presence of this article is one of the lowest points ever reached by Wikipedia! What amazes me is that there's acculturatede people (since the article was well written) who has such interests, and free time to lose to devoted themselves for such totally irrelevant arguments. [sic]
> - Editor E

The article was saved from deletion by Wikipedia's cofounder Jimmy Wales and cited as an example the gender bias in Wikipedia in the recent Wikimania conference in Washington, DC (Bosch, 2012). This also shows that even though there are procedures and policies in place governing Wikipedia, at times influential leaders in the organization must step in to intervene to align consensus with the organizational goals.

Outside of article talk pages, Wikipedia has several places that help editors interpret content policy. Several policy specific community notice boards are in place where editors can publicly discuss and build consensus on how to apply policy to a given situation. A few of the most widely used notice boards include: notability noticeboard, no original research noticeboard, copyright investigations, neutral point of view noticeboard, and reliable sources noticeboard. Each of these noticeboards are places that Administrators frequently influence and intervene in discussions of policy application.

DEVELOPING POLICES

Wikipedia policies and guidelines are not considered static, "policies and guidelines themselves may be changed to reflect evolving consensus."[2]. Table 2.4 shows the increase in complexity of major Wikipedia policies as measured by the change in the policy's length (word count). Policies undergo significant revision and clarification over time. New policies often begin by getting community consensus on a Wikipedia noticeboard named the "Village Pump" which has

[2] http://en.wikipedia.org/wiki/Wikipedia:NOTSTATUTE

Policy	First Approved Version Word Count	Word Count as of September 2007	Percent Increase
Copyrights	341	3,200	938%
What Wikipedia is Not	541	5,031	929%
Civility	1,741	2,131	124%
Consensus	132	2,054	1557%
Deletion	405	2,349	580%

Table 2.4: Policy word count data taken from Butler et al. (2008) demonstrates Wikipedia policies are growing in complexity.

sections devoted to incubating new ideas for policy, new policy proposals, and existing policies (see Figure 2.5). Once a proposal is written and ready for review, it is tagged for a request for comment on policy from the community, and advertised to affected parties (e.g. proposals on stylistic changes would be announced to the WikiProject for the Manual of Style). After thorough discussion and voting by community members, a proposal for new policy is either promoted to an official policy, marked as no consensus, or failed.

Existing policies and guidelines do not have as formal of a process to change. By convention editors are encouraged to discuss changes they want to make to a policy on the policies talk page or at the Village Pump to build consensus around the suggested change. However, editors may also "be bold" and simply edit the policy directly without consensus[3]. Presumably, changes to policy that were not thoroughly discussed and do not reflect consensus are likely to be reverted.

[3] http://en.wikipedia.org/wiki/Wikipedia:Policies_and_guidelines

Figure 2.5: The policy section of the Wikipedia discussion board "Village Pump". Separate sections also exist at the Village Pump for incubating policy ideas (Idea Lab) and proposing new policies (Proposals).

While any editor in the Wikipedia community can help enforce policy and develop policy, administrators play a large role in both. At the small level administrators enforce policy on talk pages and regularly discussed policy on the relevant noticeboard (verifiability noticeboard, notability noticeboard, etc.). In addition, blatant violations of policy are often met with an Administrators ability to block problematic users. Administrators are also very active in policy development. From proposing new policy to revising existing policy administrators play a disproportionately large role in forming organizational policy.

2.6 WIKIPEDIA ADMINISTRATORS

Woven throughout the description of Wikipedia as an organization has been the role Administrators play in dispute resolution, policy development, and policy enforcement. The qualitative background of understanding all of the coordination and meta work that goes into running Wikipedia has been up to this point a primer to understand the context of the environment Administrators in Wikipedia work in, and the influence they in the organization. In this section we provide an overview of the process editors must go through to become an Administrator. We then discuss mechanisms through which Administrators have a leadership influence in the organization.

THE REQUEST FOR ADMINSHIP (RFA) PROCESS

To become an Administrator and editor must first either self-nominate themselves for consideration for the position or more commonly be nominated by someone else. More recently, it has become common for editors to be co-nominated by multiple editors or current Administrators. When nominating someone for consideration, the nominator will often write a paragraph length recommendation with the reasons this candidate should be considered for Adminship.

Upon being nominated, candidates provide a public response to three interview-style questions on an area of Wikipedia devoted to considering and promoting editors to be Administrators known as the Request for Adminship page. Candidates are asked (1) "What administrative work do you intend to take part in?", (2) "What are your best contributions to Wikipedia, and why?", and (3) "Have you been in any conflicts over editing in the past or have other users caused you stress? How have you dealt with it and how will you deal with it in the future?".

For the next seven days candidates are scrutinized by the community. Anyone may publicly ask more interview-style questions, often about how they would handle a particularly difficult situation, or what their position is on a particular Wikipedia policy. In recent months, candidates have been asked as many as twelve to fifteen additional interview questions. Throughout the seven day period anyone in the community may publicly vote as to whether the candidate should be promoted. Votes are counted as "support", "oppose", or "neutral", and typically accompany a sentence or two about the reasoning behind the vote.

To develop an understanding of the rationale behind voting decisions and the criteria voters were using to consider candidates, we did a qualitative coding of all the comments from 25 candidates who were successfully promoted and 25 candidates who were not promoted (Collier et al., 2008). The most common category voters discussed was the candidates knowledge of Wikipedia policy. Voters also frequently discussed the candidates trustworthiness, interaction with others, their history of having a neutral point of view, and whether the candidate had a sufficient number of edits to be promoted.

Figure 2.6 provides a visual for the categories voters discussed, as well as the frequency each category was discussed amongst the 50 candidates for promotion. Comments were coded as positive if the candidate was being praised for the desired category and negative when voters thought the candidate did not sufficiently meet the criteria for that category. Of the comments coded, 76%

related to the candidates potential abilities in the Administrator role (prospective criteria, discussed more in Study 1) and 23% of the comments related to their history of editing articles and their time in Wikipedia (retrospective criteria). Table 2.5 provides an overview of the "Community Guidelines for the RfA Process" which is taken from a page that has developed to tell potential Administrators what voters are typically hoping to see in a successful candidate.

MECHANISMS OF LEADERSHIP INFLUENCE IN WIKIPEDIA

Administrators exhibit significant leadership influence in many aspects of Wikipedia. Three mechanisms of Administrator influence are discussed below.

Interpersonal Influence

Having a formal leadership role in Wikipedia conveys status and legitimacy. Because of their public role as leaders, when Administrators make requests, give a social reward (thank you or barnstar), or socially connect with editors on their talk page, other editors increase their contributions more than when non-Administrators do the same (Zhu et al., 2012). In other words, when Zhu et al. (2012) examined messages that were sent by both non-Administrators and messages sent by Administrators, the messages sent by Administrators influenced other editors' behavior more. In the present study we define leadership in terms of their ability to influence others in the organization. Zhu et al. (2012) provides strong empirical support that Administrators have substantially more influence in Wikipedia than other editors due to their role.

Similarly, while Administrators have the ability to positively effect other editors, they also have the ability to severely punish other editors. Administrators alone have the ability to place a block on a user account as well as place a block on an IP address (used for anonymous editing). While their ability to block other users is only supposed to be used in ways that adhere to Wikipedia policy, there is room for interpretation in policy. Administrators have both the ability to use their status as a carrot to influence others to contribute more,

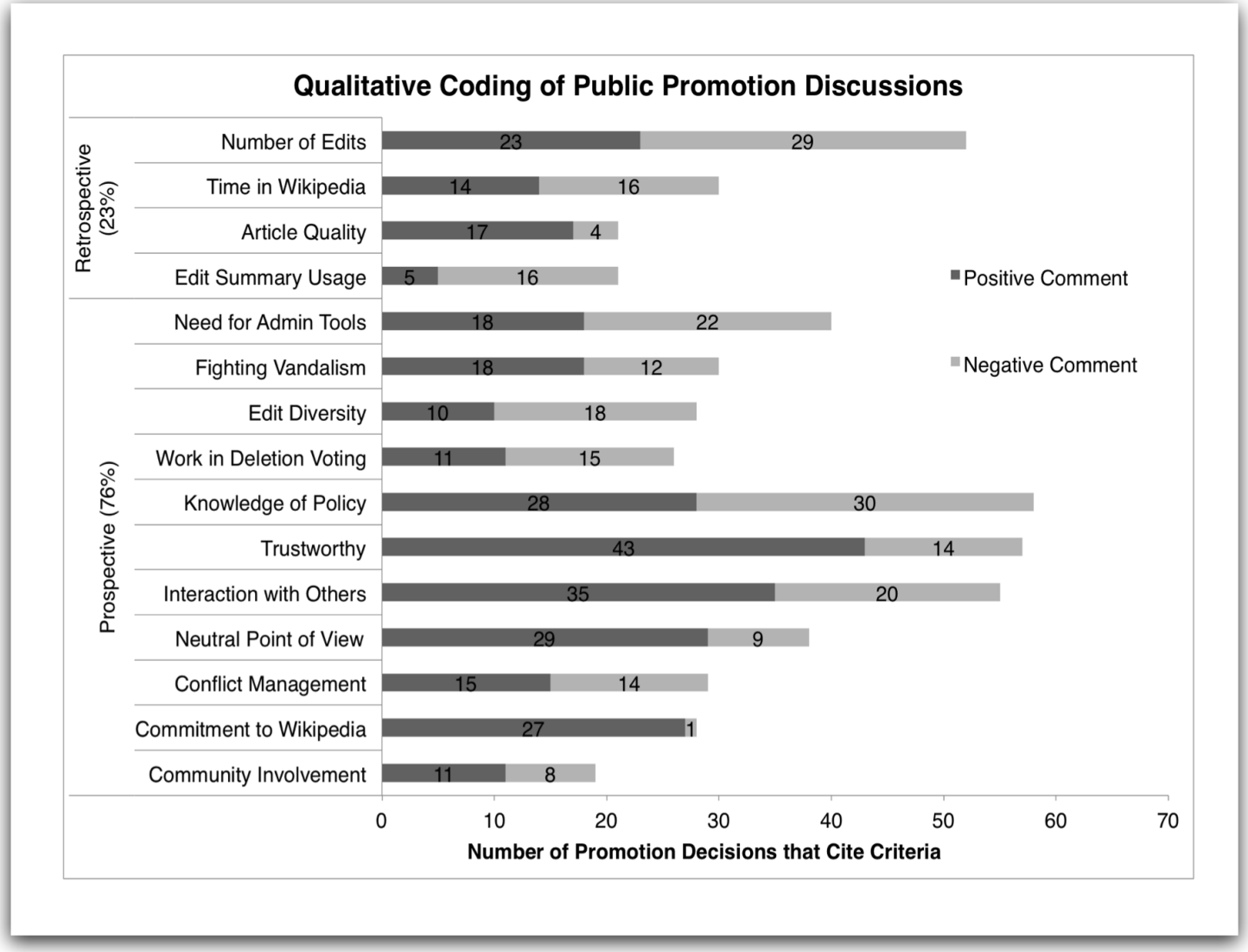


Figure 2.6: Results of qualitative coding of text discussions of promotion decisions. Voting comments addressed prospective reasons for promotion in 76% of comments, and retrospective reasons in 23% of comments.

What decision makers look for and hope to see
Strong edit history with plenty of material contributions to Wikipedia articles.
Varied experience. RfAs where an editor has mainly contributed in one way (little editing of articles, or little or no participation in AfDs, or little or no participation in discussions about Wikipedia policies and processes, for example) have tended to be more controversial than those where the editor's contributions have been wider.
User interaction. Evidence of you talking to other users, on article talk or user talk pages. These interactions need to be helpful and polite.
Trustworthiness. General reliability as evidence that you would use administrator rights carefully to avoid irreversible damage, especially in the stressful situations that can arise more frequently for administrators.
Helping with chores. Evidence that you are already engaging in administrator-like work and debates such as RC Patrol and articles for deletion.
High quality of articles. A good way to demonstrate this is contributing to getting articles featured, although good articles are also well-regarded.
Observing consensus. A track record of working within policy, showing an understanding of consensus.
Edit summaries. Constructive and frequent use of edit summaries is a quality some RfA contributors want to see. Some expect use of edit summaries to approach 100% of the time. See Wikipedia:Edit summary.
A clean block log as evidence of good editing behavior.

Table 2.5: Community guidelines for the Request for Adminship (RfA) Process.

and their special privileges to block as a stick to deter bad behavior in other editors.

Influence Through Policy Development and Enforcement

As discussed at length in section 2.5, Administrators play a large role in both enforcing and developing policy. While other users can attempt to persuade through argument, Administrators are the authority on applying force to enforce a policy.

> If an editor violates the community standards described in policies and guidelines, other editors can persuade the person to adhere to acceptable norms of conduct, over time resorting to more forceful means, such as administrator and steward actions.
>
> Wikipedia:Policies and guidelines

Administrators are notified regularly through the Admin noticeboard of issues that need to be addressed in terms of policy enforcement. In addition to the Admin noticeboard, many Administrators keep a watch on other policy related noticeboards such as the notability noticeboard, no original research noticeboard, copyright investigations, neutral point of view noticeboard, and reliable sources noticeboard. Their role extends beyond article editing to influence the meta-content work behind the scenes in Wikipedia.

As discussed in section 2.4, all of the members of the arbitration committee are Administrators and six of the eight members of the mediation committee are Administrators. While they represent a small number of the total body of Administrators, they do hold the final word for binding policy decisions. The public role of Administrators on these two committees embodies in a public and official way what most Administrators do on a private and unofficial way - enforcing policy.

Clearly Administrators are heavily involved in developing and policy that guides the community at large. As discussed in the work of Butler et al. (2008), policy is constantly under development. The leaders in the organization that are the most public and play the largest role in enforcing policy also are heavily involved in policy development.

Influence Through Administrative Responsibilities and Privileges

Lastly, many of the organizational processes that Wikipedia relies on to achieve consensus relies on the final actions of Administrators to carry out the decision. For example, if an article is not notable it may be nominated to be deleted. The community discusses whether it should be deleted or not and tries to come to consensus, but ultimately it is an Administrator that has the privileges necessary to delete the article. In cases where consensus is on the edge, such as the wedding dress of Kate Middleton discussed earlier (Hoffman & Mehra, 2009), Administrators can play a large role in influencing other editors one way or another and have the final say on whether the article is deleted.

Chapter Three

Study 1: Leadership Behaviors

> The older I get the less I listen to what people say and the more I look at what they do.
>
> Andrew Carnegie

3.1 CONTEST AND SPONSORED MOBILITY

Two main perspectives have been used in the past to analyze career mobility and promotion in organizations (Cable & Murray, 1999; Rosenbaum, 1979, 1984), namely, the contest-mobility and sponsored-mobility perspective (Turner, 1960). The contest-mobility perspective on promotion to leadership positions suggests that the most valuable quality of potential leaders is their performance on the job. Cable & Murray (1999) found that the publication record of graduate students was a strong predictor of the job offers they received than the prestige of the institution they received their degree. The sponsored-mobility perspective suggests that organizational support and mentorship from current leaders and peers within the organization provides the key to success for potential leaders. Even though organizational members may be working hard, without the right social contacts they may not be noticed or may be working hard at the wrong things.

Study 1 focuses on the contest or behavioral patterns of new members who later develop into leaders. Study 2 will include behaviors as a control but will primarily focus on sponsorship and social capital. The two perspectives are not completely mutually exclusive and may interact in interesting ways. For example, early leadership behaviors (e.g. community building) may help a member become noticed, which leads to social connections and sponsorship. Similarly, mentoring relationships may influence the types of behaviors developing leaders perform.

3.2 RETROSPECTIVE AND PROSPECTIVE DETERMINANTS OF PROMOTION

According to Milgrom & Roberts (1992), promotions serve two roles in an organization. First, they are part of a reward and incentive system to induce employees at one level of an organization to work hard in the organization's interest so that they can be promoted to positions of more power and responsibility. Second, they are part of a selection process in which people are vetted and assigned to the roles where they can best contribute to the organization's performance.

Practitioners, organizational scholars and economists alike agree that rational contest models of promotion, which focus on the quality of candidates' prior job performance, are a partial explanation for who will be promoted (Turner, 1960). In a contest model, candidates at one level of a corporate hierarchy compete against each other for promotion to the next level based on their job performance in the lower position. "What makes the greatest difference in getting ahead . . . is performance on the job and adding value . . . people compete with each other in an open and fair contest for advancement, and victory comes to those who demonstrate the greatest accomplishments" (Ng et al., 2005, pg. 369). Contest models are consistent with common organizational practices of counting sales commissions, journal publications or three-point

shots as criteria for promotion among sales organizations, professors and National Basketball Association players, respectively. Scholars often use these rational, contest models as the foil when discussing models of promotion that appear less rational and that emphasize factors less relevant to job performance, including height (Melamed & Bozionelos, 1992), good looks (Hamermesh & Biddle, 1994), gender (Maume Jr., 1999) or social ties (Burt, 1992) or other types of sponsorship (Hargens & Hagstrom, 1967).

Whether promotion functions as an incentive or a selection mechanism is likely to determine the types of evaluation criteria used in making promotion decisions. To the extent that promotions serve as incentives, decision makers should look for evidence that candidates for promotion have performed well in the past, independent of the degree to which prior job performance predicts performance in a subsequent one. Because the promotions are being used to reward past behavior and encourage effort and work quality that the organization judges as valuable, decision makers should base promotions on the type of behavior the organization wants to encourage, whether or not this behavior would serve the organization or candidate when the candidate ascends to a new position. For example, in a production environment like a factory, decision makers should promote the most productive workers to supervisor positions. In this sense, the criteria that decision makers use to make promotion decisions should be retrospective or backward-looking; they should be looking for evidence of good performance in the prior job.

This retrospective use of evidence is a partial explanation for the "Peter Principle," in which employees rise to their level of incompetence (Peter & Hull, 1969). People who are good at one job may not necessarily be good in the job into which they are promoted. If promotion candidates are being judged on a set of behavior, such as their individual productivity, for a position that requires a different set of knowledge, abilities, and skills then they will not necessarily be well qualified for the new position. This might be the case, for example, when professors are promoted to be department heads based on the

quality of their research or basketball players promoted to be coaches based on their athletic talents; the skills needed for the more managerial positions of department head or coach may have had little to do with the candidate's successes as academic or athletic superstars.

In contrast, to the extent that promotions serve as a selection device to identify appropriate candidates for higher-level, more difficult or more valuable organizational roles, then managers should use prior job performance primarily as evidence of future performance in these new roles. In this view, the promotion view is a prediction task, and the promotion criteria that decision makers use should be prospective or forward-looking, rather than retrospective, as they try to use prior job performance to predict performance in the new job.

Retrospective and prospective criteria for promotion are not necessarily mutually exclusive; in many cases some behavioral criterion for promotion may serve both as an incentive to encourage incumbents in the current job and to predict performance in a future one. Thus behaviors that indicate conscientiousness or willingness to work hard may generalize well, and using them as promotion criteria is valuable both as an incentive and as prediction. Many human-capital factors commonly used as criteria for promotion - such as work ethic or educational level (Ng et al., 2005) - have both functions. However, other potential promotion criteria, such as those indicating individual productivity in a production task (e.g., papers published in academia or points scored in basketball) may not be relevant to promotion to a leadership position.

From the promotion literature, retrospective (incentive) and prospective (selection) refer largely to promotions in a hierarchical system from a subordinate position to the next position in the hierarchy. The focus of this study is specifically examining the promotion of a peripheral member of a core-periphery organization to a leadership position. To better understand the retrospective and prospective factors that lead to a peripheral member becoming a leader we first need to identify categories of organizational behaviors common across a large body of core-periphery organizations. We draw from the theoretical

literature on communities of practice (Brown & Duguid, 1991; Fleming & Waguespack, 2007; E. Wenger, 1998; E. C. Wenger, 2001) and community forms of organization (Dahlander & O'Mahony, 2010; O'Mahony & Ferraro, 2007; von Hippel & Krogh, 2003) to identify the key categories of retrospective and prospective behaviors that may lead to advancement to a leadership position. We then combine our theoretical synthesis with survey data from Wikipedia, to identify four key categories of behaviors that may contribute to leadership development in Wikipedia: (1) production contributions, (2) organizational building, (3) administrative contributions, and (4) interpersonal interactions.

3.3 PRODUCTION BEHAVIORS

In prior research on promotions to leadership in communities of practice such as the Internet Engineering Task Force (Fleming & Waguespack, 2007) and community forms of organization (Dahlander & O'Mahony, 2010; O'Mahony & Ferraro, 2007), technical contributions in terms of patents and software code were found to impact a member's likelihood of becoming a leader. Across a variety of contexts there are several reasons why strong contributions to production work is likely to lead to a leadership position. If the leadership position is a reward and a motivator for time and effort devoted to the project, heavy and visible production contributions to the project is likely to separate a member from his or her peers. Production contributions may signal a solid track record of project knowledge and tacit experience with the organization that one could not otherwise get without direct hands on production experience. For example, in the context of software, without a working knowledge of software development and the process for creating, testing, and debugging a leader would not have the needed insight to lead a team.

In scientific and technical professions, influence is largely based on the ability to solve complex and difficult problems rather than on formalized power and

authority (Goldner & Ritti., 1967; Zabusky & Barley, 1996). From a classical learning perspective of skill acquisition, we know that direct experience with the task itself is the best way to learn how to apply complex rules and intuition to problems and achieve expert and mastery level skills (Dreyfus & Dreyfus, 1980; Dreyfus, 2004).

> H1: Production contributions to Wikipedia increase an editor's likelihood of later becoming a leader.

3.4 INTERPERSONAL INTERACTIONS

In studies of leadership in virtual organizations, researchers have found that on average leaders communicate much more often than non-leaders (Cassell & Huffaker, 2005; Misiolek & Heckman, 2005; Yoo & Alavi, 2004). Engagement in conversation and public discussion threads is the primary way in which individuals share knowledge and learn from one another (Orlikowski & Yates, 1994). In project work typical of core-periphery organizations the micro-coordination and combination of tasks results in fragmented knowledge and strong interpersonal communication is key to bringing knowledge and production work into a product.

Previous studies of community forms of organization have found both face-to-face and text-based communication influential in predicting whether a member later becomes a leader (Dahlander & O'Mahony, 2010; Fleming & Waguespack, 2007; O'Mahony & Ferraro, 2007). Strong interpersonal communication is not only beneficial for production work, it is essential for strong leaders. Leaders may communicate to direct other members' work, to motivate others, and to reprimand unwanted behavior (Zhu et al., 2011). Leaders also take a larger role in communicating to the others outside the organization, and strong interpersonal communication skills are necessary to positively represent the organization.

H2: Strong interpersonal interactions/communication behaviors in Wikipedia increase an editor's likelihood of later becoming a leader

3.5 ADMINISTRATIVE CONTRIBUTIONS

In the classic Mintzberg literature, he found a surprising amount of managerial work to be administrative overhead such as giving tours, leading organizational ceremonies, and bouncing from call to call (Mintzberg, 1971, 1990). Positions of influence often involve significant amounts of paperwork, meta-content work, and mediating decision making within the organization. In communities of practice the bridge between being a member and a leader often comes through volunteering for administrative duties such as taking minutes, scheduling speakers, and making conference arrangements.

In core-periphery organizations the transition from contributing member to leader may follow a similar path. Administrative contributions signal an interest and investment in the greater organization above and beyond the the technical work. In open source communities the motivation for contribution has been found to be in part the enjoyment of writing code, learning new skills, and being recognized (Roberts et al., 2006). Administrative contributions are often not as intrinsically rewarding as production tasks, and in scientific circles and technical circles they do not garnish the same citation counts and notoriety. Members who voluntarily take on administrative work then have a shift in perspective of valuing the organization and the group more than individual benefit.

H3: Administrative contributions to Wikipedia increase an editor's likelihood of later becoming a leader

3.6 ORGANIZATION BUILDING

At the core of organizational leadership is a leaders ability to influence the broader organization. Leaders develop teams and communities, create policy and influence culture, and lead new organizational ventures. Research on community forms of organizing found that members who engaged in smaller projects such as taking the lead on a module of code were more likely to later become organizational leaders (Dahlander & O'Mahony, 2010). Organization building could involve leading projects, work in developing organizational policy, and other contributions at the organizational level. Without a formal hierarchy to progress through, members of core-periphery organizations must seek out their own organization building opportunities. Engagement with the broader organization signals commitment to the bigger picture and a talent for leadership.

> H4: Organization building contributions to Wikipedia increases a member's likelihood of later becoming a leader

3.7 METHODS

To test our theory we will take a three step approach. First, we need to empirically validate our hypotheses that production contributions are retrospective, interpersonal interactions are both retrospective and prospective, and organization building and administrative contributions are prospective. Second, we need to find objective behavioral measures that are empirically linked to each of these categories (production, interpersonal interactions, administrative, and organization building). Finally, we will use the measures in a complete model to determine which behaviors contribute to members developing into leaders.

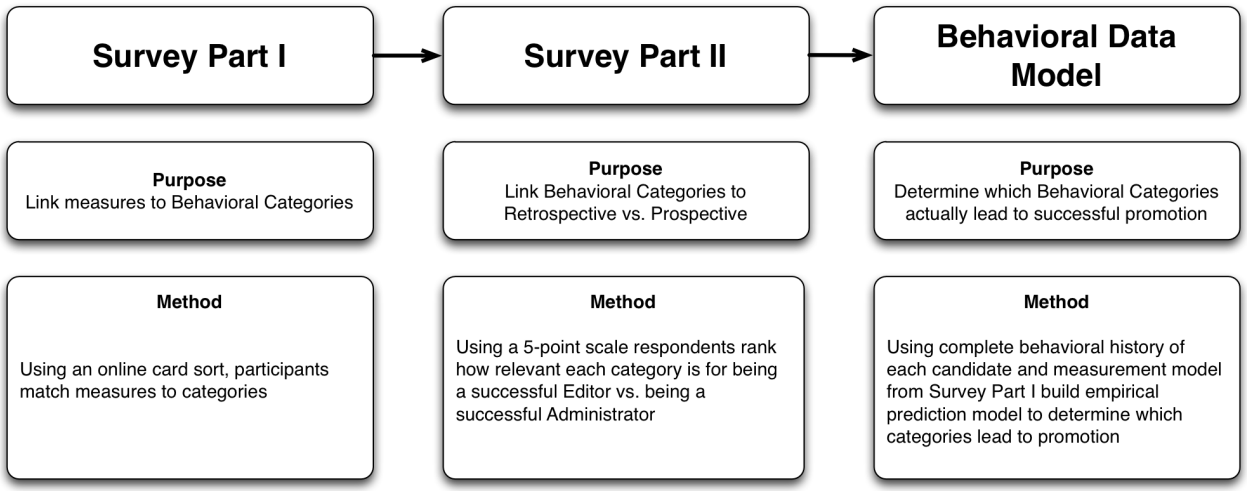


Figure 3.1: Study 1 research methods model.

WIKIPEDIA SURVEY

The first step in our approach was to identify the qualities and behaviors that are important for leaders within Wikipedia (selection/prospective). To become an administrator, an editor must undergo a week of scrutiny known as the Request for Adminship (RfA), during which the community builds consensus about the candidate's experience and suitability for the position. The process consists of three parts: an introductory nomination statement, the nominee's answers to questions about past and future behavior, and statements of support, opposition, or neutrality by community members. These statements of support/oppose/neutral are public, can be made by any member of the community, and typically contain a rationale behind their decision.

A list of 14 desirable behavioral categories were identified by combining (1) a qualitative analysis (see Figure 2.6 on page 32) of the voter's discussion of 50 candidates (Collier et al., 2008) and (2) a community guide for desirable behavioral categories in Administrators (see Table 2.5 for complete list). From this list of desirable behavioral categories, a list of 40 potential measures was

developed through informal discussions with Administrators and community members, a qualitative analysis of the voter discussions, and previous research examining measurement of work in Wikipedia (Kittur, Chi, et al., 2007; Kriplean et al., 2008).

After developing a list of behavioral categories (e.g. knowledge of policy, helping with chores, strong edit history) and a list of potential measures for those categories (e.g. editing policy pages, reverting vandalism, number of article edits) we constructed a survey which was administered to current administrators, voters from previous Request for Adminship decisions, and previous candidates for promotion. We put a call out on the Administrator's Noticeboard (a central communication hub for current administrators), the Village Pump (a general discussion board within Wikipedia) and the Request for Comment page (a general request page for contributors to review a policy or discussion). A total of 91 contributors participated in the survey.

The objective of the first part of the survey was to determine which behavioral measures would map onto the construct of the behavioral categories. We operationalized this by using an online card sorting task having participants be given a list of 14 categories and 40 measures. Their task was to drag each of the measures onto a category which it best measured.

The objective of the second part of the survey was to determine which behavioral categories were "central, important, or critical" to being a contributor (retrospective) and which were important for being a leader (prospective). Participants filled out a 5-point scale as to how relevant each category was to being a good editor, and another 5-point scale as to how relevant each category was to being a good administrator. The 5-points on the scale were as follows: 1=Not Relevant, 2=Slightly Relevant, 3=Moderately Relevant, 4=Relevant, 5=Very Relevant.

	Theory Category	Behavior Category	Relevance Score	Difference Score
Retrospective				
	Production			
		Article Quality	4.18	1.22
		Article Editing History	4.00	0.24
Prospective				
	Organization Building			
		Community Involvment	3.63	0.97
		Knowledge of Policy	4.63	1.05
		Conflict Management	4.30	0.90
		Decision Making Through Consensus	4.54	0.67
	Administrative Contributions			
		Anti-vandalism work	3.74	1.23
		Varied Experience with Administrative Work	4.04	1.19
		Administrative Work	4.21	1.55
Both Roles				
	Interpersonal Interactions			
		Interactions with others	4.52	0.72

Table 3.1: Study 1 survey results: matching behavior categories to roles (Editor or Administrator). Relevance score indicates how relevant that behavior is to success in each role on a scale of 1=Not Relevant to 5=Very Relevant. Difference score indicate the difference in relevance between the roles (e.g. Article Quality is rated as 4.18 for editors, and 4.18 - 1.22 = 2.96 for administrators).

SURVEY RESULTS

Using data from the 91 participants in the card sort we used a Ward's cluster analysis technique combining the categories and the measurement items and clustered them based on how often they were placed together by participants. The overall measurement model clustered well for 10 of the 14 categories with an inter-rater reliability Kappa of 0.81 for those categories (see Figure 1 on page 133 in the Appendix for more details on the cluster analysis). The remaining four categories (Time in Wikipedia, Commitment to Wikipedia, Trustworthiness, and Neutral Point of View) have only one measurement per category. More details on the measurement model will be discussed in the section on data collection.

To determine which categories are of most important for measuring administrator performance relative to editor performance we did a within-subjects t-test examining the difference in ratings of relevance of each category. For example, if a participant rated "knowledge of policy" as Very Relevant (a value of 5) for Administrators but Not Relevant (a value of 1) for Editors, the difference would be a value of 4. We then test whether the average rating for that category has a difference score that is statistically significantly different from zero. The results from participant's ratings of categories are shown in Table 3.1.

The results of this survey show Article Quality and Article Editing History are more relevant for Editors than for Administrators, with a difference score of 1.22 and 0.24 respectively. Administrators have seven categories of behavior that are relevant for being a successful Administrator: community involvement, knowledge of policy, conflict management, decision making through consensus, anti-vandalism work, varied experience with administrative work, and administrative work. The most relevant prospective leadership behaviors according to our survey results are knowledge of policy (relevance = 4.63, difference = 1.05), and decision making through consensus (relevance = 4.54, difference =

0.67. Pairing survey results with our review of the research literature, we find a nice matching of the four categories discussed - Production, Organization Building, Administrative Contributions, and Interpersonal Interactions - with the behavioral categories. Matchings of the theory categories and the behavioral categories are shown in Table 3.1 along with survey results.

The results of this study provide several key insights on leadership behaviors in open collaboration communities. The first is that the behaviors leaders engage in (prospective) are significantly different than those of contributors (retrospective). This suggests that a leader's value comes from administrative contributions and organization building rather than production work. Similarly, it is interesting that as a leader the quality of your writing is of much less value to the organization than for an editor. Once a leader is promoted their value lies not in the quality of the production content they create, but in the administrative and organization building tasks they perform. While the findings from the survey have some interest on their own, the primary purpose of the two-stage survey is to provide a framework and guidance in developing a behavioral model of promotion and leadership in Wikipedia.

3.8 DATA COLLECTION

Data for the second part of this study were collected for 2,972 candidates for Administrator positions in Wikipedia. The data range from January 2004 to December 2011. For an overview of Wikipedia Administrators, and the Request for Adminship process, see section 2.6 on page 29. While most editors are only nominated for promotion one time, some are nominated a second or third time if they fail at their previous attempts. To preserve statistical independence of subjects and examine the development of leaders from the time they first edit Wikipedia to nomination, our sample only includes each editor's first nomination.

In our sample 50.07% of those nominated for the position were promoted to be an Administrator. For each editor who is nominated for promotion we collect two types of historical data: (1) their history of all pages they have edited, including article work, discussions, and meta-content work, and (2) the complete text history of everyone who has written on the candidate's user talk page. All behavioral measures are derived from each editor's revision history, as well as the barnstars awarded to that editor on their user talk page.

REVISION HISTORY

Wikipedia operates as a very transparent organization in that the complete history of every contributor is publicly available for scrutiny. Anyone may view a contributor's complete editing history through the Wikipedia web interface, and Wikipedia makes the complete history of every article edit, article discussion, user talk edit, and nearly every area of Wikipedia available through their public API for software developers as well as in a large revision history data dump. From the Wikipedia API we gathered every edit each candidate made including the date and time of the edit, the title of the page the edit was made on, the area of Wikipedia it was made on (article, article talk, user, user talk, Wikipedia, Wikipedia talk), and the comment that typically accompanies each revision. We derive measures for each category based on each of these characteristics of each candidate's history. More details on the measures within each category will be discussed individually.

BARNSTAR AWARDS

Many online organizations that rely on volunteers include social mechanisms to help motivate contributors. Often these include things like badges, leader boards, or other awards exchanged between contributors. In Wikipedia there is a cultural history of awarding an image of a barnstars as a thank you for a variety of contributions. For example, there are specific barnstars designed to be awarded for major contributions to an article, for welcoming new users, or

for mediating the conflict. Figure 3.2 shows two examples of barnstars, one for producing new content, and one for mediating a conflict.

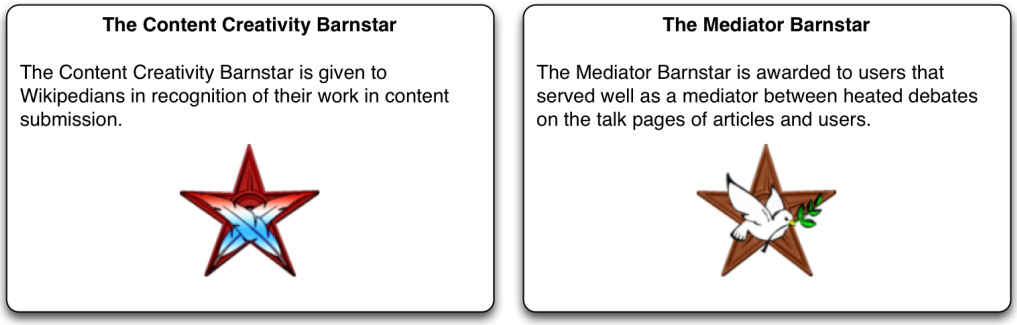


Figure 3.2: Examples of two barnstars used in Wikipedia.

Barnstars can be awarded by any editor, and are given on an editor's user talk page (see section 2.3 on page 16 for discussion of user talk pages) and can then be transferred to an editor's user page. Measuring barnstars provides addition information that revision history may not convey. For example, we can measure some aspects of mediating conflict such as participation in formal Wikipedia conflict mediation structures (see section 2.4 on page 18), but measuring barnstars awarded allows us to see the outcome of informal mediation work they have done in other areas of Wikipedia such as article talk pages.

Using the barnstar classification system developed by Kriplean et al. (2008), we can measure and categorize barnstars that editors receive. Kriplean et al. (2008) examined a random sample of 2,400 barnstars from Wikipedia and used multiple coders to classify the categories of work they were awarded for. In Figure 3.3 we see the breakdown of the activities barnstars are being used to reward. The most common are barnstars awarded for editing work with 27.8% and barnstars awarded for social and community support actions with 24.9%.

We obtained a modified version of the coding system used by Kriplean et al. (2008) that maps the barnstar's image (e.g. mediators-barnstar.png) name to the category it was awarded for. We downloaded the complete user talk history for each candidate for promotion, and developed a tool that measures the barnstar awarded, the category it was awarded for, and the date it was awarded for each candidate. In total our tool coded 5,947 barnstars across all 2,972 candidates.

3.9 MEASUREMENT MODEL

While the Wikipedia survey conducted provided a good matching of measures to behavioral categories, some of the measures were lacking in specificity, creating the need for further development of actionable measures. For example, the survey results showed that article quality was one dimension of production. However, article quality can be measured on a number of different dimensions and there is no objective agreement on which is correct. Using the the survey measurement mappings as a guide, we developed measures for each category and can identify how effective they are collectively by empirically validating that they correlate well and have an appropriate Cronbach's Alpha.

PRODUCTION CONTRIBUTIONS

Production contributions measures are developed to address four dimensions of article production work: quantity of editing, quality of editing, diversity of editing, and type of editing work. Production contribution measures in our sample correlate well across measures, and have a Cronbach's Alpha of 0.884. See Table 3.2 for complete descriptive statistics and correlations.

Article edits measures the number of times a contributor has edited any Wikipedia article. This measure reflects the quantity of editing work done.

Editing Work		**852**	**27.8%**
minor	copy-editing	112	13.1%
media	images, audio	75	8.8%
initiative	starting articles, stubs	59	6.9%
major	substantial textual addition to an article	56	6.6%
achievement	shepherding an article to a higher quality level	41	4.8%
classification	categorizing articles, adding templates	35	4.1%
redesign	large-scale refactoring, merging pages	22	2.6%
translation	to or from another language	18	2.1%
attribution	citing sources, removing unsourceable info	18	2.1%
general		416	48.8%
Social and Community Support Actions		**763**	**24.9%**
commitment	to an article, a wiki-project	331	43.4%
teaching	mentorship, question-answering	71	9.3%
leadership	of wikiprojects & other initiatives	44	5.8%
humor and cheer	being funny, cheering others up	43	5.6%
user page design	helping to design another's user page	41	5.4%
rewarding	recognizing the achievements of others	22	2.9%
welcoming	welcoming newcomers	15	2.0%
general		196	25.7%
Border Patrol		**342**	**11.2%**
vandal fighting	reverting damage to unspecified namespace	180	52.6%
deletion	article notability, spam removal	63	18.4%
vandal fighting	reverting damage to user pages	30	8.8%
vandal fighting	reverting damage to articles	29	8.5%
sockpuppets	finding users operating multiple accounts	12	3.5%
legal	copyright violations, fair use rationale	9	2.6%
general		19	5.6%
Administrative		**284**	**9.3%**
privilege granting	helping vet potential administrators	163	57.4%
intervention	formal mediation of user conflicts	35	12.3%
quality designation	determining article status (e.g. Featured)	34	12.0%
technical action	exercise of privileged power	30	10.6%
general		22	7.7%
Collaborative Actions and Disposition		**244**	**8.0%**
disposition	civility, accepting of criticism, keeping cool	82	33.6%
adherence	policy interpretation, integrity	77	31.6%
diplomatic action	conflict mediation, consensus-seeking	28	11.5%
explanation	rationale for an edit, decision, or standard	10	4.1%
general		47	19.3%
Meta-Content Work		**128**	**4.2%**
template	design of applicable templates	39	30.5%
tool programming	design & support of tools (e.g. bots)	36	28.1%
forums / portals	creation & support of help desks	15	11.7%
classification	category creation & organization	13	10.2%
process & policy	policy authoring & process design	10	7.8%
archiving	storing away old discussions	4	3.1%
general		11	8.6%
Undifferentiated Work		**447**	**14.6%**
	Total work codes applied	**3060**	**100.0%**

Figure 3.3: Data from the hand coding of 2,400 barnstars (Kriplean et al., 2008). Barnstar are categorized by the reason they were awarded. Barnstars can belong to multiple categories under this classification.

Article talk edits measures the number of times a contributor has edited the talk page for any article in Wikipedia. This measure reflects the article coordination work done to improve an article.

Article improvement barnstars measures the barnstars a contributor has received that relate to editing work, including barnstars for major improvements to an article, shepherding an article to "featured" or "good" status, or or other contributions to article development.

Distinct articles edited measures how many different articles a contributor has edited. Some editors may specialize in many edits to a handful of articles, while others may edit more diversely across several articles.

Articles substantively edited measures how many articles the contributor has edited more than ten times. Since distinct article edits may be capturing minor fixes such as spelling corrections or reversion of vandalism, this attempts to measure the diversity of articles that a user has contributed a substantial number of edits to.

Editing Gini coefficient inverse measures the Gini coefficient of the articles substantively edited (more than ten edits). A Gini coefficient measures inequality on a scale from zero being perfectly equality and one being maximum inequality. It is typically used across income levels to measure income disparity. If a contributor in our model edited ten articles, but spent nearly all of their edits on only two of those articles they would have a Gini coefficient close to one. If they edited all ten articles an equal number of times they would have a Gini coefficient close to zero. This measure reflects the interaction of editing diversity and the quantity of editing. In our sample the Gini coefficient is inversely related to the number of article edits meaning the more editing a contributor does, the more equal their distribution of edits is. Our model includes the inverse (one minus the Gini) as the Gini coefficient is inversely related to all other production measures.

Edit summary percent measures the percent of article edits that contain an edit summary. Writing a very short summary for every edit you make is part of the community norms in Wikipedia, and a candidate's edit summary percentage is frequently examined when voting for promotion.

Correcting spelling and grammer is measured by counting number of article edits that contain spelling-related words in the edit summary. When a contributor is making a spelling or grammer fix they will often include the words "spell", "sp", "typo", "grammer", or "copyedit" in their edit summary to indicate the change they made to the article. This measures the number of minor changes a contributor has made.

Edits to featured articles measures the number edits made to articles in the 90 days before they are made a "Featured Article". To obtain the featured articles list we downloaded and parsed the complete history from the log of when each article became featured. This measure reflects article edits that substantively improve an article to become featured. Improving article to a featured or good status is often something candidates talk about during their Request for Adminship. Many editors display the articles they have improved to featured status on their user page (see section 2.3 on page 17 for example).

Edit summary length measures the average number of characters an editor writes for their edit summaries. This measure did not correlate well with the other measures, it was not associated with promotion when put in the full prediction model, and it is unclear what conceptually it is trying to measure. It was dropped from the rest of the analysis.

ORGANIZATION BUILDING

Organization building measures are developed to explore the higher level work Administrators do to run Wikipedia as an organization. Measures in this category have a Cronbach's Alpha of 0.827. See Table 3.3 for descriptive statistics and correlations.

Policy edits measures the development and discussion of Wikipedia policies through counting edits made to the Wikipedia namespace. The Wikipedia namespace is an area of Wikipedia devoted to content that is outside of articles and user discussions. Included in the Wikipedia namespace are WikiProject edits, Requests for Comment, Requests for Adminship and other noticeboards. This measure subtracts edits from all of the above to include only policy-related edits[1].

Policy talk edits measures a edits to the Wikipedia talk namespace, and subtracts edits in a similar way as policy edits.

WikiProject edits measures edits to WikiProject related aspects of Wikipedia. WikiProjects are groups of editors that form around a topic (e.g. the state of Pennsylvania) or an organizational task (e.g. spell checking). Involvement in WikiProjects indicates both prior experience and an interest in involvement with Wikipedia in a more collective level (Kittur et al., 2009).

Leadership and teaching barnstars measures barnstars that are awarded for mentorship or leading WikiProjects and other initiatives. These barnstars are a subset of Social and Community Support Actions (see Figure 3.3) and were pulled out to have a special categorization due to their relevance for potential Administrators.

Mediation edits measures mediation-related words in edit summaries.

Policy related comments measures edits that cite Wikipedia policies in the edit summaries. This measure is designed to tap the application and enforcement side of policy.

[1]Policy edits = Wikipedia namespace edits - village pump, X for deletion, WikiProject edits, Request for Comment, other RfA's, Arbitration Committee, Requests for Protection, Administrator's Noticeboard, Help Desk, copyright protection page, Community Portal, NPOV noticeboard, notability noticeboard, no original research noticeboard, and Administrator's Intervention against Vandalism

ADMINISTRATIVE CONTRIBUTIONS

Administrative contribution measures are developed to reflect the administrative tasks and duties that come with the more managerial side of leadership. This construct reflects a wide variety of administrative meta-content tasks that are involved in running Wikipedia as an organization. Administrative contribution measures have a Cronbach's Alpha of 0.818. Descriptive statistics are shown in Table 3.4 and correlations are shown in Table 3.5.

Help desk, community portal, and village pump edits measures answering editor questions and being involved in community forums that are related to meta-content work. Each of these three are slightly different versions of public task-related discussion areas. They correlate well together, but did not correlate as well with other measure individually. They were added together as a single measure since they reflect a similar activity and correlate better with other administrative measures when placed together.

Request for comment measures participation in Wikipedia system (discussed in section 2.4) in which contributors publicly make a request for a third party to comment on either content or a disagreement.

Other Request for Adminship measures discussion and voting in promotion decisions for other candidates for the Administrator positions.

Arbitration committee edits measure participation in the formal dispute resolution process discussed in section 2.4.

Request for protection edits measure the number of requests this contributor has made for an Administrator to protect an article. In the event an article becomes repeatedly vandalized or is highly contentious Administrators can protect article so that only registered Wikipedians can edit the page (semi-protected) or so that only Administrators can edit the page. Requests for protection provides a system for editors to notify Administrators of problem articles and situations.

Copyright related work measures both edits to copyright-related meta-content pages (in the Wikipedia namespace) and revisions that include copyright-related words.

Administrator or Neutral Point of View (NPOV) noticeboard measures edits made to either the Administrator noticeboard or the NPOV Noticeboard. The Administrator's noticeboard brings issues within Wikipedia or within specific articles to Administrators' attention so they can address the issue. The NPOV noticeboard alerts the community of an article or article discussion that has problems with having a biased or non-neutral point of view, a core Wikipedia policy.

Vandalism-related work includes a variety of measures related to fighting vandalism. Measures include the number of edits a contributor has made with vandalism related words in it, and edits made to vandalism-related noticeboards.

Breadth of administrative participation measures an aggregate score of the number of administrative-related areas a user has contributed to more than ten times. Administrative tasks include the help desk, vandalism noticeboards, requests for comment, and Administrators' noticeboard.

Border patrol, administrative, and meta-content barnstars measures barnstars a contributor has received that are categorized as border patrol, administrative, or meta-content related by the barnstar categorization tool.

INTERPERSONAL INTERACTIONS

Interpersonal interaction measures are designed the reflect social tone and social skills a contributor has as well as the social contributions a contributor has made to Wikipedia. Interpersonal interaction measures have a Cronbach's Alpha of 0.842. Descriptive statistics and correlations are shown in Table 3.6

Welcoming new editors measures the use of variations of welcoming words in the revision summary of a contributor's edits.

"Please" in edit summary measures the use of variations of the word please in the edit summary.

"Thanks" in edit summary measures the user of variations of the word thanks and thank you in the edit summary.

Participation in "Adopt-a-user" measures edits to the adopt-a-user page in Wikipedia. Adopt-a-user is a program to help new and inexperienced users acclimate and socialize to Wikipedia.

Participation in "Editor Review" measures edits to the editor review page in Wikipedia. Editor review is a Wikipedia system in which editors can have their edits and contributions evaluated by other edits to provide feedback to help them improve.

Collaboration and social support barnstars measures the number of barnstars a contributor has received that are categorized under Collaborative Action and Disposition or under Social and Community Support Action.

User page edits measures the number of times a contributor has edited their own user page.

User talk edits measures the number of times a contributor has edited all user talk pages. This measure reflects an overall quantity of interpersonal communication.

3.10 RESULTS

All four measurement constructs show strong internal consistency with Cronbach's Alpha scores ranging from 0.818 to 0.884. Since count variables tend to have long tails, all edit count measures were log transformed for our empirical models to make the distribution of edits more normal (Wooldridge, 2002). Measures for our four constructs were created by standardizing each individual measure and taking an average across the standardized individual

		Mean	SD	[1]	[2]	[3]	[4]	[5]	[6]	[7]
[1]	Article Edits	3052.67	4601.92							
[2]	Article Talk Edits	467.93	1215.88	0.80***						
[3]	Article Improvement Barnstars	0.09	0.45	0.14***	0.18***					
[4]	Distinct Articles Edited	1595.29	3012.16	0.96***	0.72***	0.11***				
[5]	Articles Substantively Edited	79.64	125.23	0.87***	0.78***	0.16***	0.76***			
[6]	Editing Gini Coeff. (Inv)	0.60	0.25	0.40***	0.22***	-0.02	0.45***	0.31***		
[7]	Edit Summary Percent	0.80	0.23	0.46***	0.50***	0.11***	0.49***	0.33***	0.16***	
[8]	Correcting Spelling / Grammer	177.41	585.79	0.82***	0.77***	0.14***	0.80***	0.74***	0.26***	0.62***
	Cronbach's Alpha: 0.884									
	*** $p < .001$									

Table 3.2: Descriptive statistics and correlation table for Production Contribution measures.

		Mean	SD	[1]	[2]	[3]	[4]	[5]
[1]	Policy Edits	572.70	825.18					
[2]	Policy Talk Edits	91.97	209.37	0.79***				
[3]	WikiProject Edits	97.58	335.2	0.66***	0.79***			
[4]	Leadership and Teaching Barnstars	0.12	0.44	0.18***	0.18***	0.16***		
[5]	Mediation Edits	2.44	11.64	0.37***	0.47***	0.32***	0.11***	
[6]	Policy Related Comments	603.19	2320.55	0.63***	0.61***	0.59***	0.17***	0.33***
	Cronbach's Alpha: 0.827							
	*** $p < .001$							

Table 3.3: Descriptive statistics and correlation table for Organization Building measures.

		Mean	SD
[1]	Help Desk, Community Portal, Village Pump	20.92	110.62
[2]	Articles, Categories, Templates for Deletion	202.56	450.51
[3]	Request for Comment	6.86	24.72
[4]	Other Request for Adminship	35.84	67.22
[5]	Arbitration Committee	9.95	43.25
[6]	Request for Protection	4.19	16.71
[7]	Copyright Related Work	32.98	202.85
[8]	Admin / NPOV Noticeboard	22.51	91.46
[9]	Vandalism-Related Work	1038.61	2619.61
[10]	Breadth of Administrative Participation	7.65	3.04
[11]	Border Patrol, Administrative, and Metacontent Barnstars	0.38	1.44
	Cronbach's Alpha: 0.818		
	*** $p < .001$		

Table 3.4: Descriptive statistics for Administrative Contribution measures. Correlations are shown in Table 3.5.

	[1]	[2]	[3]	[4]	[5]	[6]	[7]	[8]	[9]	[10]
[1]										
[2]	0.40***									
[3]	0.34***	0.46***								
[4]	0.35***	0.58***	0.43***							
[5]	0.28***	0.39***	0.54***	0.42***						
[6]	0.22***	0.32***	.31***	0.34***	0.33***					
[7]	0.42***	0.62***	0.36***	0.40***	0.30***	0.33***				
[8]	0.36***	0.49***	0.51***	0.52***	0.52***	0.60***	0.44***			
[9]	0.34***	0.59***	0.32***	0.56***	0.33***	0.59***	0.55***	0.64***		
[10]	0.58***	0.77***	0.58***	0.70***	0.54***	0.48***	0.64***	0.68***	0.74***	
[11]	0.09***	0.20***	0.10***	0.37***	0.14***	0.11***	0.11***	0.19***	0.23***	0.22***

Table 3.5: Correlation table for Administrative Contribution measures. Measure names and descriptive statistics are shown in Table 3.4.

		Mean	SD	[1]	[2]	[3]	[4]	[5]	[6]	[7]
[1]	Welcoming New Editors	58.22	240.79							
[2]	"Please" in Edit Summary	32.60	127.48	0.52***						
[3]	"Thanks" in Edit Summary	20.57	38.71	0.66***	0.72***					
[4]	Participation in "Adopt-a-user"	0.22	1.33	0.21***	0.15***	0.20***				
[5]	Participation in "Editor Review"	1.90	6.85	0.35***	0.23***	0.34***	0.25***			
[6]	Collaboration / Social Support Barnstars	0.70	1.87	0.30***	0.25***	0.37***	0.22***	0.26***		
[7]	User page edits	211.49	391.37	0.48***	0.52***	0.58***	0.18***	0.27***	0.26***	
[8]	User talk edits	767.28	1451.13	0.71***	0.69***	0.78***	0.21***	0.35***	0.34***	0.69***
	Cronbach's Alpha: 0.842									
	*** $p < .001$									

Table 3.6: Descriptive statistics and correlation table for Interpersonal Interactions measures.

measures to create an aggregate measure. Aggregate measures for Production Contributions, Organization Building, Interpersonal Interactions and Administrative Contributions are therefore mean centered at zero, and have a standard deviation of one. Descriptive statistics and correlations for our the aggregate measures and variables in our empirical model are shown in Table 3.7 on page 68.

Since the independent variable is a binary outcome (0 = not promoted to Administrator, 1 = promoted to Administrator), we use a probit regression model to predict promotion from our independent variables (Wooldridge, 2002). Both empirical models use the year the candidate for promotion was nominated as a control as well as the number of months the candidate has been active in Wikipedia. The year is coded as a categorical variable so the coefficients for each year represent the change in the probability of promotion from that year to the baseline year of 2004. Table 3.8 shows the results of the full probit models. Model 1 shows control variables only, Model 2 shows the results of adding our four behavioral constructs to the control variables. The R^2 shown in each model is a pseudo-R^2 measure using the Nagelkerke R^2 for a probit model. The prediction accuracy of the model shows the percentage of correct predictions the model makes when comparing the predicted $\hat{y}$ with the actual y outcome. If the model predicts a probability of success greater than 0.50 then it is counted as one (success), if the predicted probability is less than or equal to 0.50 it is counted as a zero (failure).

The baseline model using only the year and number of months editing gives an R^2 of 0.26. When we add our four behavioral constructs to the model the R^2 increases to 0.546, which is a substantial increase over the baseline. The Model 2 accuracy improves to 81.09% from the baseline of 67.59%, meaning for 81 out of 100 candidates for promotion Model 2 predicts correctly whether the candidate will be promoted or not based on their behavioral contribution history. Overall, every behavioral construct was significant, and has a medium-to-large effect size.

INTERPRETING PROBIT COEFFICIENTS

Before discussing the each individual construct, it is important to note that the coefficients of probit models are not directly interpretable the way they are in Ordinary Least Squares (OLS) regression (Hoetker, 2007; Liao, 1994; Wooldridge, 2002). The magnitude of the change in $\hat{y}$ with a change in x depends both on the initial value of x, and the value of all other independent variables in the model. One might assume based on OLS regression, for example, that a change of one standard deviation in Production Contributions changes the predicted probability by 93.3%, but this interpretation is not correct. To interpret probit coefficients one must pick a value for all other variables in the model, most often the mean of those variables, and pick an initial value of x to understand the impact of a change in x on $\hat{y}$. Since all four constructs are on the same standardized scale, from the coefficients in Table 3.8 we can compare their relative effect sizes. We can also observe that the coefficients are significant at a $p < .001$ level and positive. However, in probit models interpreting the impact of each construct on the probability of promotion is most effectively done using a graph to illustrate the change in $\hat{y}$ over a range of x values holding all other measure at their means.

INTERPRETING GRAPHS

To illustrate effect sizes, each graph in Figure 3.4 on page 70 shows the predicted probability of promotion $\hat{y}$ for every value of x while holding all other variables in the model at their mean. In the Production Contributions graph, for example, moving from one standard deviation below the mean to the mean (from -1 to 0) on the x-axis results in a change in the predicted probability of promotion from 7% to 29%, a difference of 22% while moving from mean to one standard deviation above the mean (0 to 1) on the x-axis results in a change in predicted probability of promotion from 29% to 65%, a difference of 36%. The x-axis ranges from three standard deviations below the mean to

three standard deviations above the mean which encompasses the x values of 99% of candidates.

PRODUCTION CONTRIBUTIONS

From Table 3.8 we see that Production Contributions with a coefficient of β=0.933 is significant and by far has the largest effect on promotion of any of the four constructs in the model. The graph for Production Contributions on Figure 3.4 shows a large effect on promotion when moving from one standard deviation below the mean candidates have a predicted probability of promotion of 7% and one standard deviation above the mean their probability increases to 65%. There is considerably less impact of Production Contributions on promotion when candidates are either below two standard deviations, in which case they have very little chance of being promoted, or above two standard deviations, in which case their is little additional benefit of being in the top 2.5% of Production Contributions for candidates in terms of being promoted.

ORGANIZATION BUILDING

Organization Building behaviors have the second largest impact on promotion, with a coefficient of β=0.451. Looking at the graph in Figure 3.4 we see that candidates who move from the mean to one standard deviation above the mean increase their probability of being promoted by 17%. The impact of Organization Building on promotion is much more linear than we saw with Production Contributions, indicating that there are benefits of being involved in Organization Building activities such as policy discussions, mediations, and being involved in WikiProjects even when above one or two standard deviations.

INTERPERSONAL INTERACTIONS

While not as large as Production Contributions or Organization Building, Interpersonal Interactions have a substantial impact on promotion to an Ad-

ministrator position with a coefficient in Model 2 of β=0.319. A change from being a perhaps more task oriented but difficult contributor with an Interpersonal Interaction score one standard deviation below the mean to a more socially oriented contributor who actively supports others with an Interpersonal Interaction score one standard deviation above the mean creates a change in probability of being promoted of 22%.

ADMINISTRATIVE CONTRIBUTIONS

While Administrative Contributions have a significant impact on promotion to being an Administrator with a coefficient of β=0.227 in Model 2, they have the smallest impact of the four behavioral constructs. Being one standard deviation below average reduces a candidates probability of being promoted by 7% from average candidates, and being one standard deviation above the mean improves a candidates probability by 8%.

3.11 DISCUSSION

Similar to scientific and technical professions, we hypothesized that leadership influence in core-periphery organizations such as Wikipedia is based in part on production experience. We suggested that in the context of Wikipedia, authority is in part seen by the community as coming from paying dues by editing articles and producing high quality content. Our empirical model provided strong support for H1: *Production contributions to Wikipedia increase an editor's likelihood of later becoming a leader.* Production contributions had the strongest effect size of all the behaviors predicting promotion. Candidates with production contributions one standard deviation above the mean had a 36% greater probability of being promoted than candidates at the mean. Even though the results from Wikipedia contributors who participated in our initial survey (see section 3.7) suggested production contributions are more relevant

		Mean	SD	[1]	[2]	[3]	[4]	[5]
[1]	Promotion Success	0.50	0.50					
[2]	Production Contributions	0.00	1.00	0.50***				
[3]	Organization Building	0.00	1.00	0.43***	0.74***			
[4]	Intepersonal Interactions	0.00	1.00	0.37***	0.60***	0.75***		
[5]	Administrative Contributions	0.00	1.00	0.40***	0.68***	0.72***	0.76***	
[6]	Months Editing Wikipedia	14.37	12.11	0.16***	0.36***	0.35***	0.23***	0.28***
	*** $p < .001$							

Table 3.7: Descriptive statistics and correlation table for measures in Model 1 and Model 2.

	Model 1	Model 2
Intercept	-0.292**	0.692***
Year 2005	-0.570***	-0.823***
Year 2006	-1.289***	-1.827***
Year 2007	-1.323***	-2.064***
Year 2008	-1.723***	-2.541***
Year 2009	-1.780***	-2.849***
Year 2010	-2.393***	-3.167***
Year 2011	-2.083***	-3.165***
Months Editing Wikipedia	0.608***	0.342***
Production Contributions		0.933***
Organization Building		0.451***
Interpersonal Interactions		0.319***
Administrative Contributions		0.227**
R^2	0.260	0.546
p	<.001	<.001
Prediction Accuracy	67.59%	81.09%

Table 3.8: Results from Study 1: Probit model predicting promotion to Administrator position from behavioral measures.

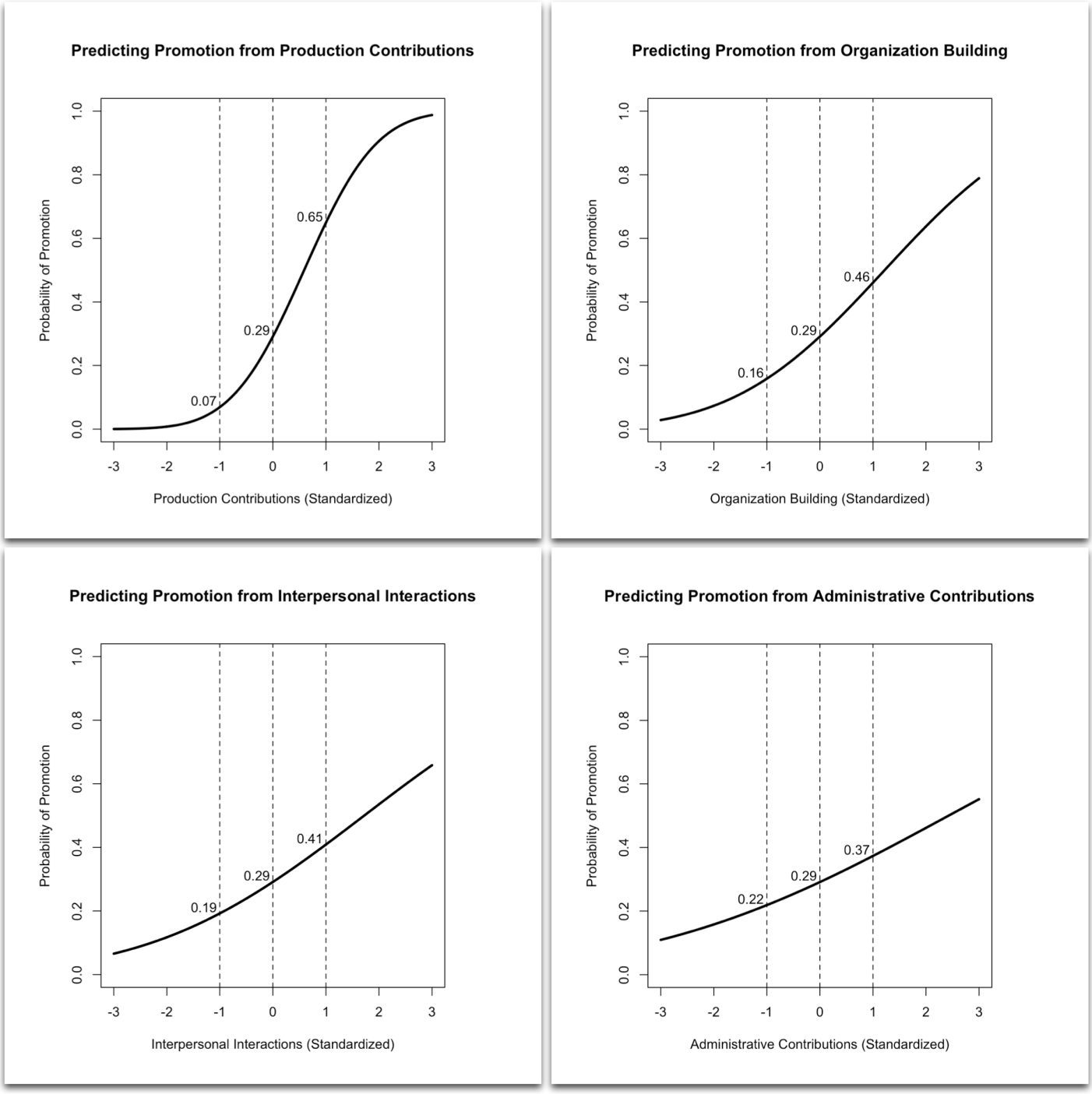


Figure 3.4: Probit model predicting promotion from Production Contributions, Organization Building, Interpersonal Interaction, and Administrative Contributions. Y-Axis shows the predicted probability of promotion, X-Axis shows the standardized aggregate measures (mean = 0, x values show the number of standard deviations above or below the mean).

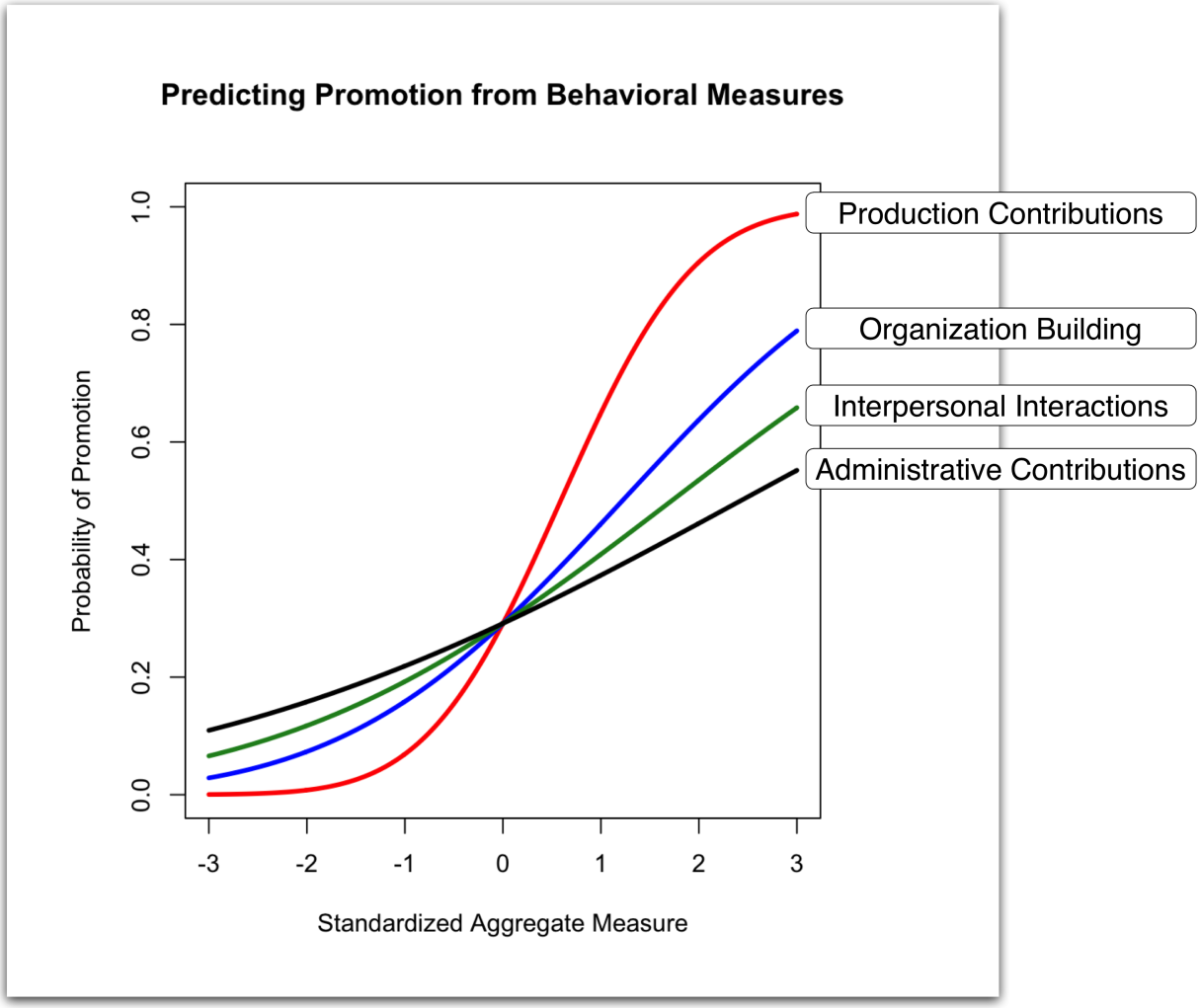


Figure 3.5: Probit model predicting promotion from Behavioral Measures. Combines all lines from Figure 3.4 for comparison.

for editors rather than Administrators, clearly they play a role in advancing to a leadership position.

Because strong interpersonal and communications skills are such a large aspect of influence in a leadership position, we hypothesized in H2 that candidates with strong interpersonal interaction behaviors would be more likely to promoted to a leadership position. Our empirical model found strong support for this hypothesis H2. Candidates with an interpersonal interactions score one standard deviation above the mean had a 12% greater probability of being promoted than candidates at the mean.

As Mintzberg found in behavioral studies of leaders, a surprising amount of leadership work is comprised of administrative tasks (Mintzberg, 1971, 1990). Similarly in Wikipedia, due to their elevated level of trust, Administrators are entrusted with a heavy load of necessary but administrative work. In H3, we proposed that candidates with prior administrative contributions would be more likely to be promoted to a leadership position. Our empirical model found strong support for our hypothesis H3. Candidates with an administrative contributions score one standard deviation above the mean had a 8% greater probability of being promoted than candidates at the mean.

A large part of a leader's role in Wikipedia as in other core-periphery organizations is to influence the larger organization through the development and enforcement of policy, and through leadership of projects. We hypothesized that candidates with more organization building experience would have a greater probability of being promoted. Our empirical model found strong support for our hypothesis H4. Candidates with an organization building score one standard deviation above the mean had a 15% greater probability of being promoted than candidates at the mean.

The results from Study 1 demonstrate that both retrospective and prospective determinants of leadership play a role in developing and selecting leaders in Wikipedia. Leaders have to establish themselves as experienced in the com-

munity through production work, but must also have the skills and experience necessary for their new leadership role. In Study 2 we explore how leaders develop their production skills as well as their leadership skills through social connections with periphery members and leaders in Wikipedia.

Chapter Four

Study 2: Social Capital

> Despite popular press prescriptions for networking, the social capital of leaders is perhaps the most ignored, under-researched aspect of leadership.
>
> *The Social Capital of Twenty-First Century Leaders*
> Brass and Krackhardt

4.1 SOCIAL CAPITAL AND LEADERSHIP

The study of leadership has focused on a few key approaches - the behavioral approach, the power-influence approach, the situational approach, and the integrative approach (Yukl, 1989, 2002). More recently, there has been a call in the literature for a social capital approach to leadership (Brass & Krackhardt, 1999). Other approaches largely focus on what leaders do in isolation from their context, or how leaders interact with their individual followers. The social capital approach to leadership examines social network ties and explores the impact ties have on leadership development and leadership effectiveness. In contrast to human capital (traits, characteristics, behaviors, styles), social capital refers to relationships with other people, and the access to information, resources, and opportunities that come with those relationships (Burt, 1992; Coleman, 1988).

4.2 DEVELOPING SOCIAL CAPITAL OVER TIME

In core-periphery organizations as in volunteer organizations there are broadly two levels of membership: leaders and non-leaders (Heidrich, 1990; Catano et al., 2001). Given that there are two broad roles within core-periphery organizations, there are two major transitions that must occur: transition to the role of volunteer and transition to the role of leader. The socialization and training processes for these two role transitions play a large part in how newcomers adjust to the role of volunteer, and veterans adjust to becoming a leader (Nicholson, 1984).

EARLY TIES TO PERIPHERY MEMBERS

In studies on both unions (Fullagar et al., 1992, 1994, 1995), and volunteer organizations (Lathram & Lichtman, 1984; Lydon & Zanna, 1990), early experiences in core-periphery organizations are shown to be especially important for socializing newcomers into the norms and values of the organization and for encouraging continued commitment to organizational activities. Early work on the socialization experiences of managers over time (Buchanan, 1974) draws on work on stages of organizational tenure member goes through over time. The first stage members go through has been termed the basic training and initiation stage (Schein, 1971) and is characterized by learning the culture and expectations. The second stage is characterized by a concern for achievement and making a mark in the organization and is referred to as the performance stage (Hall & Khalil, 1968). By the third stage, organizational members are considered to be socialized and have developed a fairly stable level of commitment to the organization (Buchanan, 1974).

The seminal work of Lave & Wenger (1991) on legitimate peripheral participation provides evidence that socialization and situated learning in core-periphery organizations (communities of practice) occurs not between peripheral members (apprentices) and core members (masters) but largely between periph-

eral members. That is, a newcomer's relationships to others in the periphery provide a better experience to learn production work and the norms of the organization.

> [Even] where the relationship of the apprentice to master is specific and explicit, it is not this relationship, but rather the apprentice's relations to other apprentices...that organize opportunities to learn; an apprentice's own master is too distant, an object of too much respect to engage with in awkward attempts at new activity
> -Lave and Wenger, 1991, p.92

The learning and adjustment that takes place for a new organizational member to learn the role of production worker or contributor in a core-periphery organization best happens when they are connected to and observing other relatively similar members of the organization. When transitioning to a role, such as accountant, the best person to teach you to be an entry level accountant is not the a partner in the firm, but rather other entry level accountants. In Alcoholics Anonymous research suggests "sponsors" hold back advice and instruction until later stages until newcomers are ready for the next step through increasing participation in the community (Alibrandi, 1978).

In addition to motivational reasons for newcomers to learn about the organization and entry level tasks from other peers in the periphery, a significant body of educational research suggests experts may not be the most suitable teachers for novices. The "expert blind spot" problem in education refers to the problem that experts have in teaching and relating to novices (Koedinger & Nathan, 1997; Koedinger et al., 2008; Nathan & Petrosino, 2003). As individuals learn they move through the four stages : (1) unconscious incompetence, (2) conscious incompetence, (3) conscious competence, and (4) unconscious competence (Ambrose et al., 2010; Sprague & Stuart, 2003). Initially a novice is unaware and incompetent at a certain task or position. They then slowly become aware of their incompetence, and then moves to a stage of competence

in which they are aware of what they know and how they learned it. In the last stage an expert often become unaware of how they learned the intricate details of the knowledge of their craft despite their high level of competent (Ambrose et al., 2010). As an example, the best teacher for a ninth grade student in algebra may not be a research scientist in advanced mathematics. As an expert, a research scientist may not know developmentally the background a ninth grade student is coming into the course with and an appropriate pace for the student to learn at. What is often a better approach may be to have peers who have recently gone through algebra tutor the student since they still remember the principles that hung them up and have a novice language appropriate for the student's developmental stage.

> H1a: Ties developed early to the periphery will have a positive influence on promotion to a leadership role.

LATE TIES TO LEADERS

As periphery members develop commitment and have entered more advanced stages in the organization the next role transition confronting them is entry into the leadership ranks of the organization (Heidrich, 1990). Current leaders in any organization have a very limited amount of time and resources to spread in making connections with others and developing one-on-one relationships within the organization (Cross et al., 2006; Cross & Thomas, 2011). Leaders must be strategic about who they are investing time and mentoring with. Following from the example in Alcoholics Anonymous and other research on situated learning, the sponsorship cannot happen immediately when people enter, it must happen later after seeing who sticks around. Core-periphery organizations are bottom heavy in the sense that a vast majority of the organizational members are only moderately involved in contributing, so leaders must be particular and invest mentoring and coaching with those who have paid their dues in the organization.

In previous research on core-periphery organizations studies have found that early on members focus on production level tasks and later develop communication and organizational building activities (Dahlander & O'Mahony, 2010; O'Mahony & Ferraro, 2007). For example, in the case of open source software, software developers initially contribute through code and technical contributions and later through support, design, and community building (O'Mahony & Ferraro, 2007). The skill set required in leading an organization is not only a matter of the amount of work a leader puts in, but of the nature of the work a leader does (Bernhardt, 1995; Faria, 2000; Lazear, 2004; Kocha & Nafzigerb, 2007). Aquiring this new skill set and status within the community is then best accomplished by having connections to current leaders who are already doing the skills a rising member is seeking to learn. Learning how to lead in a core-periphery organization is indeed quite difficult, and it comes with challenges often not present in traditional hierarchical organizations (J. L. Pearce, 1980). Mentoring and interaction from current leaders has been shown to be the principle means by which new and rising leaders absorb all the subtleties of the broader organizational culture and climate (Buchanan, 1974; Schein, 1971).

In communities of practice before a peripheral member can become a legitimate tradesperson a "master" must sponsor an "apprentice". Similarly, in career mobility models sponsorship from current organizational leaders plays a large role not only in mentoring and providing support but also in legitimizing a candidate for promotion to the rest of their colleagues (Brass & Krackhardt, 1999; Ng et al., 2005). This sponsorship and legitimizing process works most effectively the newcomer has paid their dues to the organization and is ready to be considered for a leadership position. In addition, ties to leaders later in organizational tenure can signal promise and provide mentoring and access to one's network (Brass, 1992; Kilduff & Krackhardt, 1994).

H1b: Ties developed to leaders later will have a positive influence on promotion to a leadership role.

4.3 WEAK, STRONG, AND SIMMELIAN TIES

All social ties between people are not equal. Drawing on social network theory, this paper will explore three types of ties between members of an organization: weak ties, strong ties, and simmelian ties. Strong ties are differentiated from weak ties based on four dimensions of strength: frequency, reciprocation, importance, and positive affect (Granovetter, 1973). Strong ties are most often thought of as friendships or close professional relationships, while weak ties are a more loose connection such as an acquaintance. Simmelian ties go beyond strength and are defined as a triad (or more) of strong ties in a group (Krackhardt, 1999, 2002). For example, if Irene has a strong tie to Jerry, and both Irene and Jerry have a strong tie to Kyle, the tie would be considered a simmelian tie.

Weak ties provide diverse access to information and organizational awareness (Mehra et al., 2006; Granovetter, 1973). The cost of creating a weak tie is much lower than creating a strong tie in terms of time and resources, and thus people generally have many more weak ties than strong ties. People are more likely to find out information about job openings from weak ties, and information flow in weak ties is more novel, divergent, and non-redundant than strong ties.

Strong ties are characterized by inducing commitment, providing mentoring, and eliciting trust (Kilduff & Krackhardt, 1994). One's attitudes, opinions, and beliefs are more likely to be affected through strong ties than through weak ties (Krackhardt et al., 1992). In terms of transferring knowledge and organizational culture between individuals, strong ties have been shown to be more effective at transferring knowledge that is difficult to codify and explain in short period of time (Hansen, 1999).

Simmel (1950) emphasized the importance of moving beyond dyadic ties to examine ties embedded within triads. Research has confirmed Simmel's work and found that social ties embedded within triads are more stable over time, stronger, more durable, and exert more pressure to conform (Krackhardt, 1998).

WEAK TIES TO PERIPHERAL MEMBERS

Leaders in the context of core-periphery organizations coordinate and manage a large body of peripheral contributors who have a high turnover and may only occasionally show up to contribute (Crowston & Howison, 2006b; J. L. Pearce, 1980, 1993). Learning to manage and interact with peripheral members of the organization is a key component of leadership in this context. Weak ties to peripheral members of the organization as one progresses towards a leadership positions both enables potential leaders to learn to coordinate with and manage other peripheral members and provides potential leaders with access to a diverse pool of organizational knowledge. Short, infrequent interactions with peripheral members costs relatively little time and provides access to novel information (Burt, 1992; Granovetter, 1973).

Weak ties to leaders by contrast are not as likely to give as wide of a view of the organization as weak ties to the periphery. Leaders are often well connected with each other in the core and interactions with leaders may not have as much to offer in terms of learning to manage short interactions with members of the periphery.

> H2a: Weak ties to the periphery will have a positive influence on promotion to a leadership role.

STRONG AND SIMMELIAN TIES TO LEADERS

As leaders develop in core-periphery organizations once they have adjusted to the organization and developed a threshold level of commitment the next role

transition into a leadership position greatly benefits from public sponsorship and mentoring from current leaders (Lave & Wenger, 1991). In our hypothesis on the importance of the timing of ties above we discussed at length the role these two processes play in developing leaders. The most effective ties for mentoring, coaching, and sponsorship are strong, stable, and embedded within a community of current leaders (Krackhardt et al., 1992; Krackhardt, 1999). The social and political skills for leadership are not easily transferred and written down, and research has shown this type of tacit knowledge is best transferred through strong ties (Hansen, 1999). Moreover, strong ties and interaction with veteran leaders is the principal means by which potential leaders absorb the subtleties of organizational culture and climate of leadership (Buchanan, 1974; Van Maanen & Schein, E. H., 1979). Since simmelian ties provide even stronger relationships than strong ties, we hypothesize simmelian ties with current leaders will be the most beneficial for developing potential leaders in core-periphery organizations.

H2b: Strong ties to leaders will have positive influence on promotion to a leadership role.

H2c: Simmelian ties to leaders will have a positive influence on promotion to a leadership role.

4.4 METHODS

Within Wikipedia we are able to observe and measure every conversation between contributing members from the time they enter the organization to the time they are nominated for leadership. Contributors are able to discuss how to best edit an article on an article talk page (see section 2.2, and have more directed one-on-one conversations (similar to that of a Facebook wall) through user talk pages(see section 2.3. To understand how the networks of

potential leaders develop over time, we will analyze communication in terms of directed communication on user talk pages between contributors. Leaders in this context will refer to current Administrators, and peripheral members in this context refer to any contributor who is not currently an Administrator.

Social ties were measured as ties via user talk (direct communication) with other contributors within Wikipedia to either periphery members (non-Administrators) or leaders (Administrators). To get a measure of the change in social ties over time, each candidate has their history broken up into three periods: early, middle, and late. Periods correspond to the number of months between the time they began contributing and the date they were considered for promotion. Within the analysis we control for both the number of months they have been active as well as the year they were considered for promotion.

Ties are only considered if they are reciprocal. For communication to count as a tie it must be a two-way conversation on user talk pages. We consider weak ties to be ties with less than six bidirectional communications within the given period which corresponds to 84% of the sample ties. The cutoff point of six ties was chosen to represent previous research showing that about 15% of a person's ties are strong ties, while the remaining 85% are considered strong ties. However, the results and findings from this study are robust across using cutoff points at both four ties and eight ties. Strong ties by extension are any tie that has more than six bidirectional communications within the same time period. Ties are counted as a simmelian tie if the tie between the candidate for leadership and the target of the tie is a strong tie, and there is at least one other Administrator who has a strong tie to both the candidate for leadership and the target of the tie.

The outcome in our model is whether the candidate for leadership was successfully promoted to a leadership position. Since the outcome is binary (1=successful promotion, 0=unsuccessful promotion) the data will be analyzed using a Probit model (Wooldridge, 2002). All behavioral measures from Study 1 are included as control variables.

Data for Study 2 were collected for 2,972 candidates for Administrator positions in Wikipedia. The data range from January 2004 to December 2011, and are the same candidates examined in Study 1.

4.5 RESULTS

Descriptive statistics for both Study 2 variables as well as the control variables from Study 1 are shown in Table 4.1. All social network tie measures are log transformed to normalize the long tail inherent in count measures (Wooldridge, 2002). Probit models are shown in Table 4.2 as a progressive build from Study 1 measures to the full model including all measures from Study 2.

Section 3.10 on page 65 from Study 1 provides information on interpreting probit coefficients. Graphs comparing the relative impact of social network measures on promotion are shown as a three-way comparison in Figure 4.1 on page 90 and a two-way comparison in Figure 4.2 on page 91. A guide to understanding how the graphs in both figures are derived is available in Study 1 in section 3.10 on page 65. Similarly, Study 1 describes in depth the model prediction accuracy measure. Social network tie measures are not standardized in Table 4.2, however, a table is available for comparison of standardized social network ties in Table 1 on page 135 in the Appendix.

In interpreting our results we will begin by discussing the finding shown in Table 1 with Model 1 through Model 5. Model 1 is identical to the model developed in Study 1 examining behavioral categories that lead to promotion. Model 2 adds the total number of ties a candidate has across all time periods and types to the model. We see that the coefficient for Administrative Contributions is no longer significant in Model 2, and the coefficient for Total Network Ties is significant with a coefficient of β=0.187. The R^2 of the model increases slightly from 0.546 to 0.553, however, the prediction accuracy is reduced from 81.09% to 81.00%.

		Mean	SD	[1]	[2]
[1]	Production Contributions (Standardized)	0.00	1.00		
[2]	Organization Building (Standardized)	0.00	1.00	0.74***	
[3]	Interpersonal Interactions (Standardized)	0.00	1.00	0.60***	0.75***
[4]	Administrative Contributions (Standardized)	0.00	1.00	0.68***	0.82***
[5]	Early Ties to Periphery	28.53	105.87	0.16***	0.21***
[6]	Mid-Tenure Ties to Periphery	63.63	203.52	0.21***	0.28***
[7]	Late Ties to Periphery	133.40	300.36	0.26***	0.33***
[8]	Early Ties to Leaders	2.09	4.71	0.23***	0.33***
[9]	Mid-Tenure Ties to Leaders	4.18	7.77	0.31***	0.47***
[10]	Late Ties to Leaders	8.62	11.05	0.42***	0.61***
[11]	Weak Ties to Periphery	216.04	483.49	0.72***	0.76***
[12]	Strong Ties to Periphery	6.05	10.15	0.60***	0.67***
[13]	Simmelian Ties to Periphery	3.02	6.13	0.47***	0.58***
[14]	Weak Ties to Leaders	6.84	10.44	0.49***	0.64***
[15]	Strong Ties to Leaders	1.03	1.88	0.32***	0.37***
[16]	Simmelian Ties to Leaders	0.44	0.95	0.28***	0.29***
	* $p < .05$, *** $p < .001$				

Table 4.1: Descriptive statistics and correlations for Social Capital measures. Behavioral measures are included for correlations. Correlations are continued on the next page.

	[3]	[4]	[5]	[6]	[7]	[8]	[9]	[10]	[11]	[12]	[13]	[14]	[15]
[1]													
[2]													
[3]													
[4]	0.76***												
[5]	0.30***	0.25***											
[6]	0.35***	0.33***	0.42***										
[7]	0.42***	0.41***	0.23***	0.54***									
[8]	0.38***	0.36***	0.52***	0.22***	0.10***								
[9]	0.49***	0.50***	0.28***	0.49***	0.23***	0.55***							
[10]	0.64***	0.67***	0.14***	0.28***	0.46***	0.30***	0.53***						
[11]	0.78***	0.81***	0.32***	0.42***	0.54***	0.32***	0.44***	0.60***					
[12]	0.64***	0.68***	0.23***	0.31***	0.37***	0.34***	0.45***	0.59***	0.69***				
[13]	0.58***	0.51***	0.14***	0.21***	0.24***	0.31***	0.41***	0.53***	0.48***	0.51***			
[14]	0.66***	0.67***	0.30***	0.34***	0.31***	0.52***	0.62***	0.67***	0.69***	0.58***	0.44***		
[15]	0.35***	0.39***	0.16***	0.16***	0.14***	0.36***	0.39***	0.39***	0.36***	0.49***	0.29***	0.44***	
[16]	0.28***	0.30***	0.04*	0.09***	0.07***	0.27***	0.27***	0.30***	0.25***	0.32***	0.34***	0.27***	0.23***

	Model 1	Model 2	Model 3	Model 4	Model 5
Promotion Year	(Included)	(Included)	(Included)	(Included)	(Included)
Months Editing Wikipedia	0.342***	0.370***	0.697***	0.510***	0.534***
Production Contributions	0.933***	0.842***	0.822***	0.782***	0.812***
Organization Building	0.451***	0.463***	0.307***	0.321***	0.242**
Interpersonal Interactions	0.319***	0.191**	0.098	0.123	0.032
Administrative Contributions	0.227**	0.046	-0.079	-0.079	-0.012
Total Network Ties		0.187***			
Periphery Ties			0.072		
Leadership Ties			0.496***		
Early Periphery Ties				0.082**	0.171***
Early Leadership Ties				0.137**	-0.377***
Mid Periphery Ties				0.041	0.054
Mid Leadership Ties				0.045	-0.101
Late Periphery Ties				0.037	0.090
Late Leadership Ties				0.245***	-0.103
Weak Periphery Ties					-0.054
Weak Leadership Ties					0.119
Strong Periphery Ties					0.102*
Strong Leadership Ties					0.768***
Simmelian Periphery Ties					0.132**
Simmelian Leadership Ties					1.246***
R^2	0.546	0.553	0.583	0.572	0.659
p	<.001	<.001	<.001	<.001	<.001
Prediction Accuracy	81.09%	81.00%	82.00%	82.10%	86.10%

Table 4.2: Results from Study 2: Probit model predicting promotion to Administrator position from both behavioral measures and social capital measures.

Model 3 splits Total Ties down to two component parts - Periphery Ties and Leadership Ties. We see that the coefficient for Leadership Ties is significant at β=0.496, while the coefficient for Periphery Ties is not significant. The R^2 of the model improves from 0.553 to 0.583 and prediction accuracy is increased by 1% to 82%. In Model 3 we also see that the coefficient for Interpersonal Interactions is no longer significant. Model 2 and Model 3 serve as a baseline to determine if adding the tie time period and the type of tie adds additional information to the model beyond the number of ties.

Model 4 adds early, mid, and late ties to the periphery and to leaders. As we hypothesized, early ties to the periphery are significant and positive with a coefficient of β=0.082. Interestingly, early ties to leaders are also positive and significant with a coefficient of β=0.137. Mid-tenure ties are not significant in Model 4. Late period ties to leaders are significant and positive with a coefficient of β=0.245. From Model 4 we learn that the benefits of social network ties seem to primarily come from early in a candidates tenure in Wikipedia or shortly before coming up for promotion, but not in mid-tenure. In Model 4 the R^2 is reduced from 0.583 to 0.572 while the model accuracy is increased slightly to 82.10%

Model 5 includes all social network measures as well as all behavioral measures from Study 1. We do not find support for our hypothesis that weak ties to the periphery improve a candidates probability of promotion. Weak ties to either leaders or the periphery are not significant. Interestingly, both strong and simmelian ties are significant and positive for both periphery members and leaders. The coefficient for Strong Leadership Ties (β=0.768) has a much larger effect size than the coefficient for Strong Periphery Ties (β=0.102). Similarly, the effect size for Simmelian Leadership Ties at β=1.246 is much larger than the effect size for Simmelian Periphery Ties at β=0.132. Early Periphery Ties remains significant in Model 5 and increases in effect size to β=0.171.

The coefficient for Early Leadership Ties flips signs from being positive and significant at β=0.137 in Model 4 to being negative and significant at β=-0.377

in Model 5. One interpretation of this change of sign may be that in Model 4 we are not controlling for the overall number of ties, so more ties in the early period means overall more ties which improves a candidate's probability of being promoted. However, in Model 5 we are controlling for the total number of ties by the additional six social network measures added. Given that a candidate has x number of weak, strong, and simmelian ties to leaders, if those ties are in the early period they are not as effective in developing a candidate to be promoted into a leadership position.

The graphs in Figure 4.1 and Figure 4.2 help illustrate the relative effects of social network ties on promotion. Time period graphs are based on Model 4, while tie type graphs (weak vs. strong. vs simmelian) are based on Model 5. All non-significant lines are labeled with an "(ns)" in the name (e.g. "Weak Ties (ns)") for clarity. To effectively compare effects sizes across the distribution of ties all measures in both figures have been standardized with a mean at zero and a standard deviation at one. The left side of Figure Figure 4.1 shows Ties to the Periphery (non-leaders) over the three time periods (top) and across the three types of ties (bottom). We see a small positive effect for Early Periphery Ties, while both mid and late ties are not significant. Across tie types we find that simmelian ties and strong ties to periphery members have a similar effect size, while weak ties have a downward non-significant effect.

On the right side of Figure 4.1 we see that Ties to Current Leaders have the largest impact on promotion in the late period and the early period, while the mid period is not significant. Simmelian ties clearly have the largest impact on promotion, followed by strong ties. Figure 4.2 shows the same models but in each case rather than comparing within periphery ties or leadership ties, it compares periphery ties to leadership ties for each time period and tie type. Weak ties and mid period ties are not significant and therefor not shown. Early network ties both periphery members and leaders impact promotion with approximately the same effect size. Each of the other illustrations - late ties,

strong ties, and simmelian ties in Figure Figure 4.2 clearly shows a strong benefit for candidates to connect with leaders rather than periphery members.

4.6 MEDIATION ANALYSIS

We see in Table 4.2 that both Administrative Contributions and Interpersonal Interactions are no longer significant when we add social capital measures to the model in Model 5. From this data and from our qualitative understanding of this organization we see a possible mediation relationship in which the influence of Interpersonal Interactions and Administrative Contributions may influence Promotion to Leadership through ties to leaders. In this context, the administrative work that candidates do could help to get them noticed and in contact with leaders, which in turn makes candidates more likely to be promoted to a leadership position.

We tested this mediation hypothesis using a Structural Equation Model in M-Plus. Since weak leadership ties were not significant, they are not included in the empirical model. The model included all behavioral measures from Study 1, as well as Strong Leadership Ties and Simmelian Leadership Ties, with an indirect path from Interpersonal Interactions and Administrative Contributions through both tie measures, shown in Figure 4.3. Tests for mediation did not find significant effects for Interpersonal Interactions, however, we found support for a mediation effect for Administrative Contributions.

Following the test for mediation in Baron and Kenny (1986) , we see that first the direct path from Administrative Contributions to Promotion to Leadership is significant (Figure 4.3 Part A). Next, we see a direct significant relationship between Administrative Contributions and both Strong Ties to Leaders ($\beta = 0.08$) and Simmelian Ties to Leaders ($\beta = 0.07$)(Figure 4.3 Part B). Lastly, we see that when social capital measures are included in the model, Administrative Contributions are no longer significant, and Strong Ties to Leaders ($\beta = 0.77$) and Simmelian Ties to Leaders ($\beta = 1.25$) are significant

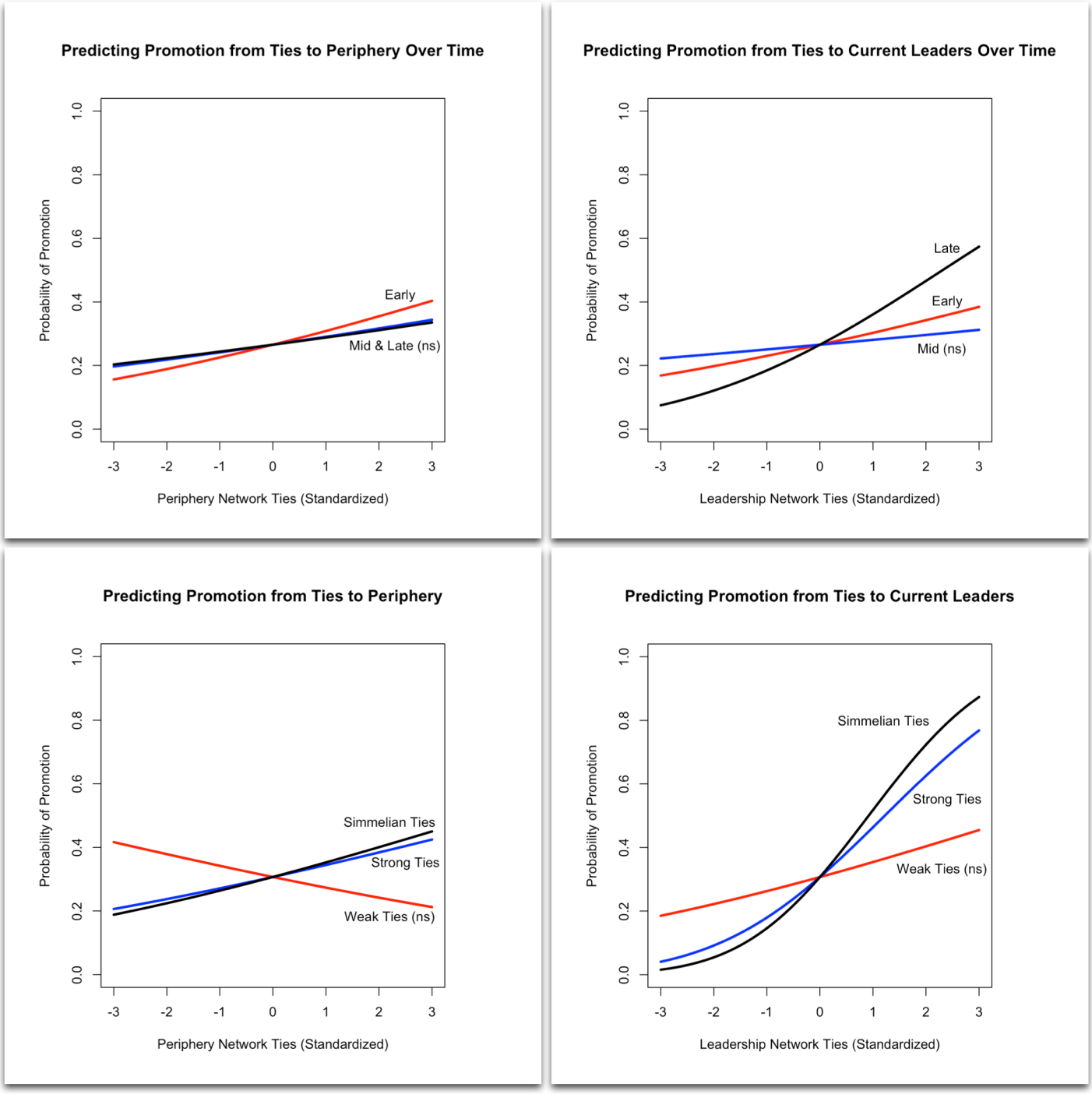


Figure 4.1: Probit model predicting promotion from social capital. Graphs on the left are ties to periphery, graphs on the right are ties to leaders. Y-axis shows the predicted probability of promotion, x-axis shows the standardized network tie measures (mean = 0, x values show the number of standard deviations above or below the mean).

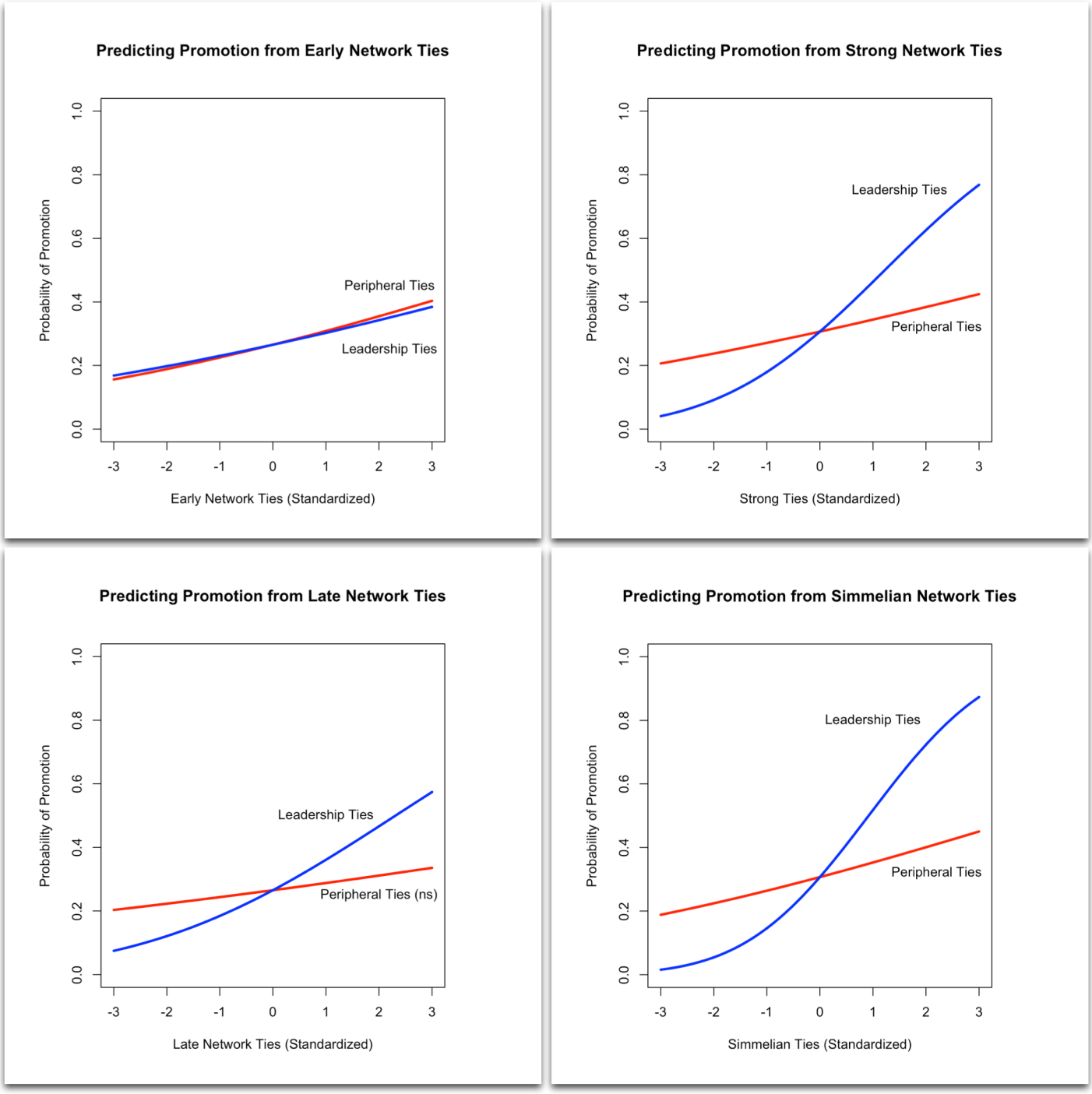


Figure 4.2: Probit model predicting promotion from social capital. Graphs on the left compare leaders to periphery over time, graphs on the right compare leaders to periphery by tie type.Y-axis shows the predicted probability of promotion, x-axis shows the standardized network tie measures (mean = 0, x values show the number of standard deviations above or below the mean).

Figure 4.3 Part C). The total indirect effect of Administrative Contributions on Promotion to Leadership in the Structural Equations Model is significant at $\beta = 0.115$, p <.001.

4.7 FURTHER QUALITATIVE ANALYSIS

Communications patterns between contributors of Wikipedia clearly demonstrate the value of strong and simmelian ties to leaders and peripheral members of the organization. The social network analysis conducted in this study also demonstrates the value of early ties to peripheral members of Wikipedia, and later ties to current Administrators. To further explore the benefits of these ties qualitatively and to better understand the nature of the content of these communications ties we collected text samples of communications that are coded as by the time period, tie type (weak, strong, simmelian) and tie target.

Text samples include communication on user talk pages. While our the software code was analyzing the structure of the network ties, the content of each tie was saved in individual text files separated by the nature of the tie. After a qualitative reading of a random sample of 100 text communications of each tie type, quotes from text communications are shown that illustrate and clarify the benefits of social network connections to developing leaders in Wikipedia.

In reading through the communications content of ties to periphery members vs. ties to leaders one clear pattern emerges: communications to periphery members involves much more production-oriented discussions and suggestions than communications with leaders. Peripheral members help new contributors to learn the production processes and the culture in Wikipedia, while Administrators communicate more frequently about organization level issues and administrative tasks.

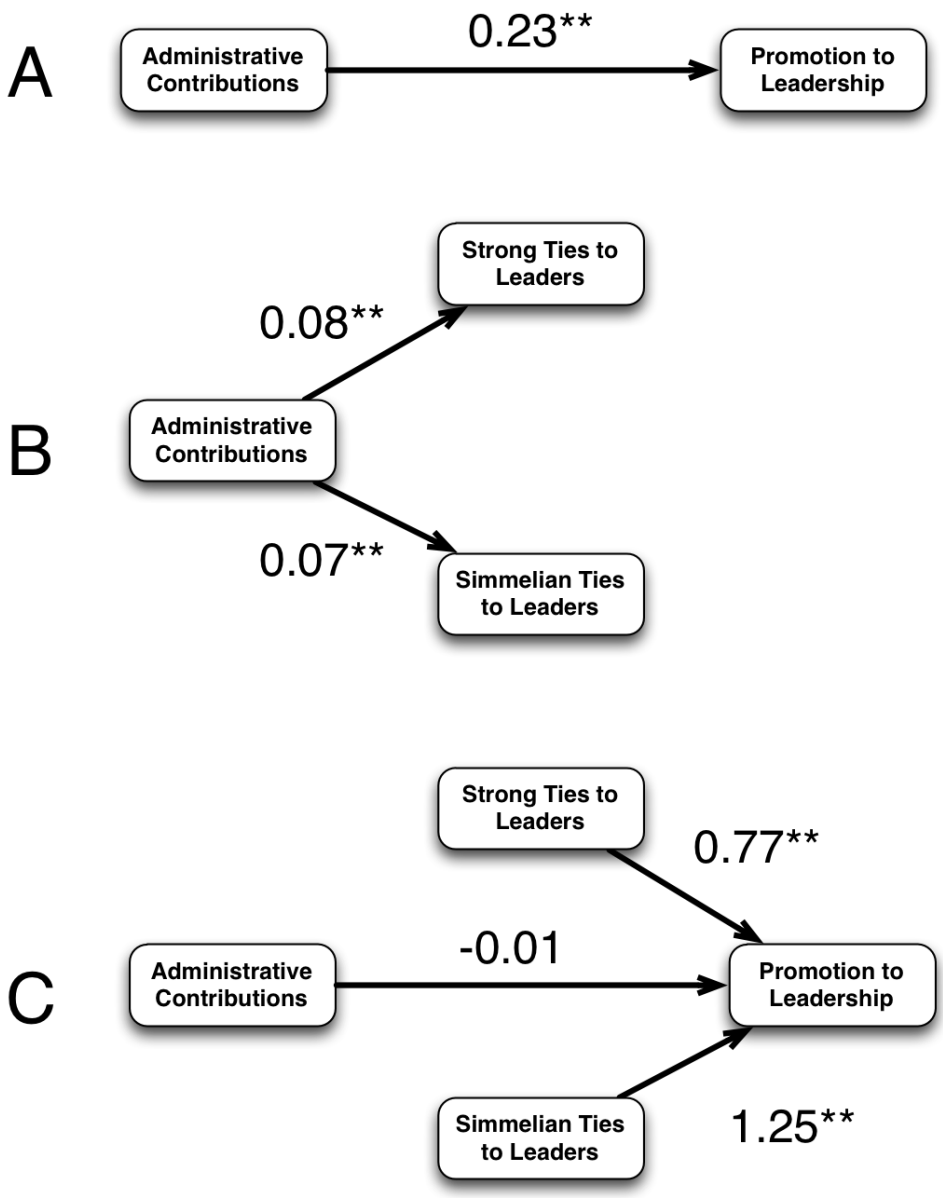


Figure 4.3: Diagram showing mediation analysis of Administrative Contributions on Promotion to Leadership through the paths of Strong Ties to Leaders and Simmelian Ties to Leaders.

STRONG AND TIES TO PERIPHERAL MEMBERS

In looking through discussions candidates had that were coded as strong ties to the periphery, we see both encouragement from others to continue production work, and tips and suggestions on how to improve as an editor. Peripheral members frequently sent encouraging messages to new editors. For example, below an editor provides a simple encouragement about a new editor's article quality.

> Who rocks? You do! Great job on [[Province of Carolina]] - I'm going to try to do my share on [[Province of Georgia]] when my books come in at the library–everything else is quick and dirty of the web. Anyway, just wanted to compliment you on the awesome work. :)

In another example, one peripheral member encouraged a new contributor who was having doubts about his/her contributions because English was his/her second language.

> Hey, you thanked me for copyediting your work on Stane, and apologized for mixing up some of the "little confusing words" in English. I just wanted to say, KEEP WRITING! Who CARES if English is your second language? That's the beauty of wikipedia. I teach English and majored in English: I love grammar and enjoy just surfing around to add commas here and there! It's EASY to fix the spelling ... the hard part is all the research, so KEEP IT UP!

In addition to encouragement during a contributor's early period of editing, peripheral members provided suggestions on how Wikipedia works and how to effectively edit. In the following exchange, a peripheral member explains

how to use HTML code within Wikipedia, and how the software that runs Wikipedia handles the back end.

> There is a stylesheet, but it doesn't seem to be officially documented, so I think one shouldn't make reference to it in an article. Mediawiki (the software that runs wikipedia) does take out several HTML tags (and scripts and stuff) but it leaves in "style" directives. So this means one can use CSS, but one can't really reference a stylesheet (which kind of defeats the purpose of CSS). Thus you'll see only very small uses of CSS, almost entirely to do with floating tables and graphics.

Similarly, a peripheral member that had been collaborating on an article with a new contributor gives advice on using edit summaries - a comment that goes along with each edit to let other editors know what was changed and why. While the summary box is at the bottom of every edit screen, it is not required to fill out. New users may not know that it is in the organizational culture to fill out an edit summary for each and every edit.

> Please note what changes you made to articles by filling in the bottom field called "Summary:". Otherwise, other people have to go fishing for them to see what's different, trying to compare old version with new, which is not fun at all.

One reason we don't see a significant impact of weak periphery ties on promotion may be that encouragement and suggestions like we saw above happen in the context of ongoing collaboration and do not happen as frequently when editors do not interact more regularly. For example, for another editor to (1) notice and (2) be motivated enough to provide the suggestion in the quote above regarding edit summaries, the two editors may have to have already

been (1) working together regularly and (2) have the expectation that they would likely be working together on content in the future.

SIMMELIAN AND TIES TO PERIPHERAL MEMBERS

One pattern that emerged from reading the communications between contributors with simmelian ties to peripheral members was that editors with simmelian ties seemed more likely to be embedded in a particular topic or area of Wikipedia. For example, one editor in a simmelian peripheral tie refers to the tie in asking for help with the topic "Indian political parties".

> Hi. [simmelian tie] tells me that you may be knowledgeable about Indian political parties - The [[List of political parties in India]] is a mess! I'd appreciate any help in trying to sort it out. Thanks for your help.

Examples of similar topical collaborations were common across topics such as medicine, religion, military history, and pop culture. In the example below three editors in a simmelian tie all discuss edits to article on the Christian religion.

> The same problem used to exist in the entries on [[prayer]], [[prophecy]] and [[revelation]], where people used the same word to descrive radically different ideas. Wikipedia now has clear descriptions of these different meanings. Perhaps we could compare the structure of those articles, and apply it to the [[predestination]] article.
> - Editor B writing on Editor A's page

> Just noticed you're interested in writing about [[ecumenism]]. When you get to that, you might want to take a look at the [[religious pluralism]] article. It could probably use some help itself, plus some

> material there could probably be moved to or replaced by a good ecumenism article, with a link from religious pluralism pointing to it.
> - Editor C writing on Editor A's page

> I was wondering if you could take a look at the [[Great Apostasy]] article? I fear I may have over-slanted the last paragraph or two; other parts could probably use help as well. Thanks again for your work.
> - Editor C writing on Editor B's page

From an examination of the social network ties we see when editors become embedded in a simmelian tie to periphery members, it is likely due to their shared topical interest. This shared interest and community may increase group identification, similar to a WikiProject, and lead to higher commitment to Wikipedia and to fellow editors (Kittur et al., 2009).

STRONG TIES TO LEADERS

In contrast to the communication ties with peripheral members, communication ties with leaders contained substantially more references to policy discussions and administrative tasks. The neutral point of view (NPOV) policy requires a significant amount of interpretation for applying it to specific situations. In the quote below, an editor who later became a candidate for promotion interpreted NPOV to mean if a statement is not balanced for both points of view it should be deleted. Through several discussions and interactions, an Administrator explains that if there is an NPOV problem, the best way to fix it is to find a way to add the missing point of view.

> I think I understand your concern, but that's not what NPOV is about; it does not dictate the removal of factual material, in fact

> the rule is to add more material to represent the alternate points of view. [...] It doesn't serve our readers well to reduce WP articles down so far that they don't say anything beyond a bare recitation of names and dates [...] So achieve balance by adding facts, not deleting them.

In examining strong ties to leaders I also found many references to administrative work the editor was doing, and receiving recognition by an Administrator for their efforts in helping with administrative work. Many administrative tasks involve periphery members nominating a change, coming to consensus on that change, and then having an Administrator execute the change. Through administrative tasks editors learn both how to do the administrative work of leaders, as well as developing social connections to leaders.

> As an admin I greatly appreciate you helping catch candidates for speedy deletion. I notice you also help out with possible copyright violations. I thank you for helping out, would you like to become an [[Wikipedia:Administrators|Admin]] yourself? I'd be more than happy to nominate you.

SIMMELIAN TIES TO LEADERS

When reading social network communications within simmelian ties to leaders, I found a similar types of conversations as with strong ties. However, the nature of the simmelian ties seemed to indicate that the editor had become actively engaged in a community of leaders more than with strong ties.

The largest policy split in Wikipedia is the difference between "inclusionists" and "deletionists". Inclusionists tend to think that most articles that someone has taken the time to write and properly cite are worth being considered notable since Wikipedia is not limited by printed pages. Deletionists tend to want only

highly notable topics for articles, and want to keep the quality bar very high so as to be more comparable to a printed encyclopedia.

In the strong tie example above, one Administrator explained a policy and the remedy for the policy to an editor. In the example below, two Administrators are engaged in a discussion about an unclear inclusionist/deletionist policy, and an the editor has joined in giving their perspective.

> My comment was part of this very long discussion with [[User: Administrator]] (see warning) about deletionism. You seemed to be of the inclusionist persuation. My comment was more tongue-in-cheek, and an inappropriate jibe at inclusionism - I will remove it if you like

In other simmelian tie communications I found evidence to suggest an editor had become so embedded into ties with Administrators that the Administrators did not realize the editor did not have Administrator status. In fact, in many Request for Adminship discussions that I qualitatively coded, the person nominating the candidate would say something akin to "this editor has done so much and been around so long I can't believe this editor is not already an Admin!" In the example below, another Administrator had delegated a task to this editor who did not have the Administrator privileges to perform the task (deleting articles). A different Administrator in the simmelian tie offers to help and clearly trusts the editor's decisions.

> I noticed that [[User:Administrator]] seems to have delegated the Xena mess to you. [...] **I think he assumed you're an admin. Although you aren't, you're the best person I know of to sort the mess out.** The VfD consensus seems to give a carte blanche on deleting these things. Anyway, I know absolutely nothing about Xena, but I'll volunteer to do the actual deletions if you point me to list of Xena articles that you think should be deleted.

While strong and simmelian ties to both periphery members and leaders improve a candidate's likelihood of becoming a leader, from a qualitative analysis of the text we see the mechanisms underlying the ties appear to be performing different functions. Strong ties to periphery members early on help an editor learn the ins and outs of Wikipedia through article editing. Simmelian ties to periphery members provide a community around a particular topic, such as medicine, religion, or history, that helps editors develop commitment to the organization and a community to learn from. Strong ties to Administrators help editors learn about administrative work and organization building skills such as applying policy. Simmelian ties to Administrators perform a similar function as strong ties, but often also signal that the editor is learning to operate as a peer to other leaders, and engage at a high level with current leaders.

4.8 DISCUSSION

Drawing from work by Lave & Wenger (1991), we hypothesized in H1a that early ties to periphery members of Wikipedia would be most beneficial to help them learn production behaviors and be socialized into Wikipedia culture and practices. Our empirical model found strong support for this hypothesis H1a. Candidates who had one standard deviation more ties than the mean had a 4.34% greater probability of being promoted than candidates at the mean. While this is a modest effect size, it is still positive and statistically significant.

Drawing on social network theory (Brass & Krackhardt, 1999), we hypothesized in H1b that later ties to leaders in Wikipedia would be beneficial mentoring and knowledge transfer to help editors learn leadership skills in organization building and administrative contribution. Our study found mixed empirical support for H1b. In Model 4 we saw that before tie type is added to the model, late leadership ties are a significant predictor of promotion. However, when controlling for tie type, the effect is no longer significant. However, in

Model 5 we also see that when controlling for tie type early leadership ties are a significant negative predictor of promotion. One interpretation of this finding is that mid-tenure and late leadership ties have a positive effect on promotion, and the effect is lessened for early ties.

In hypothesis H2a we posited that weak ties to peripheral members would be a significant predictor of promotion. This hypothesis was not supported by our empirical model. Our empirical model suggests that strong and simmelian ties to peripheral members are positive and significant, and that simmelian ties have the largest effect of all tie types to the periphery. In our followup qualitative study examining the content of the ties, we found evidence to suggest that these ties are largely task oriented, and that new editors need to have regular contact with peripheral members to benefit from the task knowledge transfer. We also found qualitative evidence to suggest that simmelian ties represent ties centered around a topic. These topic-based ties may be helping new editors build a community and develop commitment and attachment to other editors and to Wikipedia.

In H2b and H2c we posited that the tacit knowledge transfer, mentoring, and coaching related to organization building behaviors and administrative responsibilities is best transferred through strong and simmelian ties to leaders. Our empirical model provides strong evidence to support both hypotheses. Simmelian ties to leaders have the largest effect of any tie in the model, demonstrating that being embedded in a group of leaders is a more effective way for editors to develop leadership behaviors than a strong tie.

Overall we learned that social capital plays a large role in developing leaders in core-periphery organizations, above and beyond the four behaviors examined in Study 1. The accuracy of our predictions in the model with all social capital measures was 86% while the accuracy of the predictions with just the behavioral measures was 81.09%. Implications for theory and practice from both Study 1 and Study 2 are discussed in Chapter 5.

Chapter Five

Discussion

> Increasingly employees are going to be volunteers, because a knowledge worker has mobility and can go pretty much every place, and knows it. Businesses will have to learn to treat knowledge workers as volunteers.
>
> *A conversation between Jim Collins and Peter Drucker*
> Peter Drucker

5.1 IMPLICATIONS FOR PRACTICE

Clearly retrospective production behaviors such as article editing quantity and article editing quality provide substantial benefit in developing leaders in Wikipedia. Much like in open source software projects and in the academic community, the production of content provides the necessary experience to be able to lead others to do the same. Wikipedia Administrators play a key role in resolving conflict and developing policy, but without the hands on experience of producing article content they would be as effective in their leadership role.

Leadership in Wikipedia is clearly not simply a reward for production or a purely status symbol. To be selected as a leader one must demonstrate experience in interpersonal communications, administrative contributions, and

organization building. These key building blocks of leadership in core-periphery organizations help shape leaders to form and enforce the policies and processes that guide the organization to be effective.

Leaders clearly do not simply arrive in core-periphery organizations, they are made and developer over time. Commitment, socialization, and mentoring processes that are key to developing potential leaders happen in a social context. By examining the social networks of organizational contributors over time we find clear differences in the impact of social networks on leadership. Early in a member's tenure we showed that ties to periphery members are important and help develop production skills and embed them in a community of peers with similar interests. In developing leaders in traditional organizations it may seem intuitive to pair new entrants into the organization with current leaders. However, this study suggests that in core-periphery organizations new entrants to the organization are best socialized by other entry level or non-leadership members. When considering work done on situated learning and legitimate peripheral participation, this finding lines up with Lave and Wenger's (1991) observations in trade organizations that early on apprentices largely learn from other apprentices.

Counter to our hypotheses, we found that strong and simmelian ties to peripheral members are superior to weak ties in developing future leaders. Our qualitative followup suggests ties to peripheral members are task oriented in nature, and the learning process of becoming familiar with the tools, culture, and Wikipedia practices happens most effectively in stronger social ties.

As organizational members spend more time in the organization and develop the rudimentary skills and begin to adapt to the culture, current leaders can play a large role in helping them transition into a more central leadership position. However, our finding suggests that when considering a mentoring or relational program to pair leaders with non-leaders, one should consider using small groups of strong ties to best develop leaders. Strong ties to leaders in core-periphery organizations played a significant a role in developing leaders,

however, simmelian ties to leaders embedded in groups showed showed an even stronger impact on the development of future leaders.

More broadly, while a significant portion of leadership development research focuses on developing leadership skills and selecting people with certain personality traits (Day, 2001), more attention should be given to the social capital of emerging leaders. The social networks of organizational members over time ultimately play a large role in developing newcomers into organizational leaders. Social network connections play a different role over time depending on the tenure of the individual in the organizations (Brass & Krackhardt, 1999). This study provides theory and evidence to suggest that both individuals seeking to be leaders and organizations seeking to develop leaders from within may benefits from understanding the underlying social networks in the organization.

5.2 LIMITATIONS

As with any study that does not use an experimental approach, caution should be taken when interpreting causation. While our study attempts to control for appropriate variables, it is based on correlational data which has the limitation of not being able to clearly demonstrate causality. Future work should attempt to add an experimental approach that can show causality using a control and treatment group.

All studies in this paper were carried out in the context of Wikipedia, which is a very specific culture and may not generalize to all other core-periphery organizations. Research on core-periphery organizations needs to be undertaken in multiple other contexts to verify the generalizability of findings in this study.

Our study captures communications through user talk pages, however, within Wikipedia there are other methods for contributors to communicate. Contributors may be communicating on policy discussions and article talk pages, which are not accounted for in the social networks in this study. Contributors may also use email, or communicate through IRC channels.

Since our context is in a virtual organization, there is no guarantee that contributors are not using multiple user names. Since our sample consists of very active users, and reputation in Wikipedia is largely based on building a history of edits, our data assumes that none of the contributors are using multiple user names.

5.3 FUTURE RESEARCH

In Study 2 we examined tie strength using communication frequency to distinguish strong and weak ties. Simmelian ties were measured as three or more contributors connected through a strong tie. Previous research suggests that communication is more frequent in embedded ties such as circles of friends rather than strong ties without mutual strong connections. One hypothesis that we cannot rule out with the data examined is whether the benefits of simmelian ties to leaders and peripheral members are due to increased communication in simmelian ties compared to strong ties. Future research should examine communication frequency and determine what portion of the benefits of simmelian ties may be due to increased communication frequency.

Social network research examines a variety of types of networks such as advice, friendship, information, trust, and communication networks. Our study focused solely on communication networks, and did not examine the contents of the communication. Networks built on mentoring or advice may have a different effect on promotion to leadership than networks built on information exchange or other forms of communication. Future research should explore the content of the communication networks to better understand the nature of the ties, and the benefits of each type of communication.

To understand the development of leaders in core-periphery organizations, this research has focused exclusively on Wikipedia as a prototypical core-periphery organization. However, there are other many other features of Wikipedia that distinguish it from a more traditional hierarchical organizations

such as its reliance on volunteer contributors, the distributed and virtual nature of the organization, and the size of the organization. To have a better understanding of the bounds and scope of the findings in this research, future work should extend to other core-periphery organizations that differ on these dimensions.

In Study 2 we examined the mediation relationship between Administrative Contributions Promotion to Leadership through Strong Ties to Leaders and Simmelian Ties to Leaders. However, another interpretation of this finding could be that rather than administrative contributions increasing communication with leaders, which increases their likelihood of promotion (mediation), it could be that both administrative behaviors and communication with leaders are indications that a candidate is acting like a leader. In that case, communication with leaders is simply a stronger measure of a candidate's leadership behaviors and causes the main effect of Administrative Contributions to become non-significant when added to the model. Future research should attempt to tease apart these two competing models using additional instrumental variables or other methods to distinguish the causal relationship.

5.4 IMPLICATIONS FOR THEORY

Management scholars and practitioners have suggested that organizations are becoming more like Wikipedia and less like the traditional hierarchical organizations of the past (Arthur & Rouseau, 1996; Manville & Ober, 2003). As many organizations move towards a model that more closely resembles Wikipedia than Microsoft or General Motors, research on leadership in core-periphery organizations is needed to address new leadership challenges. While the findings from our study in Wikipedia may not generalize to all core-periphery organizations, the central three drivers discussed below that cause Wikipedia to naturally form a core-periphery structure are also the key drivers causing

many other organizations to operate more like a volunteer organization and a core-periphery organization than a hierarchical organization.

We will first provide a few examples of organizations that are operating with a core-periphery structure, then discuss the mechanisms that are causing this structure to emerge. We then discuss the new challenges of leadership in core-periphery organizations, and conclude by relating the findings of the present study to address the new leadership challenges in core-periphery organizations.

EXAMPLES OF CORE-PERIPHERY ORGANIZATIONS

In the private sector, citizen scientists and citizen journalists are an example of core-periphery organizations. In both cases the product being developed is an output that is aggregated, edited, or put together by a core group of often paid scientists or journalists who are leveraging an extended group of volunteer or piece rate paid contributors. Citizen journalists can be used in the case of finding on the group stories, providing difficult to get photography, and providing a broader context to the story that a local citizen may have that an outside journalist may not.

In the government sector campaigns are often run in a core-periphery model with paid campaign staff, dedicated volunteer staff, and occasional contributors who may canvas a day or two, go door to door, or help to run a onetime event. Similarly in the government sector, congressional caucuses where a wide body of congressional members belong to a group such as wildlife interests, environmental interests, and financial interests to gain information. Typically a core of members are dedicated to the cause and are actively creating legislation in the area, while many of the members simply attend for information and networking purposes.

Lastly, in virtual organizations such as Wikipedia a core group does long term coordination, policy, and conflict resolution while the larger contributor group does occasional contributions to improving articles. Similarly, in open

source software development a vast majority of the code written and the final decision making on what is committed to the final code repository is done by a small group of developers while a much larger group of peripheral contributors submit smaller pieces of code to the project.

Table 5.1 provides a variety of examples of common core-periphery organizations across government, private sector, academic, and virtual contexts.

DRIVERS OF CORE-PERIPHERY ORGANIZATION FORMATION

In her work on volunteers, Pearce presented evidence supporting her claim that since volunteers simply do not spend as much time at work, volunteer organizations often develop a "social network structure in which a central person or group in the 'core membership' interact(s) with all other individuals (the 'periphery'), who interact only with the core members" (J. L. Pearce, 1993, pg. 10). Pearce later goes on to point out that this "bifurcation of the membership was present in all of these volunteer-staffed organizations" (J. L. Pearce, 1993, pg. 48). Pearce draws on her study of seven different volunteer organizations, and explores the differences between volunteer organizations and traditional organizations. Her study suggests several key differences that could influence the emergence of the core-periphery model: (1) communication and contact between volunteer members is qualitatively different, and more transitive in nature, (2) roles, job responsibilities, and organizational membership are less formalized, (3) work is divided differently than in a traditional organization, (4) rather than hierarchical authority from positions, the "core" set of members derives authority from experience and commitment, (5) volunteer organizations often have lower standards for performance and selection criteria due to understaffing.

Synthesizing the observations Pearce makes, we suggest three key drivers that lead an organization to emerge as a core-periphery structure: (1) lack of or reduced clarity in pre-defined roles, (2) high variability in time commitments and motivation, and (3) low barriers to entering the organization.

Type	Organization	Core	Periphery
Government	Political Election Campaigns	Campaign Staff	Campaign Volunteers
Government	Congressional Caucuses	Council / Elected Officers	Caucus Members
Private	Cross-Organizational Teams	Dedicated Employees	Peripheral / External Employees
Private	Citizen Journalism	Professional / Paid Journalists	Amateur Journalists
Private	Citizen Scientists	Professional / Internal Scientists	Amateur / External Scientists
Non-Profit	Red Cross	Full time employees	Volunteer staff
Non-Profit	UNICEF	Full time staff / Core volunteers	Volunteers
Academic	Research Centers	Steering Committee / Board of Directors	Contributing Faculty
Academic	Professional Organizations	Board of Governors / Conference Chairs	Organizational Members
Virtual	Wikipedia	Administrators / Bureaucrats	Editors / Contributors
Virtual	WikiVersity	Catalysts / Custodians	Editors / Students
Technical	Intuit Live Communities	Superusers	Community Member
Technical	Microsoft Developer Network	Microsoft MVP's	Network Member
Open Source	Apache	Apache Group	Contributors / Developers
Open Source	GNOME	Foundation Members	Project Members
Open Source	Debian	Project Leaders	Contributors

Table 5.1: Examples of Core-Periphery Organizations.

Reduced Role Clarity

In traditional hierarchical organization employees are generally hired for a specific role - sales, marketing, finance, or engineering. Their role was created to fill a need, and performance guidelines for what is required of that role are generally clearer than in a volunteer organization. Performance is regularly evaluated so employees may come up for pay increases or promotion. While this is not true of all organizations or positions, it is generally more common in hierarchical positions in organizations than in core-periphery positions. With a lack of clear roles as to what differentiates one volunteer from another, it becomes unclear as to how a leader may develop differently in a core-periphery model. Research on social networks have found that promotion and leadership positions are more likely to be given to people who span the boundaries of roles and organizational hierarchies (Burt, 1992), however, with a lack of roles and hierarchies it is unclear what a boundary spanner would look like. In addition, with a lack of clear performance guidelines and systematic reviews, the typical sorting mechanisms inherent in tournament style promotion systems for leaders do not apply to core-periphery models of organizing.

High Variability in Time Commitments

While many traditional organizations may have a mix of part time and full time positions within the organization, there is a drastic difference in the variability of time commitments and motivational difference in core-periphery organizations. Volunteers may show up a few hours a week to a few times a year and still consider themselves regular volunteers in an organization. Few paid positions would have a similar role defined in hierarchical organization. With such drastic differences in time commitments a potential leader must have a different set of transactive and transformational skills.

Leaders must accommodate and work with both seasoned and dedicated volunteers as well as peripheral volunteers who show up on a very occasional basis. It is unclear whether developing leadership skills in this context could best be accomplished by contact with peripheral members to get a broad

understanding of the organizational context and the organizational members or whether contact with other seasoned leaders who would pass down knowledge on how to handle peripheral members indirectly would be a better approach to leadership development.

Lower Barriers to Entering the Organization

Very few core-periphery organizations would fire someone who showed up to contribute or refuse contributions from an under qualified volunteer. In the workplace there is often an elaborate recruitment and selection process by which employees are hired. Employees must have the appropriate skills, go through the appropriate training, and have an adequate level of sustained motivation in their job. In a core-periphery context periphery members often simply show up and expect to contribute (J. L. Pearce, 1993). A leader in this context must develop the ability to create ties with peripheral members quickly, to direct work and coordinate, while at the same time maintaining ties to the core leadership group who do a bulk of the coordination and long term building of the organization.

5.5 CONCLUSION

These three phenomenon driving organizations are important for several reasons. The first is that many of them transcend volunteer organizations and can occur in volunteer, mixed paid / volunteer, and all paid staff. Second, these drivers are important because they not only change the underlying organizational structure, but the potential development processes of leaders as well. Table 5.2 provides an overview of the new challenges to leadership in core-periphery organizations.

With the less formalized basis of authority that comes from hierarchy, leaders in core-periphery organizations must earn their place in the core through a combination of retrospective and prospective contributions to the organization. Both criteria in Wikipedia strongly influence which candidates were promoted

Hierarchy	**Network**	**Mechanism**	**Impact on Leadership**
Emphasis on leading organizational members	Dual emphasis on leading organizational members and on the production of knowledge work	Production behaviors, influence mechanisms	Leaders may be promoted for either strong social and organizational skills or for their ability to produce knowledge goods
Followers generally have predictable (full time or part time) time commitment to organization	Followers have drastically different time commitments to the organization	Communication patterns	Leaders must balance strong communication with peers and ephemeral communication with volunteers
Typically includes authority over increasing numbers of individuals through progression	Lack of middle management	Organizational building experience	With no formal experience in organizational building leaders may have to seek out informal organizational building opportunities
Roles and responsibilities are formalized	Roles and responsibilities are less formalized and often nonexistent	Role clarity	With the role of occasional contributor, regular contributor, and leader not well defined, the mechanisms and behaviors that lead a member to transition into higher levels of participation and influence are unclear
Formalized authority from position	Little or no formal authority over followers from position. Informal authority is gained through experience and meritocracy	Basis of Authority	Authority may be gained from production behaviors, social behaviors, community building, or social network connections
Heavily involved in managing organizational boundaries (hiring new members, firing underperforming members)	Organizational boundaries are reduced, membership often requires lower standards	Mentoring, tacit knowledge transfer	Organizational membership may be ephemeral, leaders may have to wait until members demonstrate sustained commitment before investing time and resources mentoring newcomers
Promotions to leadership positions often accompany increases in salary	Promotions to core positions may lead to more status but no increase in salary	Post promotion performance	Once members gain the status associated with leadership, they may lose the incentive to contribute as heavily

Table 5.2: Leaders in Hierarchical Organizations vs. Core-Periphery Organization

and which were not. Much like department heads at universities must earn their place in the field through their publication record before they lead a department, leaders in core-periphery members must contribute through production or technical means. However, leadership in Wikipedia is not simply a reward for production. Experience in organization building, interpersonal interactions, and administrative contributions contributors play a large role in the development of contributors into core leaders.

In core-periphery organizations, roles are much less formally defined. New members may benefit in defining their own role by embedding in a simmelian tie or small group with other contributors based on similar interests. Those contributors who embed in groups may develop more commitment to the organization and contribute with more direction than members who do not develop strong connections with other periphery members.

With lowered boundaries for entering and leaving in a core-periphery organization, leaders and core members may not have time to develop the talents and effectively socialize new members. In our study we saw periphery members playing a large role in developing new contributors through strong and simmelian ties. Later, once contributors had learned production tasks and were more stable in the organization, strong and simmelian ties to leaders allowed contributors to develop the higher level leadership qualities to move into a leadership position.

Without a hierarchy to progress through potential leaders must actively seek out organization building opportunities. We saw that engaging in policy discussions, assisting with enforcing policy, and receiving awards for leadership and teaching predicted who would be promoted to a leadership position. When looking for new leaders, rather than promoting through a hierarchy, perhaps the most effective way to find formal leaders may be to look for contributors who are already taking on informal leadership roles and being noticed by others in the organization as informal leaders.

This study has contributed to both theory and practice by taking some first steps in identifying behaviors and social network connections that lead contributors to develop into leaders in core-periphery organizations. As organizations continue to evolve through the use of technology, increased knowledge work, and a globalized economy, more research should examine how to effectively develop leaders in 21st century organizations.

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Appendix A: Cluster Analysis for Survey Measures

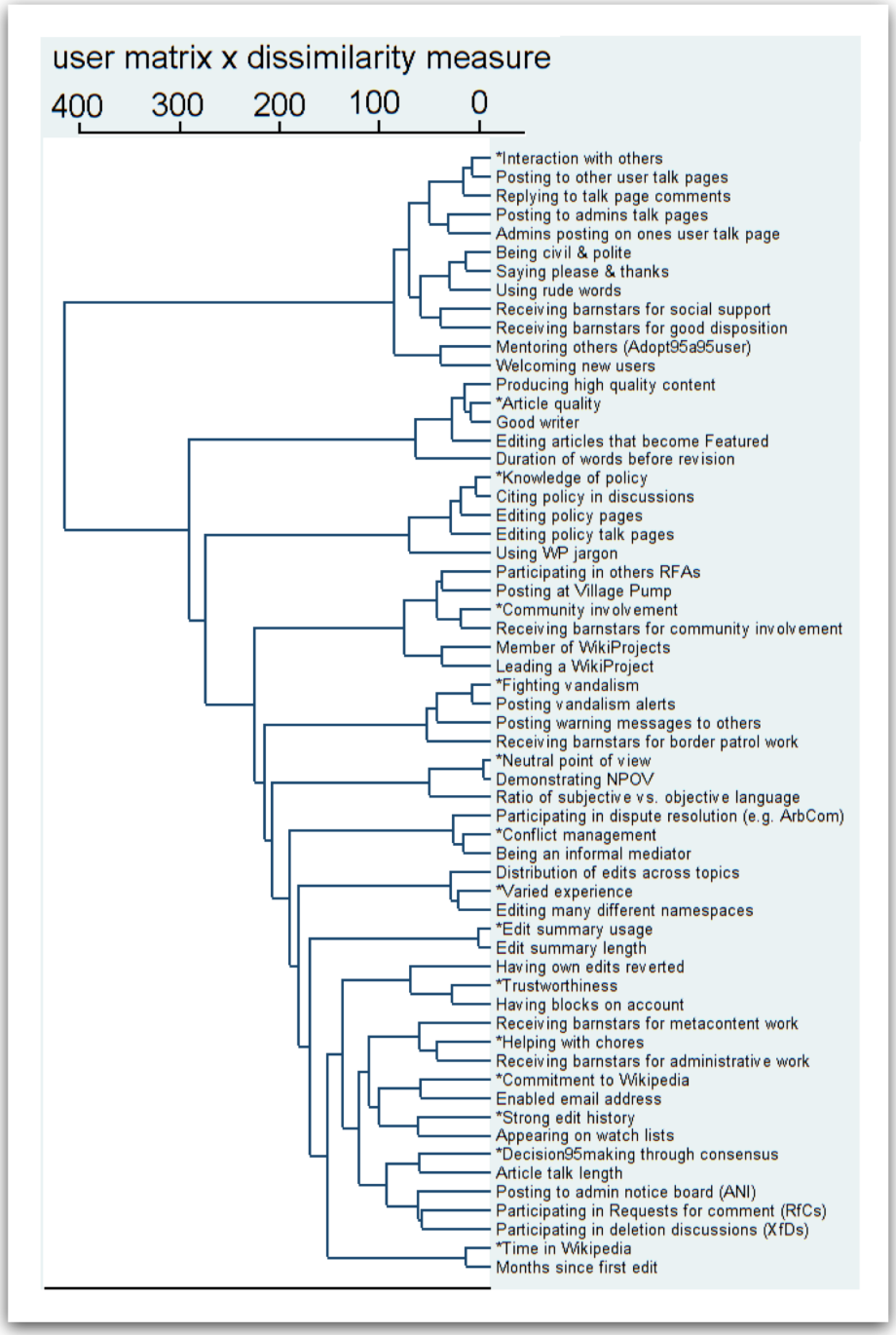

Figure 1: Dendrogram for Wardslink cluster analysis of measurement model for Survey Part I in study 1. Connections show items that were placed together frequently by participants. As links move farther to the left items become less similar.

Appendix B: Standardized Model Results from Study 2

	Model 1	Model 2	Model 3	Model 4	Model 5
Promotion Year	(Included)	(Included)	(Included)	(Included)	(Included)
Months Editing Wikipedia	0.342***	0.370***	0.697***	0.510***	0.534***
Production Contributions	0.933***	0.842***	0.822***	0.782***	0.812***
Organization Building	0.451***	0.463***	0.307***	0.321***	0.242**
Interpersonal Interactions	0.319***	0.191**	0.098	0.123	0.032
Administrative Contributions	0.227**	0.046	-0.079	-0.079	-0.012
Total Network Ties		0.187***			
Periphery Ties			0.072		
Leadership Ties			0.496***		
Early Periphery Ties				0.128**	0.265***
Early Leadership Ties				0.111**	-0.307***
Mid Periphery Ties				0.075	0.099
Mid Leadership Ties				0.046	-0.103
Late Periphery Ties				0.068	0.163
Late Leadership Ties				0.271***	-0.114
Weak Periphery Ties					-0.098
Weak Leadership Ties					0.130
Strong Periphery Ties					0.105*
Strong Leadership Ties					0.413***
Simmelian Periphery Ties					0.126**
Simmelian Leadership Ties					0.549***
R^2	0.546	0.553	0.583	0.572	0.659
p	<.001	<.001	<.001	<.001	<.001
Prediction Accuracy	81.09%	81.09%	81.00%	82.10%	86.10%

Table 1: Results from Study 2 with Model 4 and Model 5 standardized: Probit model predicting promotion to Administrator position from both behavioral measures and social capital measures.