

Comparing Language Communities: Characterizing Collaboration in the English, French and Spanish Language Editions of Wikipedia

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Abstract

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Is Wikipedia a standardized platform with a common model of collaboration or is it a set of 312 active language editions with distinct collaborative models? In the last 20 years, researchers have extensively analyzed the complexities of group work that enable the creation of quality articles in the English Wikipedia, but most of our intellectual assumptions about collaborative practices on Wikipedia remain solely based on an Anglo-centric perspective. In my dissertation work, I aim to understand how collaboration models on Wikipedia generalize across online language communities.

This dissertation extends the current Anglo-centric body of literature in human-computer interaction (HCI) and computer-supported cooperative work (CSCW) through three studies that mutually help build an understanding of collaboration models in the English (EN), French (FR) and Spanish (ES) editions of Wikipedia. In the first study, I replicated a model by Viégas et al. (2007) based on editors' behaviors in the English Wikipedia. This model was used as a lens to examine collaborative activity in EN, FR and ES. In study two, I leveraged a collaboration model by Kriplean et al. (2007) that suggested editors used

“power plays” – how groups of editors claim control over article content through the discourse of policy – in their talk page debates to justify their edits made on articles. In study three, I interviewed editors from the English, French and Spanish language editions to build a typology of collaborative behavior and understand editor’s perceptions of power and authority on Wikipedia.

In the first two studies, two well-known collaborative models discovered in EN were replicated in EN, FR and ES. I show that these models manifest differently across Wikipedia language editions. In Study 1, across all languages, the editor had similar behaviors, but they exist in different quantities. In Study 2, the qualitative coding of a dataset in EN, FR and ES show that these “power plays” still exist and no new ones were discovered in any of these language platforms across all three languages. Through the participant interviews, I find that across language editions, editors have different perceptions on the factors that drive consensus on Wikipedia talk pages. I use all of the findings to build a more comprehensive model of collaboration in all three languages.

In each of these studies, I demonstrate that Wikipedia is a sociotechnical system – an instantiation of both social and technical processes. To better compare each language edition, I specifically draw out the social and technical processes within each of my studies’ findings to understand the differences in collaboration. Further, in this dissertation work, I introduce the idea that language processes also help play a role on Wikipedia talk pages. The fact that Wikipedia has multiple language editions shows that language may have a relationship with broader social issues. Essentially, language *and* language use manifests into new social processes across different language editions of Wikipedia. The differences that might exist in the language processes between editions is an accessible way of understanding the social processes - this has not been adequately represented other research on Wikipedia language editions.

The implications of this study are threefold: (1) empirical contribution, (2) methodological contribution and (3) validation contribution. First, this dissertation presents an empirical understanding of peer production collaboration models in three different language editions. Secondly, I demonstrate a clear

example of how to conduct research across multiple sites or contexts. Lastly, from a more intellectual standpoint, this work provides a complete replication or validation of a prior study, the synthesis of two models that already exist in EN and the existence of collaboration models in three languages.

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Chapter 1: Introduction

Background

“The tools of change are technological, but their results are social” (Konieczny, 2009 p.219).

With the development of the internet, the spread of information is boundless and instantaneous. Online platforms allow people to interact with each other and support the ability for the world’s users to collaborate. More than ever, it is easier to collaborate with someone across geographical borders to achieve a common goal. Online platforms by design present remarkably few barriers to participation and support the development of mature social structures. These virtual organizations allow humans to self-organize into groups and work together. In traditional, offline organizations, people collaborate in one location to produce a physical artifact, but with the globalization of the internet, we can now create digital artifacts and communities from virtually anywhere.

With the global spread and advancement of online communities, the internet has now broadened beyond just English to include hundreds of languages. The few limitations on who is allowed to communicate and contribute online make it easy for anyone to produce content in their language and collaborate with others in any language they want. The divergence of the internet and the breath of the language landscape have led to the creation of new online social interactions. These interactions foster online cultures that are different from those that people have traditionally connected to geographical places such as the cultures of a country or to the specific language users speak. The cultures produced online are socio- technical; they combine the technical aspects of a website with the evolving social interactions.

In a socio-technical system, the platform itself and its technology have influenced the way people socialize and help shape these social interactions on the platform. As noted by sociologist Erving Goffman (1956, p.12) in his book, *The Presentation of Self in Everyday Life*, "*A society's cultural norms define the social forces that push humans to interact in ways that are congruent with accepted social rules*". When forced to interact with another person, that person is putting on a show and carefully analyzing every move they make in terms of how the other person will react or how someone else's perception of them may change. In online communities, participation requires some interaction with other members of the communities. In turn, their own beliefs and cultural background may be shaped by these interactions they have in the online community.

Furthermore, the way that users conform to the technical aspects, the backend and front-facing system of the platform, might also influence their self-presentation in these online communities. It is possible to contribute to an online community without sharing any personally identifiable information. The languages that users speak and their cultural identity within online systems may be different from how they present themselves in their daily lives, creating a dichotomy of identity presented online. The architecture of the online space (both the technical and social aspects) allows different ways of behaving that might not be the norm in daily life.

Geographic and metaphysical boundaries between language and culture are now smaller than ever because of the development of tools from the internet like computer-mediated communication (CMC) and machine learning algorithms that help further bridge language differences between users. The very nature of technology and the internet has led to the creation of new ways of interacting and collaborating creating its own culture produced online. In this dissertation, as I continue to talk about culture, I want to specify that I am interested in understanding the culture shaped by the specific online community and not the culture inherent to an online user, their geographic location or their own beliefs. I will specifically call out this culture produced online as online culture or collaboration culture. If I do not denote the specifics of the type of culture, then I am referring to the traditional view of culture, typically offline, defined by anthropologists as: "*Culture has been defined in a number of ways, but most simply, as the learned and shared behavior of a community of interacting human beings*" (Useem & Useem, p. 169).

As people from around the world with different perspectives and backgrounds come together to build a language-specific digital platform, it is important to understand how they work together. In this dissertation, I want to better understand how collaboration develops on platforms that share an important commonality: the language that the participants speak and use to build their shared content. I contend

that it is possible to model the culture of collaboration that takes place on platforms without making assumptions about the cultural background of the contributors by building an understanding of these language-specific communities.

Wikipedia offers one example of a peer production platform where editors from around the world collaborate and share information. The Wikipedia platform is made up of a subset of communities each representing a distinct language edition. Researchers have noted that Wikipedia is an example of a wildly successful and expansive online collaborative platform (Ortega et al., 2008). For a long time, most of that research has focused on the English Wikipedia language edition (EN). The way scholars think about the platform and the assumptions we base other work on is based solely on the EN Wikipedia which influences the way the platform is developed and supported. For that reason, my research addresses a largely overlooked challenge demonstrating ways in which it is possible to investigate and build other language editions of Wikipedia.

In this chapter, I introduce Wikipedia, a peer-production platform and speak to why it is the platform that I selected to conduct this research. I then motivate my research by explaining why it is necessary to conduct social computing research across each language community. I then list my research questions and outline the structure of this dissertation.

Wikipedia is a Free Online Encyclopedia for Everyone

Inherently, Jimmy Wales created Wikipedia with the intention of bringing forth “*a free encyclopedia of the highest possible quality to every single person on the planet in their own language*”¹. To support Jimmy Wales’ vision, Wikipedia as a platform needs to support and allow for the globalization of the world through facilitating access to encyclopedic information. This would allow Wikipedia to accumulate massive amounts of knowledge at a global scale. This vision becomes possible as Wikipedia is provided across the world at no charge to those who have access to the internet.

As of June 2021, the wide availability of Wikipedia has led to the creation of 323 editions with 312 of them being active editions² of the platform in different languages. Editors now contribute from around the world in many different languages (Warncke-Wang et al., 2013). This platform is built by a diverse group of collaborators representing a variety of perspectives across the globe. On Wikipedia, collaboration among editors is essential for the development of quality content (Kittur et al., 2007; Kittur et al., 2008).

¹ “Wikipedia is an encyclopedia”. Wikimedia. March 8, 2005. Retrieved March 5, 2019

² List of Wikipedias - https://meta.wikimedia.org/wiki/List_of_Wikipedias

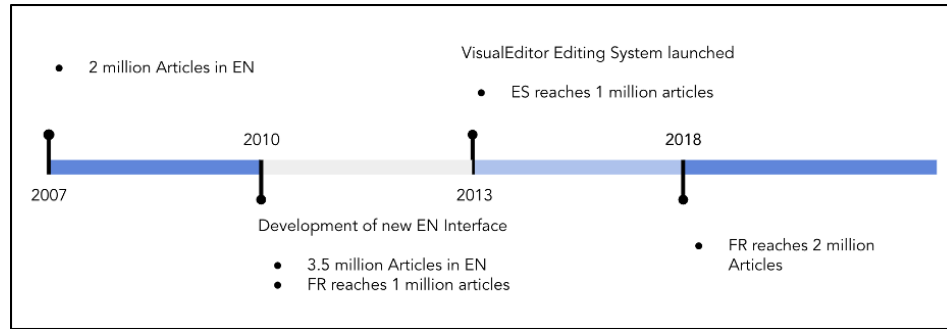


Figure 1.1. Sample timeline of the development of the English (EN), French (FR), and Spanish (ES) editions of Wikipedia. Further discussion about each of these language editions and their timelines is included in Chapter 2.

Across the various language editions, editors collaborate within their distinct language edition to create separate articles on a specific topic in the specific language of that edition. Figure 1.1. demonstrates a sample of the development timeline of three language editions of Wikipedia. Each edition on Wikipedia has a different timeline punctuated by the development of new tools and language related facets.

The hundreds of language editions have led to Wikipedia not only becoming a global platform but also each language edition can be described as a *vibrant virtual community* (Ciffolilli 2003; Gillmor, 2004; Lebowsky & Ratcliffe, 2005). A language edition is a community that works together with a common overarching goal -- to create quality encyclopedic content. Like an offline community, people collaborate, achieve common goals, build a structured platform government, and even follow community laws.

As common in many countries' political governments, the people using and editing any language of Wikipedia are part of a democratized community. The model of governance is highly decentralized and successfully prevents the platform from being controlled by a small group of editors (Forte et al., 2009). The diversity of the editors, the technological offerings, and the organizational structure built by the editors make Wikipedia an example of a successful global peer-production platform.

On Wikipedia, editors in each language edition work together to create quality articles and over time they begin sharing common interests and goals. The production of content gives rise to a knowledge commons on a global scale. Wikipedia has become a shared resource that includes data and information that is maintained and owned by a large group of editors from around the world. Wikipedia in its entirety is a global platform and a knowledge commons made up of a culmination of individual language editions or communities with editors who speak a particular language.

The Research Gap: Collaboration in Language Editions of Wikipedia

With so many different people collaborating online, Wikipedia has become a salad bowl of cultures, languages and socioeconomic statuses. With Wikimedia and Jimmy Wales goal of collecting the sum of all human knowledge, it becomes important for us to better understanding how to share that knowledge with the global population. Research scholars should think about how people with differing points of view collaborate to create content, and how we can build systems that support these dynamic and diverse collaborations. Productive collaboration leads to the creation of quality encyclopedic content. Wikipedia is a source for many across the world to access information, so it is necessary and essential to have factually accurate and verifiable coverage of any topic.

The interesting, evolving, dynamic, and vibrant *global village* of Wikipedia has caused many scholars to be interested in how the platform works. Wikipedia is different in its structure as it is run by editors and less by any organization, making it a place that scholars have been very interested in understanding. With nearly 20 years of Wikipedia research, studies of group work on Wikipedia have primarily focused on the English language edition. English-based studies have proposed behavioral models of collaboration to satisfy technical and social requirements such as contributions on talk pages (Luyt, 2012), the use of policies (Butler et al., 2018), the use of WikiProjects for coordination (Morgan et al., 2013c), and recommending new talk page tools for editors (Laniado et al., 2011).

CSCW/HCI researchers cannot assume that Anglo-centric models of collaboration generalize to the diverse forms of cooperative work in different language editions of Wikipedia. This Anglo-centric viewpoint seems at odds with the stance that CSCW researchers commonly take when studying other forms of work. Prior CSCW literature has focused on informational communication in multilingual contexts (Yuan et al. 2013), how multilingual speakers engage with multiple languages (Hale, 2015) and cross-cultural studies on collaborative platforms (Dong et al., 2016; Hinds & Reinecke, 2014). Across these studies, researchers argue for the importance of understanding cultural and linguistic diversity.

Based on a review of Wikipedia collaboration research presented in Chapter 2, there is a large body of knowledge that presents the English Wikipedia, while other language editions are less represented in the research. This dissertation attempts to fill this significant gap by examining collaboration in the English (EN), French (FR) and Spanish (ES) editions of Wikipedia.

Research Goals

With the multiple language editions of Wikipedia, research to address this variability should consider not only the technical evolution of the platform, but the socio-technical aspects of each of these language editions. However, much of the research on Wikipedia has been conducted using the English edition. Consequently, the understanding of how editors aid in the growth of the world's premiere peer production community is based on practices in only one language edition, leaving open questions about socio-technical norms in the other active editions of the encyclopedia.

The overarching goal of this research is to understand how findings from an EN model generalize to two other large Wikipedia language platforms, Spanish (ES) and French (FR) and then use these findings to build a comprehensive model of collaboration for each language edition. As of June 2021, English is the largest Wikipedia edition with over 6 million articles, French is the 5th largest with a little more than 2.3 million articles, and Spanish is the 9th largest with 1.6 million articles (MediaWiki, 2021). English, French and Spanish also transgress traditional geographical borders -- they are spoken in countries all over the world so understanding these three large Wikipedia editions is literally of global interest. I specifically chose FR and ES as supplementary to EN because (a) I have proficiency in these languages (b) Spanish and French are popular global languages (c) they are different in size and culture from other language editions of Wikipedia.

Examining the way editors collaborate across languages, can lead to a better understanding of the platform as a whole and how to better design for a multilingual socio-technical platform. In this dissertation, I attempt to do so for EN, FR and ES. This study is not designed as a direct comparison of three different language editions. As I will demonstrate, each of these editions are different, reflecting their own online culture and organizational structure, and these differences ultimately make them comparable in only a reductive sense. Furthermore, I will demonstrate the differences and similarities that influence the behavior of Wikipedia editors and how the editors shape the platform.

It becomes difficult to conduct this analysis because I cannot make assumptions about the culture of Wikipedia editors — each of the three languages are spoken across the globe. For that reason, I focus only on each language edition as a holistic language platform that is based on the culture produced by the socio-technical features of Wikipedia. I discuss more of the methodology to understand each language platform in Chapter 3.

This dissertation is only the beginning of a broader research agenda. Low-resource languages, smaller languages, endangered languages, and non-Western Romance languages should also be considered.

Furthermore, how can we relate these findings to actual design implications of the platforms and the cultures of the editors? This dissertation attempts to demonstrate to other scholars how to study multi-language Wikipedia and defines what collaboration is for editors in EN, FR and ES.

Modeling Collaborative Behavior

In order to demonstrate collaboration across different language platforms, the contribution of my dissertation is a representation of the collaboration models that exist in EN, ES and FR. These models will assist in creating predictive patterns of collaborative behavior across multiple language editions of Wikipedia. Understanding and building these models gives knowledge of how Wikipedia contributors behave and how CSCW/HCI researchers can recommend the design of technological tools to support these social interactions.

Prior researchers have attempted to model both the indirect and explicit coordination practices of editors on Wikipedia (e.g., Burke & Kraut, 2008; Morgan et al., 2013a). In indirect coordination, editors structure the work they do to create articles, like the creation and maintenance of policies. In contrast, explicit works are the massive peer production activities (e.g., editing articles, reverting edits, discussing edits, etc.) on Wikipedia that directly affect the creation of the articles. These various manners of work lead to different social dynamics, such as conflict and cooperation between editors (Kittur & Kraut, 2008).

An example of a model of indirect coordination is the decision-making centered on the administrator promotion status on Wikipedia. Burke and Kraut (2008) presented a model of the behavior of candidates for promotion to administrator status in Wikipedia. This self-evaluation model helps editors decide about an editor's readiness to be promoted to an administrator. Other collaboration models describe the explicit coordination on Wikipedia. Viégas et al. (2007) manually coded talk page posts to show the type of contributions made by editors.

Some of these models also consider different language editions. Most of these language editions build assumptions around geographical regions, where editors speak the respective languages. These models compare translated versions of similar article topics and use these comparisons to understand cultures across language editions. These authors leverage the socio-technical processes of Wikipedia to demonstrate how culture is different across language editions. One study compared the technical processes of article tagging, to understand controversial tagged articles across language editions (Yasseri et al., 2014). The authors then attempted to understand the sociopolitical nature of Wikipedia by relating their findings to geographical regions. Massa & Scrinzi (2012) provided a tool that uses these language edition models to provide a cross-cultural analysis of articles by comparing articles from multiple

language editions side-by-side (Massa & Scrinzi, 2012).

In this work, I attempt to build upon these studies by focusing solely on the collaborative and coordination implications of the editors' work in each language edition. However, most of these prior models become difficult to replicate in other language editions. Researchers have relied on quantitative measures such as publication histories and number of editors on articles and talk pages to understand user behavior — these quantitative models comprise the majority of research done to understand collaboration on Wikipedia. It becomes problematic to use quantitative methodologies because there is much less content in FR and ES than in EN. For this reason, I chose to study collaboration across language editions using a qualitative methodology. I describe this qualitative methodology more fully in Chapter 3.

Research Questions

This dissertation is separated into two parts. Part A aims to explore how prior research in English generalizes to the French and Spanish Editions of Wikipedia. Part B expands on the findings from Part A and attempts to further detail what collaboration models look like in EN, ES and FR. The formulation of my research questions in this dissertation was an iterative process. Part B was built after gathering findings in Part A to understand the generalizability of prior EN collaboration models. Part B attempts to fill and expand on some of the gaps of the findings explored in Chapter 4 and 5.

Part A (Investigated in Chapter 4 and 5). In the first part of my dissertation, I aim to understand how collaboration models on Wikipedia that already exist in EN are generalized across FR and ES. Global systems like Wikipedia must be understood as a sum of all of its parts, with the language editions operating as individual subsections. By understanding the different collaboration models across language editions, we can consider how to better support and study the different language editions. In Part A, I pose two questions:

R1. How have English collaboration models on Wikipedia changed over time?

R2. How generalizable are findings from English language edition of Wikipedia to the French and Spanish language editions?

Part B (Investigated in Chapter 6 and further defined in Chapter 7). In Part A, the findings show that two English collaboration models manifest differently in the French and Spanish language editions of Wikipedia. These findings show that two different collaboration models do exist on talk pages across language editions. Accordingly, I hypothesize that both collaboration models co-exist in English, French and Spanish language editions of Wikipedia and can be combined to present a larger collaboration model

in all three languages.

In the second part of this dissertation, I conduct an interview study with Wikipedia editors (Chapter 6) on three different language editions to answer the following research questions:

R3. What are the properties of a model synthesized from Study 1 (Chapter 4) and Study 2 (Chapter 5)?

R4. What similarities and differences exist across English, French and Spanish language collaboration models?

Furthermore, in Chapter 7, I delve into an illustration of how the collaboration models exist in EN, FR and ES. Through presenting one form of collaboration models, I can begin to highlight the separate identities of editor behaviors across language editions that may impact how users make decisions on Wikipedia. The snapshot of collaboration in each language edition attempts to answer the final research question:

R5. How do these comparisons hinder or motivate collaboration on Wikipedia across different languages?

Structure of this Dissertation

Date	Research Question	Study	Publication Status	Dissertation chapter
Aug. 2017- April 2020	R1, R2	Do We All Talk Before We Type?: Understanding Collaboration in Wikipedia Language Editions	Completed (Published :OpenSym 2018)	Chapter 4
		Community, Consensus, Coercion, Control: Does CS*W Support Collaboration in Different Language Editions of Wikipedia?	Completed	Chapter 5
Nov. 2020- April 2021	R3, R4	Typology of Collaboration Work in EN, FR and ES	Completed	Chapter 6
March 2021- June 2021	R5	Constructing Collaboration Models in EN, FR and ES	Completed	Chapter 7

Table 1.1. This table presents the timeline of the work in this dissertation. Additionally, I have included the studies, the publication status, and the chapter this work can be found in.

In the field of CSCW, there has been a lot of work on language, particularly work related to culture and natural language processing on social media platforms. In contrast to the bulk of CSCW-related research, this work focuses on understanding how a community of users collaborate on three language platforms. In Chapter 2, I delve deeper into related literature and distinguish this dissertation from other forms of language studies in CSCW. A timeline of research activities in this dissertation is provided in Table 1.1. In Chapter 3, I provide a theoretical lens to better understand the contribution of the work. I present three models of collaboration in the EN, FR, and ES language editions of Wikipedia. I demonstrate the technological and language influences that drive the culture of Wikipedia talk page collaborations. Chapter 3 provides more instantiations of why I have chosen to present the EN, FR, and ES platforms through a language perspective. In Chapters 4, 5, and 6, I present three studies all done in the three language editions. In Chapters 4 and 5, I answer my first two research questions; in Chapter 6, I connect the findings from the previous two chapters and add additional context through an interview study to answer the remainder of my research questions. In Chapter 7, I present the collaboration models across the different languages in qualitative form. This is in response to research questions 4 and 5. In Chapter 8, I summarize the major contributions of the dissertation, propose areas for future work in open collaboration based on my findings, and present how future researchers can leverage the methodologies presented in this dissertation to conduct multi-site research.

Researcher Stance

It is important to note here that a researcher's positionality does not only shape their own research, but influences their interpretation, understanding and ultimately their belief in the 'truthfulness' of other's research that they read or are exposed to (Holmes, 2014). This research is primarily a qualitative experiment where I needed to analyze text from conversations on Wikipedia talk pages and interview transcripts. It is important to list my position when making subjective decisions when categorizing my findings. I come from an English language background. I am a native English speaker, but I have proficiency in both French and Spanish. I attended a French immersion school for K-8th grade making French my first academically learned language. I began learning Spanish in high school and have been practicing it on my own and with my Spanish-speaking family members.

While I do take a lead role in all the studies presented in the dissertation, it is important to note that the research presented in this dissertation was completed in collaboration with other researchers from the Department of Human Centered Design and Engineering at the University of Washington. These researchers were native speakers of English, French or Spanish. In the studies that were done collaboratively, I will clearly state in the methodology section the role that other researchers played in conducting and analyzing the results of the study.

Chapter 2: Related Work

Hundreds of millions of people around the globe communicate daily through the internet. In turn, researchers in the field of CSCW have become increasingly interested in understanding how behavior occurs online, especially with the expansion of global languages from just English to hundreds of other languages. However, much of the research centered around online communities makes assumptions about the culture of an online user. Currently, less research has focused on characterizing users' collaborative behavior on different language peer production communities without approaching collaboration through a cultural lens.

In this section, I highlight prior language work in CSCW to understand how language has been studied on global online platforms. Next, I discuss language research outside of CSCW to justify why this study is distinct from other types of language research. I then narrow down the focus to understanding Wikipedia and the multilingual online peer production communities to motivate the rationale for this dissertation. I explain why I use Wikipedia to understand the generalizability across language editions and list prior language research on Wikipedia. Lastly, I detail research specifically on the French and Spanish language editions of Wikipedia to give additional context on each of these communities.

The Prominent Role of the English Language on the Internet

English has been considered the “de facto lingua franca” of the internet since its inception. Contributing to this illusion is the prominent role that English plays in globalization but additionally the fact that the internet itself was first created in the United States, a primarily English-speaking country (Hafner & Lyon, 1996). However, most internet users are not actually native speakers of English. Two-thirds of the 1 billion users communicate online in other languages, in non-native English, or both. Yet the English-based scholarly literature on computer supported collaborative work (CSCW) and computer-mediated communication (CMC) does not reflect this diversity according to research in the early 2000s (Danet & Herring, 2003). This lack of literature drives the superstition that English is the primary language of online communities (Herring, 1996).

It is necessary to expand the body of social computing research beyond English. Many prominent platforms on the internet including Wikipedia started as an English-only community and has since expanded to hundreds of other language platforms with users from around the globe. In this dissertation, I first attempt to characterize collaboration models in other language editions by trying to understand how influential collaboration models that originated in an English language platform generalize to other language editions. This research agenda begins to fill the gap of studies that analyze other language communities. In Chapter 3, I further discuss the importance of understanding a language-specific online community and the theoretical approach undertaken in this work.

Language research in CSCW

With the expansion of globalization online, in turn, we see the spread of more languages online. The increase in the number of languages online has piqued the interest of few scholars to understand language use and help support communities that do not communicate in English. Research has considered this new “*complex empirical reality*” brought forth by the spread of new languages (Danet & Herring, 2003).

In particular, the array of languages online has been a focal point for some researchers in the field of CSCW. Social media interaction is still heavily influenced by the languages people use to interact with others. Lim & Fussell’s study (2018) found that users who only spoke English focused less attention on, and indicated less willingness to interact with, online posts written in languages other than English. Also, an analysis of Twitter revealed that a variety of spoken languages and cultures among users predicted less communication volume (García-Gavilanes et al., 2014). Garcia-Givalenese et al. (2014) show that language and culture are substantial barriers to Twitter communication. For example, people may have to

adapt to technology from other cultures such as cultures who use non-Roman characters on a technology created in English.

To better be able to understand how language has grown in the field of CSCW, I conducted an exploratory analysis of 10 years of CSCW accepted papers. I used the search terms “multilingual” and “language” within Confer³ or the online conference programs to uncover language related research. My search found no papers in 2011 with those search terms. However, beginning in 2012 to 2020, there were a quantity of language focused papers each conference year. Most of the research presented in CSCW used language analysis tools and natural language processing (NLP) mechanisms to understand the behavior of users online. Furthermore, scholars have begun to develop new technologies to support multilingual and accessibility-related language collaborations. In the following subsections, I detail various categorizations of language research in CSCW:

Parsing language data to understand diverse behaviors

In the field of CSCW, researchers parse language data to better understand how users behave on social media. Most of this work occurs in the English language. Morgan et al. (2013a) analyzed WikiProject discussions to build a typology of explicit coordination to see how people work together online. Other scholars (Wang et al., 2014) have parsed English social media platforms to understand how traditional human behavior such as cursing appear in online platforms. Furthermore, through parsing online text, researchers (Ernala et al., 2017; Mitra & Gilbert, 2014) have been able to build English language models that predict future online behavior using current language trends that persist. For example, Ernala et al. (2017) analyzed schizophrenia posts on Twitter to create a self-disclosure model that can lead to therapeutic outcomes.

Other scholars have used linguistic analysis tools such as the Language Inquiry and Word Count (LIWC) tool to understand user sentiment online (Pennebaker et al., 2015). Matthews et al. (2015) used LIWC to understand satisfaction in the online workplace. Chandrasekharan et al. (2017) analyzed Reddit posts to draw out hate speech lexicons to investigate differences in hate speech usage.

While most of the studies listed previously were conducted English language data, non-English data has been analyzed only in a handful of studies. In one study, Eleta and Goldbeck (2012) compared social tagging behavior on image collections of art in Spanish and English. Tagging behavior is commonly used to improve access to resources, especially non-text media. The authors compared tags and tag groups to draw conclusions regarding tagging practices across languages by measuring consensus between speakers

³ <https://confer.csail.mit.edu/team>

of the same language and speakers of two different languages. In another study, González et al. (2019) conducted a cross-language analysis to understand how information privacy is framed by users from around the world. There is a significant gap of non-English studies that parse large amounts of data to create models that help predict user behavior online.

Moreover, the language research in CSCW included studies that used natural language processing (NLP) to understand users' communication and behaviors online. The following section further discusses the use of NLP within the 10 years of CSCW research that I investigated.

Using Natural Language Processing (NLP) and Machine Learning Tools

Social media use around the world gives rise to large databases that can be utilized to understand how users behave online. These large databases then can become training sets for machine learning systems that can make predictions or decisions without being explicitly programmed to do so. One example of this is using Twitter hashtag trends to automate the prediction of compound hashtags -- hashtags with two (or more) words or phrases glued together (Maity et al., 2016). De Choudhury et al. (2016) used language as a source of data to understand large public health crises. These authors identified specific language through online posts that represented a specific topic to be able to better understand a population and the impact the language in those posts had on the community. Wu et al. (2018) used natural language processing (NLP) mechanisms to create semantic mappings between color themes and everyday language to improve filter findability. Additionally, prior work mapped language cues to the credibility of information found on social media by using NLP techniques to identify different language dimensions (Mitra et al., 2017; Porcheron et al., 2017; Rezapour, 2020; Samory & Mitra, 2018).

NLP techniques are widely versatile and can be used in different ways to understand varying contexts. CSCW scholars have also used NLP and machine learning algorithms to build automated tools and models that detect information sharing, shared understanding, word counts, and group activation in spoken interactions. In the brainstorming context, Huber et al. (2019) created the Meeter tool that allows researchers to annotate without having to do it manually. Likewise, researchers can understand the socio-cognitive processes (e.g., negotiation, shared knowledge, etc.) used during collaborative work to better understand how to support these behaviors (Stewart et al., 2019).

Within my literature review of 10 years of CSCW research, only a few studies have used NLP techniques across different languages. Li et al. (2020) used NLP techniques to analyze linguistic features associated with politeness across American English and Mandarin Chinese. Li et al.'s (2020) data helped inform linguistic-based machine learning tools to predict politeness. Understanding politeness online can

be a way to facilitate intercultural communication. Furthermore, Lim et al. (2019) used NLP tools to annotate online conversation to better support multilingual sense-making on social media.

However, using natural language processing techniques and machine learning to identify language and linguistic features online does not always work. Automated techniques such as labeling and classifying which is done through NLP and machine learning does not always address the hierarchical structures of online communities (Blackwell et al., 2017). NLP techniques also do not account for a diverse user base, individual experiences or systems of social oppression (Blackwell et al., 2017). If NLP techniques are not used carefully and properly, there is a chance that it can lead to marginalizing various online communities. Other research, explained in the following section, uses other non- NLP tools to help build technology that understands and supports language behavior.

Developing technological solutions to understand language behaviors

Many of the CSCW papers in my 10-year dataset (2010-2020) are centered around building technologies that help foster collaboration but also are tools for scholars to use to better understand some of the linguistic insights that come from online conversation. CSCW scholars like Piper et al. (2012) developed hybrid paper-digital interfaces such as digital pens to enable collaborative language and social exchange, and Mugunthan (2020) developed a crowd-based game that gathered knowledge of native Hindi speakers to detect spellings of colloquial words.

Furthermore, novel technological solutions include the development of accessible technologies to improve spoken language and digital collaboration. Researchers have created technology to analyze impaired linguistic communication (Hailpern et al., 2013), mobile intervention for children with language delay (Hwang et al., 2014), a crowd-sourced American sign language dictionary (Bragg et al., 2015), and assistive technology to improve collaboration between Deaf and Hearing individuals (Gugenheimer et al., 2017). Typically, most of these studies have shown the development of technological solutions focusing on only one language and mostly the English language. Only one study described in this section focuses on the Hindi language (Mugunthan, 2020). In the following section, I outline a few studies that focused on more than one language.

Multilingual Research: Communicating in different languages online

Currently, there is a small body of research within CSCW that demonstrates how users interact with foreign language content on social media (Lim & Fussell, 2017; Eleta, 2012). Moreover, this research attempts to understand multilingual speakers that might switch between languages online (Eleta, 2012). Eleta (2012) built a language ecology on Twitter that allows better design of a system that can allow

transmission of data across language boundaries. In this study, the author explored the decisions of bilingual and multilingual users to understand cross-language flows on the platform. In another study, Chen et al. (2018) implemented a language support tool that automatically identifies a user's spoken language and then transcribes and translates the speech into another language (common language or non-native speaker's natural language). This gave non-native speakers more freedom to interact in a collaborative activity with native speakers. The tool that Chen et al. (2018) developed encourages diverse use of a language during a meeting, resulting in more equal participation for each meeting member.

Additionally, researchers have demonstrated the importance of using machine learning algorithms and language translation to help support multilingual collaboration (Gao et al., 2015). Wang et al. (2013) noted that groups must address contact barriers caused by linguistic differences among participants. These authors compared two approaches to overcoming these barriers: using English as a shared language and using machine translation resources that enable each person to communicate in their own native language (Wang et al., 2013). Further research has produced technologies that help support non-native speakers collaborate in online communication (He et al., 2017; Pan et al., 2017; Timpa et al., 2020; Weibert et al., 2015; Zhu et al., 2017). These studies show how technology can help facilitate conversations between people who may not have the same culture or language. In the following section, I highlight research that tries to better understand how these cross- culture or cross-language studies happen and the problems they face when trying to work together.

Intercultural Communication

Moreover, some of the language research in the CSCW field currently focuses on the impact culture of people can have on collaboration. These types of research equate language and culture -- the language of the user is strongly tied only to the culture from the locations that speak these languages. These studies typically examine in greater detail issues that can happen in intercultural communication using a retrospective analysis. Prior research has demonstrated how cross-cultural collaboration and communication can be difficult with mismatched styles and beliefs (Nguyen & Fussell, 2012; Oliveria, 2018). Nguyen & Fussell attempt to understand how to design tools that better support these cross-cultural collaborations. In turn, these research studies help improve collaboration within teams across global boundaries.

Learning a second language

Lastly, research from the CSCW community has focused on creating new technologies and gaming artifacts to help second language learning (Culbertson et al., 2016; Kallioniemi et al., 2016) and finding out ways to improve readability for second language learners (Wang et al., 2016).

There have been different approaches to understanding language communities and how language is used — but most of these studies have been done with a very strong focus on the English language community. Only Das & Semaan (2020) noted the importance of language-specific virtual groups and built technology to help scrape quantitative data from the online community. However, there is currently a lack of research that uses qualitative methods to truly understand a language-specific online community and model those behaviors. This dissertation attempts to fill that gap.

Interestingly, I noticed that by exploring 10 years of research in CSCW, I have found the integration of many other disciplines including computer science, sociology, anthropology and linguistics. In order to explore the complexity of where this dissertation work fits within these fields, I turned towards understanding how this specific language-related dissertation is categorized outside of CSCW.

Characterizing research that analyzes language communities

At the start of this dissertation, I approached this work contemplating whether this work fits into the sociolinguistics field. However, through my explorations it is important to note that this study does not necessarily fit within only the sociolinguistics field. In this work, I note that there are different language online communities that might enact different social processes. I study the behavior on different online communities that speak a specific language and not the sociolinguistic -- the study of language in relation to social aspects. I also acknowledge that there are different methods to leverage the language that exists in these online communities (e.g., natural language processing, machine learning algorithms, etc.). This dissertation does not look specifically at sociolinguistic methodologies but there needs to be future research to understand these language communities from a sociolinguistic perspective.

While this study does not fit within the sociolinguistics field, I am still interested in understanding language communities. This section helps place this work within a variety of other studies that attempt to understand language communities undertaken across multiple disciplines including computer science, anthropology, sociology and linguistics. Furthermore, by delving into these different studies, readers of this dissertation can better contextualize why this dissertation does not fit within these other fields of knowledge. Researchers have presented the dilemma of the English-centric internet perspective and have responded with a range of language studies stemming from multiple disciplines. In Table 2.1., I highlight five types of language studies that I found most connected to the multilingual internet.

	Field of Study	N*	Types of Studies	Study Examples
Computational Linguistics	Computer Science, Machine Learning, Linguistics	More than one language	Building tools to process and produce language, understanding language using computational tools	Automatic expansion of DBpedia exploiting Wikipedia cross-language information. (Apro시오, 2013)
Cross-Cultural Studies	Sociology, Anthropology	More than one language	Studies that theoretically, politically, and empirically engage cultural analysis that uncover the dynamics of contemporary culture and its historical foundations.	The Tower of Babel Meets Web 2.0: User-Generated Content and Its Applications in a Multilingual Context (Hecht & Gergle, 2009) The efficacy of human post-editing for language translation (Green et al., 2013)
Multilingual/ Cross-linguistic Studies	Linguistics, Sociology, Anthropology	More than one language	Deals with users who speak multiple languages, require code switching from one language to another.	Cross-language Wikipedia Editing of Okinawa, Japan (Hale, 2015)
Foreign Language Studies	Linguistics, Foreign Language	One individual language	Understanding one language, the linguistics and sociolinguistic impact.	Enhancing the Status of Catalan versus Spanish in Online Academic Forums (Climent et al., 2007)
Comparative Language Study	Linguistics	More than one language	Comparing languages to establish their historical relatedness.	The multilingual and multiorthographic Taiwan-based Internet. (Su, 2007)

*typical number of languages represented in study

Table 2.1. Foreign language studies, multilingual studies, cross-cultural studies, computational linguistics studies, and comparative language studies are all areas of research that investigate online users’ behaviors and languages.

Each of these types of studies listed in Table 2.1. attempt to understand users online that speak different languages. Studies on computational linguistics focus on multiple languages and a large subset of these studies include machine learning techniques to automatically translate content for users. Multilingual studies investigate how users switch between languages online or curate content in their non-native languages. Foreign language studies dissect one single language and how that language might evolve online. Cross-cultural studies attempt to better understand how people behave online but make cultural assumptions to do so. Lastly, comparative language studies attempt to compare and contrast the histories of various language communities. Below, I further defined these five broad CMC themes that are tied to language studies and give further examples from my own review of relevant literature:

(1) Foreign Language Studies: Linguistic and discourse features of online communication.

I found that many foreign language studies highlight the linguistic features of certain platforms to better understand the specific language. However, most of these studies rely on the culture of the places in which these languages are spoken. Climent et al. (2007) attempted to create a machine translation tool for Catalan-speaking community using online academic forums. The tool was created because in daily life Catalan speakers tend to transition to Spanish since both of these languages hold different statuses, so it is necessary to switch languages depending on the various social domains. Thus, this tool can mitigate the impact of the reduced use of the Catalan language (Climent et al., 2007). Other studies try to understand different dialects and the discourse online. Researchers noted that online linguistic features in Hong Kong differ from other Chinese-speaking communities (Lee, 2007). In this dissertation work, I focus on more than one language edition. Furthermore, while I do contextualize each edition, I will not be taking a deep dive into the specifics of the language itself and its structure; I am focusing instead on a language-specific community and the behaviors of its users.

(2) Multilingual research: Language switching in multilingual platforms.

Many online platforms today have users that speak multiple languages curating content online; this helps enable cross-language information flows (Eleta, 2012). Research suggests that multilingual users may even contribute more than monolingual users (Hale, 2014). Multilingual users have become unconscious translators and they are able to bridge the language gaps in online communities (Hale, 2015). Users can adapt to a common language or switch languages to accommodate other users. The requirement of switching between languages especially if a user switches into their second language might lead to a complexity barrier - unfamiliar topics might be too complex for non-native speakers. Multilingual users might be less likely to contribute in their second language especially on more complex topics or in unfamiliar situations (Kim et al., 2016). While it is entirely possible that editors on the Spanish, French and English language editions contribute and collaborate across language editions, that practice is not a focus of this dissertation. In Chapter 6, I interview editors of these three language editions, and some do have experience on other language editions. However, collaboration across language editions is not included as part of the collaboration model.

(3) Computational linguistics studies: Language Translation and language machine learning research.

To help address language barriers, researchers have promoted translation tools (Vrandecic, 2018). Some of the translation tools additionally use machine learning translation to give real-time updates on collaborative platforms. My research does not use any form of computational analysis; I focus on understanding the qualitative content on talk pages and interviews without using any automatic analysis tools.

(4) *Cross-cultural studies.*

These are studies that theoretically, politically, and empirically engage in cultural analysis that uncover the dynamics of contemporary culture and its historical foundations. In the case of Wikipedia, many studies attempt to compare the type of content across language editions to help make assumptions about the cultures of editors. I further explore these types of studies from CSCW in Chapter 3.

(5) *Comparative Language Study: Comparing the histories of language structure.*

In the field of linguistics, comparative language studies compare the histories, evolutions, and interconnectedness of the language structure and creation. More specifically, comparative language studies try to understand the relatedness between languages. Unlike the other studies in Table 1, few comparative language studies were done on online communities. The closest connection has been investigations around the writing systems of global language users online. The majority of the world's writing systems employ conventions that link the sounds of spoken language with written symbols. Much of this research discusses how users of non-western Romance languages may use other characters to represent text online (Su, 2007). For example, researchers analyzed how female Arabic university students in the United Arab Emirates use the Roman alphabet to write vernacular Arabic in instant messaging (Palfreyman & Khalil, 2003). Even so, the comparative language studies still engage the culture of the users on the online system.

In this dissertation, I do not compare and contrast the linguistic histories of each Wikipedia edition; instead, I compare the relatedness of the behaviors that stem from the population that speaks the language specific to that edition. This distinction helps understand the purpose of this language-based research agenda and better present this work as a study that analyzes social behavior, collaboration, in three different language communities.

Wikipedia: An Evolving Platform based on Editor Collaboration

I chose Wikipedia as the site to compare language communities because each language edition of Wikipedia allows for growth of an online culture and organization structure. As Wikipedia continues to expand (Halfaker et al., 2013), the platform attracts editors from across the globe with their individual perspectives about topics of interest and how collaboration should occur on Wikipedia (McDonald et al., 2004). Each individual language edition brings new editors with their own perspectives and for these editors to develop an in-depth and quality encyclopedia, they must collaborate.

Collaboration mostly occurs on talk pages, also called discussion pages, these are the most active sites of

collaboration used by editors who wish to discuss edits that need to be made to articles. Each article has its own individual talk page, and the size of these pages depends on the amount of collaboration occurring. Previous work has shown that prior to editing articles in EN, editors will first discuss the changes that need to be made on the article's talk page before editing the talk page (Viégas et al., 2007).

Talk pages have been so critical in the development of EN articles that archival processes have been created to help keep talk pages shorter and up to date. The WP:ARCHIVENOTDELETE guideline page provides instructions and specific rationale for when and why to archive talk pages, preserving important rationale for future inspection. Because of these different views of editors who use talk pages, there is an increased likelihood of conflicting ideas on talk pages. Wikipedia's mass participation allows for many types of social dynamics that include conflict and cooperation (Kriplean et al., 2007).

The use of policy and guidelines⁴ on Wikipedia can help resolve conflict and clarify principles when discussing with other editors. Consequently, this helps improve the overall collaboration between editors. Prior work has shown that article talk pages are the most prominent site of policy use on Wikipedia (Schneider et al., 2012). These policies are constantly evolving to handle the different types of discussions that happen around article creation and curation. Editors on Wikipedia work to create and change these policies over time. Prior work done on collaboration on Wikipedia, specifically how *indirect work* between editors has increased. Now that there is more indirect work, the creation and curation of policy procedure and other Wikipedia specific pages has increased (Kittur et al., 2007).

Researchers have been trying to understand the nature and roles of Wikipedia policies. There has been continuous debate across various disciplines on how to characterize policies. These views challenge each other and demonstrate how multifaceted policies and guidelines are. Butler et al. (2008) believe that since there is no solid definition on the guidelines and processes, they instead focus on the formal, written policies. These formal, written policies are important because they act as boundary objects -- as specifications of how the content will be used and communication will occur (Butler et al., 2008). According to Wikipedia, "*a policy is similar to a guideline only more official and less likely to have exceptions*". Other papers have noted that there is a policy hierarchy (Kriplean et al., 2007). At the top are official policies, in the middle are guidelines, and at the bottom, there are essays. I describe in more detail each of these layers later in this chapter.

Overall, Wikipedia is typically characterized by "*many as emergent, complex, messy, informal, popularly,*

⁴ WP: Policy and Guidelines - https://en.wikipedia.org/wiki/Wikipedia:Policies_and_guidelines

uncontrolled, non-organizational, and radically different from other traditional organizations” (Butler et al., 2008, p. 1). However, policy and guidelines help regulate and maintain the complexities of Wikipedia. Two of the main policies on Wikipedia tell editors that they should *Be Bold*⁵ and *Ignore All Rules*⁶. However, there are still a lot of policies, guidelines, processes that are created to help guide user behavior. The policies on Wikipedia are continuously being updated by the editors and there are still lots of proposals for additional policies. Rules, policies, and guidelines all refer to the “*explicit and implicit norms, regulations, and expectations that regulate the behavior of individuals and interactions between them*” (March et al., 2000, p. 5). While official Wikipedia policies such as *Be Bold* and *Ignore All Rules* are considered formal rules, informal rules are the guidelines and processes; formal rules can impact the development and use of informal rules (Butler et al., 2008). Holistically, on Wikipedia, policy and precedent impacts the curation of the content online. The development of policies and procedures in Wikipedia is related to research in online dispute resolution, more specifically, how technology can help users collaborate and build consensus (Burke & Kraut, 2008).

Language Editions of Wikipedia

As noted earlier in this chapter, few studies have examined Wikipedia from solely a language perspective. The first reason for understanding language editions of Wikipedia is this current gap in literature that focuses on language. Researchers have analyzed Wikipedia from a geolinguistic perspective and noted that the creation of new language editions can impact global linguistic diversity and can influence the evolution of specific world languages (Mamadouh, 2020). Most other research about policy and collaboration, highlighted in the beginning of this section, only explains phenomena from the English language edition. This Anglo-centric approach to research becomes the basis of most language research done on Wikipedia. English was the first edition created in January 2001 and remains the edition with the most articles and number of contributors to this day.

As the platforms develop and new language editions have appeared since Wikipedia’s inception, more recent research set out to explore other language editions of Wikipedia. Similarly, to language studies done on multilingual internet, the literature around Wikipedia ranges from computational linguistics to cultural studies to multilingual studies. Many of these studies attempt to operationalize multilingual users. For example, research shows that many editors contribute on more than one language (Hale, 2015), there may exist gender differences between editors (Antin et al., 2011) and editors may have various motivations for editing Wikipedia (Kuznetsov, 2006; Yang & Lai, 2010). Other studies try to understand the culture of each language edition based on the neutrality policy and article-level classifications such as controversial articles (Yassari et al., 2014; Callahan, 2014). More specifically, Samoilenko et al. (2016)

⁵ WP: Be Bold - https://en.wikipedia.org/wiki/Wikipedia:Be_bold

⁶ WP: Ignore all Rules - https://en.wikipedia.org/wiki/Wikipedia:Ignore_all_rules

described the cultural borders on Wikipedia showing that bilingualism, linguistic similarity of languages, and shared religion provide the best explanations for the similarity of interests between cultural communities. In contrast, population attraction and geographical proximity are also significant but much weaker factors in bringing communities together (Samoilenko et al., 2016). While this study does focus on the culture of the editors, these findings demonstrate how understanding Wikipedia language editions is still critical for global development as language editions on Wikipedia can relate to each other but also have their own identities.

Another reason for studying language editions of Wikipedia is the need to understand Wikipedia's "neutral point of view" (NPOV) policy across language editions. The NPOV policy⁷ is a fundamental policy on Wikipedia and critical to the development of quality articles across any language edition. The NPOV policy asserts that all content must be written from a neutral point of view, "*representing fairly, proportionately, and, as far as possible, without editorial bias, all of the significant views that have been published by reliable sources on a topic.*" Across language editions, NPOV helps ensure content bias but when this content bias arises from language differences, this potential bias is referred to as linguistic point of view (LPOV) (Massa & Scrinzi, 2012).

In addition, prior research has shown that content on Wikipedia is different across language editions and represents cultural diversity (Hecht & Gergle, 2010). Hecht & Gergle measured the multiplicity of topics in 25 different Wikipedia language editions to prove the *global consensus hypothesis* false. The falsification of the *global consensus hypothesis* shows that encyclopedic world knowledge is diverse across different languages and cultures, which in turn violates NPOV because the same information can be represented differently across language editions. Moreover, a study by Callahan and Herring (2011) demonstrates that articles about famous people exhibit differences in cultural and historical perspectives between Polish and English Wikipedia articles and shows an English language content advantage both in the length of content and quality. Another study focuses on measuring self-focus bias on Wikipedia across 15 different language versions (Hecht & Gergle, 2009). Self-focus bias occurs when editors on Wikipedia input information that is important and correct to them and a large proportion of contributors to the same language edition but may not be important for other language editions. Hecht & Gergle's (2009) study casts further doubt on the *global consensus hypothesis* that encyclopedic knowledge is constant across languages; instead, Hecht & Gergle (2009) demonstrate that each language version offers their own information. Additionally, there have been the creation of tools used to compare and analyze the content differences across various language editions of Wikipedia (Bao et al., 2012; Massa & Scrinzi, 2012). Systems such as Omnipedia and Manypedia allow users to actively seek "*information exclusive to*

^{77 7} WP: Neutral Point of View - https://en.wikipedia.org/wiki/Wikipedia:Neutral_point_of_view

unfamiliar language editions and strategically compare how language editions defined concepts” (Bao et al., 2012, p. 1). Manypedia enables a linguistic point of view and facilitates comparisons of content across language editions, helping demonstrate content bias for Wikipedia users and editors (Massa & Scrinzi, 2012).

Another critical reason for understanding language editions of Wikipedia is because about a quarter of multilingual users always edit the same articles in multiple languages, while just over 40% of multilingual users edit different articles in different languages (Hale, 2014). When non-English users do edit a second language edition that edition is most frequently English (Hale, 2014). Editing in multilingual contexts can sometimes hinder the collaboration that occurs on Wikipedia. Contributors who are not native speakers of the common language in a multilingual context may find it hard to interact informally (Yuan et al., 2013; Kim et al., 2016). Hale et al. (2015) analyzed contributors who edited articles about Okinawa, Japan in the English and Japanese editions of Wikipedia. Editors who edit in their first language are more likely to make large, high-quality edits and editors who edit in their second language make smaller and restricted -- less detailed edits (Hale, 2015).

Studies that attempt to understand the identities of each language edition focus on the culture of each platform. One study evaluates the information quality in the Arabic, English and Korean Wikipedia editions to demonstrate that each platform has its own model of quality (Stvilia et al., 2009). Another study analyzes the cross-cultural links between the top biographical pages on Wikipedia to identify the interaction or network between the language editions (Eom et al., 2015; Gloor et al., 2015). Moreover, each language edition has its own motivations for readers coming to the platform demonstrating that Wikipedia is used differently around the world (Lemmerich et al., 2019).

Most of these studies show that language context has an impact on the creation of content and the behavior of editors on Wikipedia. The importance of each language edition can be due to the fact that while the English Wikipedia has a volume of content advantage, every language edition still has its own content (Callahan & Herring, 2011; Hecht & Gergle, 2010). This different information within each edition is due to factors including language structure issues, language translation issues, and cultural issues. To further expand the multilingual domain in social computing research, I believe that adding this dissertation as an extension or replication of prior literature in this field can help further understand the generalizability of English canonical studies.

The Differences between EN, FR and ES

Based on the prior research on Wikipedia highlighted in the prior section undertaken on the English

language edition, I can construct a basic understanding of the way things work on Wikipedia. At a very broad, high level, the way work is done in the French (FR) and Spanish (ES) Wikipedias are similar: Editors work to edit article pages; policies guide the collaborative creation of the content; some articles are “featured”; administrators work to keep the system working and editors productive, if not happy; and people are not always in agreement about everything, which results in dispute resolutions. However, aspects of these common conceptualizations about “the way things work” in Wikipedia should be carefully reconsidered before studying editors and their practices when they come from a different language-based perspective. In the following, I outline aspects of the broader environment that has shaped FR and ES so far.

Contextualizing EN, FR and ES

FR and ES were chosen because they are both within the top 10 largest Wikipedia platforms. The English Wikipedia remains the largest edition by number of articles and editors. The French Wikipedia⁸ started on 23 March 2001, and has 2,341,637 articles as of 30 June 2020, making it the 5th-largest Wikipedia overall. The Spanish Wikipedia⁹ has 1,697,217 articles. Started in May 2001, the Spanish Wikipedia reached 100,000 articles on March 8, 2006 and 1,000,000 articles on May 16, 2013. It is the ninth largest Wikipedia as measured by the number of articles.

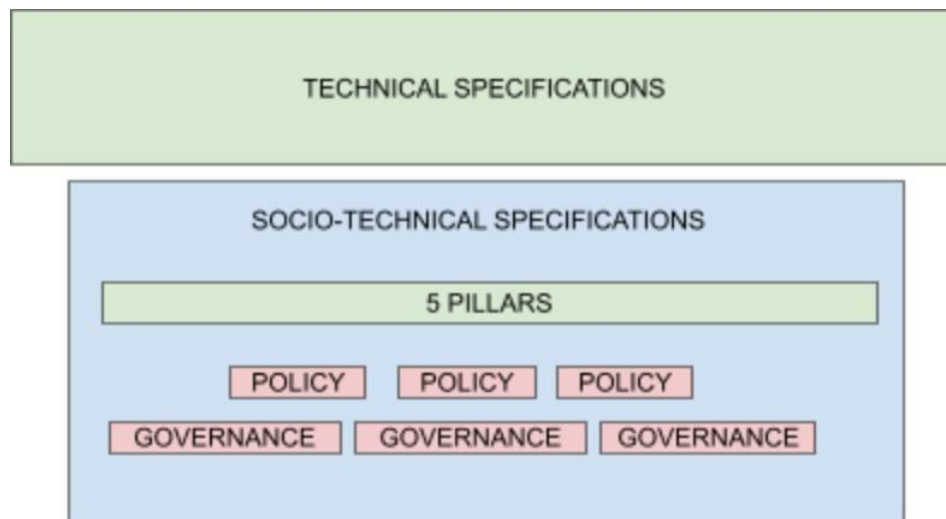


Figure 2.1. In this figure, I demonstrate the various layers of Wikipedia. In the top layer there are the technical specifications, this mostly refers to MediaWiki, the software that Wikipedia is built for. The second layer is the sociotechnical layer that includes both the social processes and technical implementations that might be different across language editions.

⁸ French Wikipedia - https://en.wikipedia.org/wiki/French_Wikipedia

⁹ Spanish Wikipedia - https://en.wikipedia.org/wiki/Spanish_Wikipedia

EN, FR and ES were developed separately at the inception of Wikipedia in 2001 by the Wikimedia Foundation. EN, FR and ES were built on the same technical specifications —MediaWiki— and continuously receive similar upgrades as the platforms grow. However, the development of each platform has not been the same, which suggests that the socio-technical system — how editors collaborate and the underlying technical foundations— begin to articulate the differences of these language editions. In Figure 2.1., I demonstrate the various layers of Wikipedia. In the top layer there are the technical specifications, and this mostly refers to MediaWiki as it is the same across all language editions. However, the way that MediaWiki is implemented across languages is different and this brings rise to the socio-technical layer. In this layer, the social system and the technical system work together to produce the organizational structure of Wikipedia. Some things included in these layers include policy and governance structure.

Technical Operations & Structure

The software operations or technical side of Wikipedia remain the same in all three languages. The operation of Wikipedia¹⁰ depends on MediaWiki¹¹, a free, open custom-made source wiki software platform written in PHP and built upon the MySQL database system. While the software operations are the same, there are different ways of implementing the various features including different templates, infoboxes and bots. Additionally, all of the languages include the option for a visual editor, WYSIWYG editor, or the classic editor through wiki markup language. All language editions archive and document the images using the Wikimedia commons (Porter et al., 2020).

All three of the languages have automated editing done by bots. These bots can complete simple and repetitive tasks, such as fixing misspellings and grammatical issues in the text. While each language edition does have bots, each edition has different bots that try to achieve different tasks. Some language editions have bots that help write specific articles. All bots must be approved to be activated. The roles of the bot in each language are one example of how the sociotechnical side of the platform can be influenced. For example, some bots may reverse vandalism and thus editors react less to vandalism on articles they may be editing.

EN, FR, and ES have an organizational structure based on Wikipedia namespaces; the three languages currently have 16 namespaces in each language edition. A Wikipedia namespace is a set of Wikipedia pages whose names begin with a particular reserved word (followed by a colon). For example, in the *user namespace* all titles begin with the prefix *User:*. Namespaces allow for the organization and separation of content pages from administration pages. Namespaces separate data into core sets: those intended for

¹⁰ Software Operations and Support: https://en.wikipedia.org/wiki/Wikipedia#Software_operations_and_support

¹¹ MediaWiki: <https://www.mediawiki.org/wiki>

public viewing and those intended for the editing community.

Policies and Laws

EN, FR, and ES are founded on the same five pillars (as seen in Figure 2.2.) that were started with the inception of Wikipedia in 2001. These pillars are non-negotiable laws at the uppermost level of the policy regime of the platform. Each of these pillars and their corresponding article pages are transliterations of the English edition.

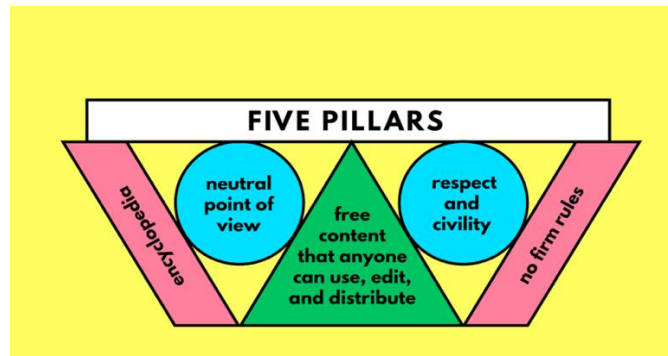


Figure 2.2. The five pillars of Wikipedia: (1) Wikipedia is an encyclopedia, (2) Wikipedia has a neutral point of view, (3) Wikipedia is free content, (4) Wikipedians should interact in a respectful and civil manner, (5) Wikipedia does not have firm rules. These are five non-negotiable rules that are at the uppermost level of the policy regime. Picture taken from Wikimedia Commons¹².

In each of the languages, rules govern the standards that editors must follow. In EN, FR, and ES, these rules are specified in policies, guidelines, essays, and more administrative pages. Policies are widely accepted among editors and describe standards that all users should follow, while 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. Essays are the opinion or advice of an editor or group of editors for which widespread consensus has not been established. The essays do not speak for the entire community and may be created and written without approval.

However, the differences in policies are evident in the articles for each of these rules. The classifications of the rules for each language edition are not the same. For example, a rule that is classified as a policy in EN might only be a guideline in FR. Additionally, each of these languages has their own policies that

¹² Wikimedia Commons - https://commons.wikimedia.org/wiki/File:Five_pillars_of_Wikipedia_%2B_three_core_content_policies.png

might not exist at all in another language.

Lastly, while the five pillars are commonly used to defend edits on articles, other policies might be used completely differently in each of the language editions. Digging a little deeper, the policies look similar, but differences exist in the policy regimes on an individual level. I do not delve into the difference between policy differences across language editions in this dissertation, but I do note the importance of additional work to understand the varying policy regimes.

Governance

In EN, FR, and ES, there is a hierarchy of roles that helps Wikipedia grow. Figure 2.3. highlights the human administration tiers in the English language edition.

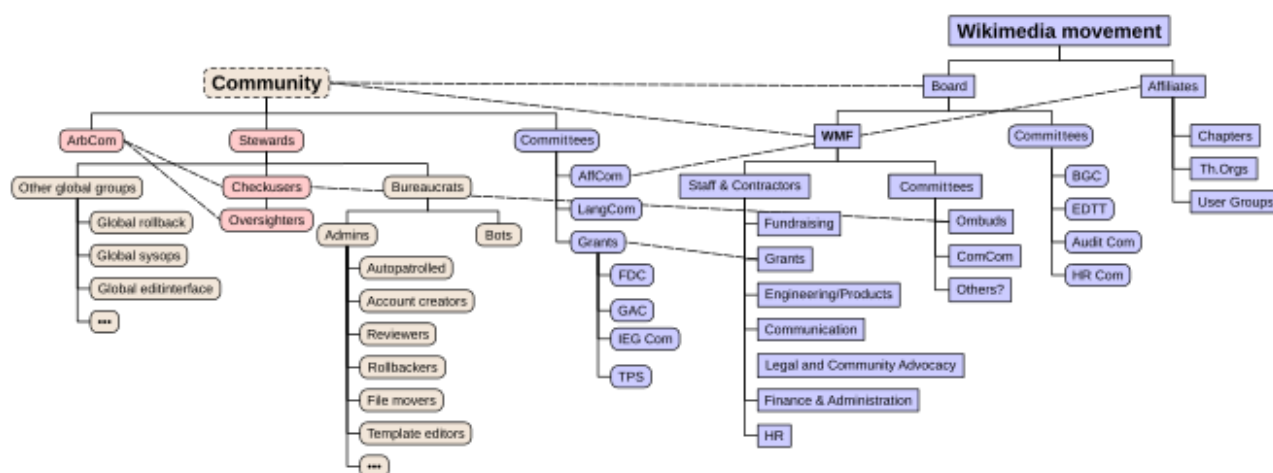


Figure 2.3. Hierarchy roles in EN. This chart represents the administrative structure of Wikipedia with the Wikimedia Foundation at the top. The chart is also split into two halves – the Wikipedia community (the pink/yellow side) is the self-governing side of Wikipedia that includes editors. The purple side is the Wikimedia foundation. This is a screenshot taken from WP:Administration¹³ article on Wikipedia.

In EN and FR, the administrators are critical to overseeing article development; ES has a role called librarians who serve the same role as administrators. The only difference between the hierarchies in the three languages is the conflict resolution committee. As seen in Figure 2.4., in ES, is the removal of the conflict resolution committee and now dispute resolution is taken to a librarian bulletin board.

¹³ WP: Administration - https://en.wikipedia.org/wiki/Wikipedia:Administration#Human_and_legal_administration



Figure 2.4. In ES, the conflict resolution committee is no longer used to resolve issues. Rather, librarians now take on this role. This screenshot is a translation of the template enacted on ES article of WP:Arbitration¹⁴.

While the technical specifications of the platforms at the topmost level are the same, the bureaucracy and laws are where the socio-technical differences begin to emerge. Each platform derives from EN and takes on many of the same properties. However, the small shifts in the socio-technical structure allow for each platform to have its individual identity; I hypothesize that the collaboration models will have properties observed on EN but will also develop variations in their own way.

Research on the French and Spanish language edition of Wikipedia

Additionally, to contextualize FR and ES, I wanted to understand specifically the type of research done on each language edition. My literature search showed limited research that focuses specifically on the French and Spanish language editions. In this section, I detail a number of the studies that I found that researched the French and Spanish language editions of Wikipedia.

French Language Edition

Research specifically on the French language edition is sparse. Poudat et al. (2016) demonstrated different methodological techniques for linguistics to discover conflicts on French Wikipedia talk pages using WikiConflicts corpus. Furthermore, researchers have analyzed the patterns of participation and cooperation in FR, Aurray, Poudat & Pans (2007) segmented different contributors and evaluated the main motivations for participation.

In the section that described research on language editions of Wikipedia, I discussed the importance of a diverse Wikipedia readership; it is critical to promote equitable access to Wikipedia to help broadly spread information across the globe. Prior research on the French Wikipedia has demonstrated gender differences in readership. According to Johnson et al. (2020), women are underrepresented among Wikipedia users; women view fewer pages per reading session than men; men and women visit Wikipedia for the same purposes; and men and women have distinct topical preferences. The findings from this study help demonstrate how bridging the gap in gender differences can improve knowledge equity across encyclopedic knowledge (Johnson et al., 2020). It is also important to acknowledge that these gender differences are based on a gender binary, which does not represent all readership.

¹⁴ WP: Comité de Resolución de Conflictos:
https://es.wikipedia.org/wiki/Wikipedia:Comit%C3%A9_de_Resoluci%C3%B3n_de_Conflictos

Lastly, as reflected in many FR studies, research explores how we can use the corpus of content from Wikipedia for computational linguistic algorithms. Studies have demonstrated how to use information extraction from the French Wikipedia (Gotti & Langlais, 2018). Furthermore, Bubendorff et al. (2021) developed machine learning systems that compare other social platforms (i.e., Twitter) to the French Wikipedia (Bubendorff et al., 2021).

Spanish Language Edition

Like French, the research specifically focused on the Spanish Wikipedia is meager. Here I outline a few studies about the Spanish Wikipedia. Alvarez et al. (2020) attempt to analyze and predict conflict on the Spanish language edition of Wikipedia. The authors identify linguistic categories which could be bias indicators in both English and Spanish versions of Wikipedia articles about international conflicts (Álvarez et al., 2020). Furthermore, research explores the gender gap in the Spanish Wikipedia. Similar to FR and ES, significant differences in gender population on ES. Researchers have analyzed this gender gap and noted significantly less women on the platform. Nonetheless, a group of veteran female editors surpass men in terms of editing practices and participation on the platform (Minguillón et al., 2021). Lastly, scholars have used Wikipedia as a database of information that can feed into machine learning models. The development of these quality models (Ferretti et al., 2018) can support the identification of featured articles (Pohn et al., 2014).

Studies that do significant work on languages across various languages have been highly quantitative. Typically, these studies do large-scale data analysis to understand the differences between each of these languages. However, in this section, I have highlighted a few studies that have solely focused on the study of the French and Spanish Wikipedia editions.

Multi-language comparisons

Many of the studies that I have listed previously about language editions of Wikipedia already consider multiple languages. Other studies include the French and Spanish Wikipedia, but they are typically large-scale quantitative studies that compare multiple Wikipedia editions.

References and citing them are important to be able to have content quality in Wikipedia that meet the standards of the platforms. Lewoniewski and al. (2017) investigated English, German, French, Russian, Polish, Ukrainian, and Belarussian to demonstrate common references across many articles. They show that similar content in multiple languages might have different sources since they are edited independently but also because multilingual users can transfer information from one to another, there might be similar content (Lewoniewski et al., 2017)

Furthermore, researchers have created recommendation and reputation systems to grow language platforms (Adler & De Alfaro, 2007). Researchers have created automatic tools that help compare language editions and extra biases across language editions (Consonni et al., 2019). Similarly, Miz et al. (2020) created an automatic evaluation system to be used across the English, French, and Russian editions.

Modelling Collaborative Behavior

In this dissertation work, I attempt to build collaboration models of the editing interactions that exist in EN, FR and ES. Each of these language editions is different in their socio-technical structures and their evolution. For that reason, I hypothesize that the collaboration models discerned from each platform will be unique. To test this hypothesis, I began by replicating two collaboration models that already exist based on EN to see if these models continue to exist in EN and in what capacity they may exist in FR and ES. In this section, I detail why these two collaboration models were chosen and list other models of collaboration in existence.

Models allow the development of behavioral taxonomies that can be used to forecast how people can use and communicate on online platforms. Models are more descriptive than hypotheses, as models have the potential to explain possible applications and offer predictive capacity. It's critical that models support focus on building richer behavioral understandings (Brown et al., 2010). Modeling behaviors on Wikipedia has been important for understanding how people behave so that they can continue best practices for creating quality articles. Models can help both researchers and designers continue to think about how we can promote better collaboration and build a platform (the technological resources) to better support social collaboration. Thus, modeling can help researchers and designers predict user behavior to improve the socio-technical efforts of Wikipedia and other peer production communities.

Models of collaborative behaviors in online peer production communities

Past studies have demonstrated models of contributory behavior or motivation on collaborative platforms (Budhathoki, 2013), models of information quality (Kane & Ransbotham, 2016), and information retrieval and creation in open-source (Müller, 2008; Potthast et al., 2008). These studies are difficult to understand across language editions because they require understanding of the beliefs and culture of editors. For example, past research on information quality gathered reviews from medical students to judge quality of medical articles on Wikipedia (Kane & Ransbotham, 2016). The medical students' judgements are based on their own medical knowledge and beliefs.

Researchers have worked to try to model collaborative behaviors on Wikipedia. A model allows for the future prediction of the use of the system and behaviors within the system that contribute to its overall development and growth. Furthermore, Wikipedia is a dual weight enterprise, making it difficult to measure because it has both light and heavy weight models of collaboration. Lightweight from the crowds who enter, edit and update entries; heavyweight from the inner circle of editors who determine such as which articles should be kept and update policies (Duguid, 2006). These heavy weight interactions are typically done by “Wikipedians” for whom “*Wikipedia as a whole becomes more important than any single article or set of articles*” (Bryant et al., 2005; Haythornthwaite, 2008).

Decision-making models have been presented about EN (Burke & Kraut, 2008; Welser et al., 2011; Hara & Doney, 2015), but most of these models are highly quantitative and do not allow for the differences in the platform. While there are other models around the bureaucracy and structure of Wikipedia, talk pages are the site of debate and collaboration on Wikipedia. I specifically want to understand how collaboration occurs on Wikipedia, thus studying Wikipedia in its entirety would be not only very difficult but also would not spotlight specific collaboration mechanisms that I am searching for.

Studies done on Wikipedia talk pages have examined the network of editors and the tree structure of discussions, but these studies are difficult to replicate in different languages when there are less content and fewer editors. For other language editions, it is critical to understand the discussions occurring on the talk pages.

Other studies have analyzed talk pages but have done them on specific samples of articles from EN, so it makes it difficult to make assumptions about the collaborative model that exists on the entirety of the English platform (Laniado et al., 2011; Luyt, 2012). Lastly, talk page studies have adapted the models I use in this dissertation, highlighting that the collaboration models chosen have been validated in prior research studies (Schneider et al., 2012).

Other collaboration models exist that are not solely recorded on peer production communities. For example, the common ground framework by Clark et al. (1983) argues that to communicate cooperatively speakers and hearers must determine what constitutes the ‘common ground’ or shared knowledge and beliefs that help ensure that messages are understood as intended. Similar, Yuan et al. (2013) attempted to better understand communication in multilingual contexts. Their findings show that there are barriers to communicating as users do not have a shared knowledge if they do not comprehend the other language community context (Yuan et al., 2013). On Wikipedia, users follow the same five pillars and similar policies, but their knowledge and beliefs may be different since users do not necessarily know each other.

These other models have a lot to do with understanding multilingual cultural context but relate less to understanding each language community as I am looking at each of these communities individually. Furthermore, these models in a multilingual context do not relate completely to Wikipedia or any peer production community, making it difficult to replicate within Wikipedia language editions.

Replicating Wikipedia Models of Collaboration

Many types of behavioral patterns in Wikipedia have been modeled but a common thread among these studies is their reliance on observable and quantitative behaviors in EN. For example, Ransbotham & Kane (2011) have modeled over the retention of users. Moreover, studies have used edit history to build editor collaboration patterns to support Wikipedia (Liu & Ram, 2011). These EN-based studies include behavioral patterns related to administrator promotion (Burke & Kraut, 2008), deletion (Geiger & Ford, 2011), and content production (Kittur & Kraut, 2008). Additional EN-based studies have proposed behavioral models of collaboration to satisfy technical and social requirements (Kittur et al., 2007; Viégas et al., 2007). Such models are further seen in studies of contributions on talk pages (Kittur & Kraut, 2008; Morgan et al., 2014; Schneider et al., 2010; Viégas et al., 2007) in the use of policies (Butler et al., 2008), in the use of Wikiprojects for coordination (Morgan et al., 2013a), and to recommend new talk page tools for editors (Lam et al., 2015, Schneider et al., 2010). Additionally, there have been studies done to predict vandalism to help protect content (McKeown & Wang, 2010).

Collaboration models, primarily based on studies of EN, suggest recommendations to extend Wikipedia. For example, Lam et al. (2015) recommend that enhancements should be based on the influence they can have on the decision quality of the editors. Kittur et al. (2007) suggest creating tools that can increase coordination and reduce conflict. However, it is not evident that recommendations derived from behavioral observations in EN can generalize across other language editions. Furthermore, modeling behavior on Wikipedia has been centered around specific and cultural events, making them even less generalizable from one language platform to another (Twyman et al., 2017). To begin understanding collaboration, I leverage existing analytical models developed on EN to begin to examine behaviors in ES and FR.

The two models of collaboration included in this dissertation were chosen, first, because I had access to other authors. Additionally, both models have been highly influential but with different types of impact. The collaboration model around user's power plays (Kriplean et al., 2007) is highly referenced in the Wikipedia: Academic studies¹⁵ of Wikipedia article. The collaboration model around user behaviors on

¹⁵ WP: Academic Studies of Wikipedia - https://en.wikipedia.org/wiki/Wikipedia:Academic_studies_of_Wikipedia

talk pages (Viégas et al., 2007) is highly cited in academic papers. These two collaboration models have an impact on both academic and industry researchers. Furthermore, these studies were methodologically sound, offering a detailed methodology that could be replicated with help from the authors. I further detail how the replication occurred in Chapters 4 and 5. Additionally, both of these models (Kriplean et al., 2007; Viégas et al. 2007) have previously been uncovered from discussions on Wikipedia talk pages in EN. Since I am interested in collaboration on Wikipedia, talk pages are the best site to conduct this research and proving these models even more useful to my overall research agenda. I leverage these models in FR and ES to outline their existence in other language editions. I then use the replication of these two models to create a more comprehensive model of collaboration in each language. Most prior studies have only analyzed EN collaboration and have narrowed down to specific pieces of collaboration. By putting together multiple collaboration models, I present a more complete picture of collaboration across languages.

Summary of Related Work

In this chapter, I detail various studies that dive deep into language and language communities. It was necessary to provide this literature review to both demonstrate the gap in language community research in CSCW but also to show how this work does not necessarily fit within other studies that explore language communities online. Additionally, in this chapter, I described the research that has been previously conducted on Wikipedia and examined the contextual considerations of the EN, FR and ES communities. The sum of this knowledge is the foundation that I use to support the three studies presented in Chapters 4, 5 and 6. Before I present these three research studies, in the following chapter, I highlight the theoretical lens and methodologies that I use to dissect and compare Wikipedia editors' collaborative practices across three languages.

Chapter 3: Theory & Methodology: Extracting Language Processes from a Socio-technical System

In this dissertation, so far, I have discussed two processes that influence the development of Wikipedia: the social and the technical. In this chapter, I narrow down the focus on the importance of additionally extracting and understanding the language processes and the relationship between language and the culture of an editor. While language and culture are intertwined, they do not equate, and it is important to note that distinction in peer production communities where editors have the choice to present themselves in any way they choose. Adding language as a process influencing the development of Wikipedia is an important lens to understanding and supporting the collaborative practices as editors on the specific language edition. Lastly, I wrap up this chapter by diving into the methodologies that I will use to better understand the collaboration practices in EN, FR and ES.

Does English Truly Power the Internet?

As of 2019, the internet has over 5 billion users and is composed of billions of petabytes. It is almost impossible to describe or measure the vastness of the internet. As far back as April 1996, the *New York Times* quoted Anatoly Voronov, the director of Glasnet at the time saying that “*the internet is the ultimate act of intellectual colonialism*” (Specter, 1996, p.1). Suggesting that since the internet was created in America, everyone must adapt to English or just not use the internet at all. Fundamentally, the internet has the possibility to consume how we think and work.

This view of intellectual colonialism of the web, at first glance, is easy to believe. Many pages on the internet are in English driving the assumption of cultural imperialism as the spread of Western, more

specifically, American ideals become more prominent. In particular, the English language is taking over the internet. It is easy to fall into this hole because most of the well-known digital social platforms are majorly in English nowadays (e.g., Facebook, Youtube, Buzzfeed, etc.). Furthermore, the internet was developed in the United States of America and in the English language. With the roots being in the United States and with so much technological development drive coming from the United States, it is possible that the internet's development will continue in English (Greifferstern, 2010). As discussed in Chapter 2, much of the internet is in English and "*many scholars have expressed concern about the dominance of English world and the Internet as a new source for its spread.*" (Danet & Herring, 2007 p.2).

This belief that English is the lingua franca of the internet is not entirely true and not representative of the vastness of the web. As society continues to globalize, many more languages are being used on the internet (Danet & Herring, 2007). Phillipson (1992) coined the term "*linguistic imperialism*" to better describe what is happening on the internet with English and multiculturalism. According to Phillipson (1992), linguistic imperialism is the imposition of one language on speakers of other languages. In our time, the global expansion of English has often been cited as the primary example of linguistic imperialism because of the stigmatization of smaller languages on the internet (Phillipson, 1992). Essentially, the belief that English is the main language of the internet overlooks the fact that the language landscape online is expanding.

Throughout the fast-paced evolution of the internet, around 75% of the users are not native speakers of English (Internet World Stats, Nielsen). With the diverse language landscape online, it is important for us to be aware of the issues that arise as online users need to communicate in a variety of languages. According to Crystal (1997), there are four basic approaches to the challenge of communication access across linguistic boundaries and these challenges also transcend to online users: (1) Remaining monolingual (i.e., not communicating across linguistic boundaries); (2) Multilingualism (i.e., learning the language of another language community, such as German speakers learning French); (3) Creation of a contact language (e.g., a pidgin or creole); and (4) Adoption of a lingua franca (i.e., a common language that may be the native language of few or none of the specific discourse participants, what is happening now with English). While some non-native speakers may become fluent in the full-fledged version of the lingua franca, others may function with a restricted subset of the language (Crystal, 1997).

With the spread of multiple languages on the internet and online users facing the mentioned challenges, it is important for CSCW/HCI researchers and designers to focus on understanding and building tools to help support collaboration between users who speak languages that are not English. In Chapter 2, I delved into the work around language and technology in CSCW. Looking beyond CSCW, there exists research that focuses on language and computer-mediated collaboration (CMC). Danet and Herring (2007) classified

some of the more prominent research on the internet into five broad categories, the first of which being writing systems and online communication. The internet first started as an English platform, so the text-transmission is based on ASCII character set, making it difficult for others to be able to communicate using characters that are not in the Roman alphabet (Pargman & Palme, 2004). Some languages (e.g., Arabic, Chinese, Japanese, etc.) are dependent on special character sets for word processing and online communication. The second category is the linguistic and discourse features of CMC. Internet users might use smiley faces but in other languages, they use other forms to express themselves (Baron, 2000; Crystal, 2001). For example, Japanese speakers use *Kaomoji*, a form of emoticons, to express themselves (Katsuno & Yano, 2007). The third category is gender, language, and culture online. In English, men and women use different discourse styles both online and offline (Hayat et al., 2007; Herring, 1994). This third category is quite prominent in Wikipedia research work because of the possible existence of the gender gap between editors on the Wikipedia platform (Massa & Zelenkauskaitė, 2014; Collier & Bear, 2012; Wagner et al., 2015). The fourth category is language switching between languages online (Kelly-Holmes, 2004; Wang & Komlodi, 2008). Multilingualism is becoming more prominent on the internet and researchers have analyzed multilingual editors Wikipedia (Hale, 2014; Hale, 2015; Somoilenko et al., 2016). The last category is the internet and global linguistic diversity: It is important to understand the future of smaller languages online as English has been at the top of the food chain of the internet for a very long time and is still perceived to be at the top. Holistically, these five broad categories demonstrate that there is research that looks at online work through the lens of language. An increase in research focusing on the Wikipedia platform ties in many of these categories and I further detail some of this research in the following section.

Why study language editions on Wikipedia?

This dissertation focuses on Wikipedia because it is a holistic platform made of a subset of different language editions. Thus, language becomes critical to the overall growth of the platform. Most importantly, multilingual speakers contribute to the development of content. In Chapter 2, I discussed prior research that has shown that even some editors speak multiple languages and might not even edit in their native language (Hale, 2015). One reason for that is that switching between different language editions is hard for users, especially those editing in their non-native languages.

Hale (2015) demonstrated that edits produced in the non-native language of users were smaller and more restrictive than their normal edits. Thus, editors might include more content and novel in-depth content in the language edition of their native language. In this section, I describe three areas of research that demonstrate the importance of language and the tools that help facilitate the spread of different language content.

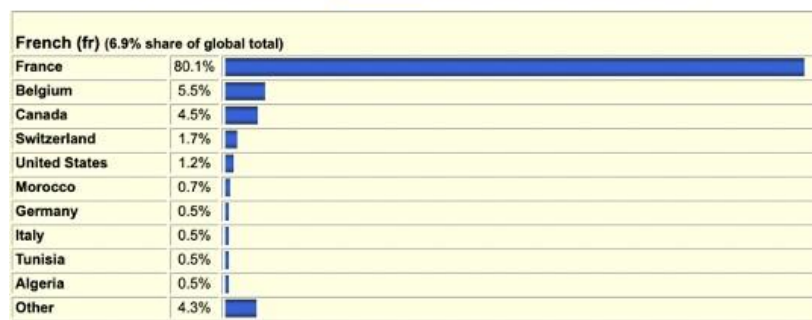
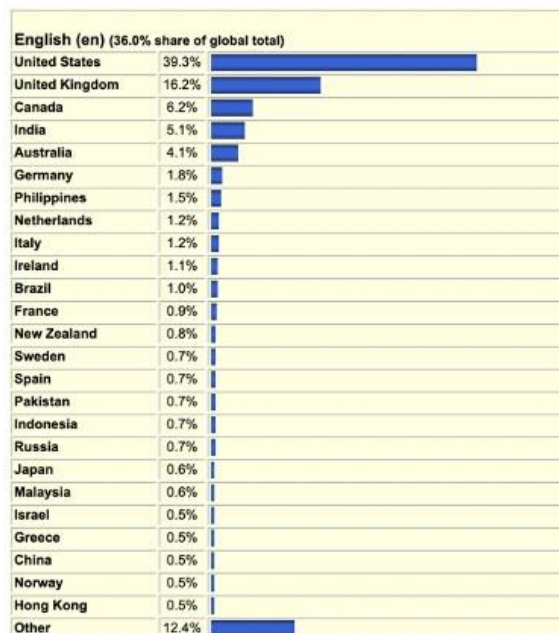
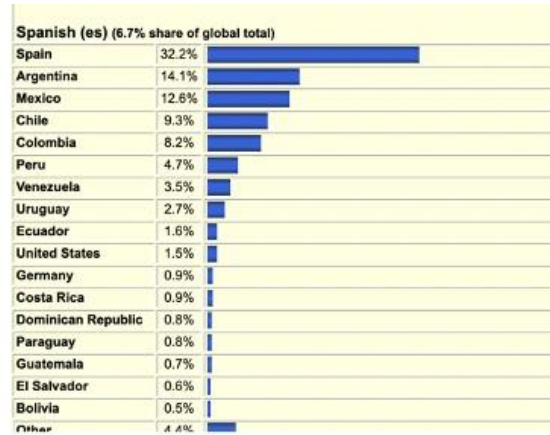


Figure 3.1. In EN, FR, and ES, the editor population comes from more than 10 different countries. In ES, only around 30% of the users are from Spain. In FR, 80% of the users are from France and in EN, approximately 40% are from the USA.

Multilingual Editors and Readers

Editors who collaborate on Wikipedia come from around the world¹⁶. In Figure 3.1, I show how in EN, FR, and ES, the editor population comes from more than 10 different countries. Furthermore, internet users from around the world visit Wikipedia to consume or read the content. According to the Wikimedia foundation's facts and figures¹⁷, every second, 6,000 people view Wikipedia pages from across the globe.

Additionally, across different languages, the number of readers is substantially different. Research has shown that the readership on English Wikipedia is not representative of other language editions (Lemmerich et al., 2019). For example, Lemmerich et al. (2019) show that articles are read more in-depth by readers in countries with a low Human Development Index. One reason for this may be that the socio-economic characteristics of a country that a reader comes from can demonstrate the prevalence of the use of Wikipedia (Lemmerich et al., 2019).

Language Translation on Wikipedia

Another reason that language is important on Wikipedia is that content can be transferred across different language editions through translation. Translation plays a big role on Wikipedia for three reasons. First, translation helps develop content in other language editions by allowing editors to reuse content from other editions (McDonough Dolmaya 2017). Secondly, readers can use automatic translation tools such as Google Translate to read content from other platforms. Third, since Wikipedia is such a large database of multilingual content, it is possible to use that data to build machine learning translation tools (Potthast et al., 2008; Basile & Semeraro, 2010; Hálek et al., 2011).

The roles that translation plays on Wikipedia support collaboration across multiple languages (Vrandecic, 2018). Given that a previous study suggested that many of English Wikipedia's translators had neither formal training in translation nor professional work experience as translators, prior research has focused on evaluating the quality of translations (McDonough Dolmaya 2015; McDonough Dolmaya 2017; Torres-Simón, 2019). Currently, the technical software of Wikipedia does not support translation capabilities and so researchers have additionally created tools to help facilitate translation, thus making it more effective and efficient (Laxström et al., 2015). Furthermore, natural language processing as a tool for language translation has become much more prominent. Wikipedia is a large database of textual information, so it has become possible to use the text data as corpus or training material for language machine learning algorithms (Aprosio et al., 2013; Lehmann et al., 2015).

¹⁶ WP: Who writes Wikipedia? - https://en.wikipedia.org/wiki/Wikipedia:Who_writes_Wikipedia%3F

¹⁷ Wikimedia Foundations facts and Figures for the press - <https://wikimediafoundation.org/about/press/>

Importantly, on Wikipedia, translation has been an important aspect of multilingual collaboration. Some users work across language editions and thus translation is a community activity, there is a lot of community interaction that involves finding and solving problems that might occur when translating, including issues of transliteration, proper nouns, and source referring (Hautasaari & Ishida, 2011).

Interlanguage Links

Interlanguage links are the connection between language editions on Wikipedia. Interlanguage links (ILLS) are a function of MediaWiki and enable the spread of multilingual information. Interlanguage links are one part of the technical system that I further described in Chapter 1 and Chapter 2. Authors and editors can create a hyperlink between two articles that appear in two different languages, making it easier for someone to find similar content across multiple languages (Arai et al., 2008).

Prior work has suggested that there is a difference in topical representation across different languages (Massa & Scrinzi, 2012; Ortega et al., 2008). However, few studies have looked at ILLs. One study presented by Geser (2007) analyzed the evolution pattern of ILLs across various languages. Arai et al. (2008) proposed a cross-lingual keyword navigation system using ILLs. A multilingual dictionary was developed using ILLs and can be used for cross-lingual information retrieval (CLIR), multilingual information access (MLIA), and machine translation.

With the diversity of readers and editors, translation machines, and the use of interlanguage links, it is possible to demonstrate the need to accommodate for various language communities and that language, in general, plays a large role on Wikipedia. Through various mechanisms such as automated translation or machine learning, editors add content and facilitate the spread of information on each language edition. All the language mechanisms mentioned in this section are an integral part of other language editions, not just English.

What is the Relationship between Language and Culture?

As I pursued this dissertation work, one of the biggest challenges was explaining the reason that I was looking at the language without making assumptions about the culture of an editor. As noted by Danet and Herring (2007, p.7), *“identifying context can be really difficult in the world of CMC.”* Included in that context is the culture and beliefs of the editors on Wikipedia. As I learned and researched these language platforms, I did not feel qualified to make claims about the personal context of these editors. In Chapter 6, I speak with multiple editors in EN, FR, and ES, and in each language edition, the editors that I spoke to did not have the same geographical location or culture. As an example, I spoke to editors that spoke Spanish and edited ES, but a few were from Spain, some from Mexico, and another from Colombia. I could not

claim that all these editors had the same culture, but I could confirm one language they edited in, Spanish.

I also learned that language is not equivalent to culture. Language *and* language selection is a way for users online to transmit their culture or location online and show online who they are, but their behaviors or practices online are not necessarily tied to their own individual beliefs and culture. The behaviors performed online are not only determined by their culture but also shaped by the social interactions they have online, and the technical system of the platform being used. Essentially users have the freedom to construct themselves online, they can curate and demonstrate any type of culture they want.

On Wikipedia, individuals may not report where they are from, but they become part of a language community by participating in a specific language edition. As noted by Danet & Herring (2007, p.7), *“geographical boundaries do not coincide neatly with linguistic ones. Whether residing in a country or abroad, participants share online the sociolinguistics norms acquired originally in a face-to-face context, which are not static but themselves change over time. Individuals may belong to more than one speech community”*. It becomes difficult to understand the geographical boundaries or language norms from a face-to-face context on the online platform, making it difficult to make assumptions about Wikipedia editors.

Cross-Cultural studies

I acknowledge that it has been a challenge to study solely language in a peer production community. The research on multilingual online communities has been mostly driven by culture; however, this becomes very difficult as users speak multiple languages and stem from all corners of the globe. This prior research attempts to demonstrate how culture is deeply rooted in language. Many see the online environment as a culturally and linguistically transparent global village (Hawisher & Selfe, 2000). In this section, I describe some of the work done to understand the culture of editors using online communities.

Cultural models have been used to compare online communities. A study by Pfeil et al. (2006) uses a highly influential model, Hofstede’s Cultural Dimensions (Hofstede & Bond, 1984) to compare and contrast countries based on six dimensions (i.e., Power Distance Index (high versus low), Individualism Versus Collectivism, Masculinity Versus Femininity and Uncertainty Avoidance Index (high versus low)). Other models exist such as Huntington’s Clash of Civilizations that categorizes cultures as civilizations (Huntington, 2000). Huntington (2000) split up the world into different civilizations and each civilization represented a different cultural identity. Moreover, temporal comparisons have been done using Robert Levine’s Pace of Life that considers the perception of time in different countries to better understand the culture online (Garcia-Gavilanes et al., 2013; Levine & Bartlett, 1984).

In CSCW, researchers have used sentiment analysis measures to understand the differences between

countries on social media with respect to language use (Poblete et al., 2011). Additionally, cultural comparisons have been done to understand how online collaborative technologies such as instant messaging have been used (Kayani et al., 2006; Lim et al., 2017). Cultural studies have tried to unearth and compare gender differences online. (De Oliveira 2003; Katsuno & Yano, 2007; Panyamethekul & Herring, 2003). A study by Vatrapu and Suthers (2009) demonstrates how socio-technical affordances and technological intersubjectivity differ across various cultural dimensions. These authors experimented with three dyads from similar or different cultures participating in a collaboration problem-solving scenario. Using a computer interface with multiple forms of interaction (diagrammatic workspace, embedded notes, threaded discussion), the participants had to solve a particular problem. The results show differences across the various dyads; American and Chinese participants had different collaboration techniques to support their digital problem-solving efforts.

Furthermore, researchers have investigated how one's culture influences their decision making online. Yuan et al. (2013) noted that cultures that are built on strict laws offline might be more likely to abide by online policies. On the other hand, research has connected language and culture to show the influence of language differences on online behavior. In a study done to understand the privacy practices in Facebook use in Cambodia, Jack et al. (2019) noted that the lack of some words in the Cambodian language altered the perspectives of how privacy was used on the platform. Other studies connect users' language abilities and cultural knowledge to their language behaviors. Non-native speakers, offline, generally preferred interacting informally with fellow speakers in their own native language as opposed to native English speakers, which hinders communication and collaboration between groups. This research helps support the development of collaboration tools that will help foster collaboration between speakers of different languages (Yuan et al., 2013). Furthermore, technology was created to help support language switching in collaborative efforts. Research has shown that if non-native speakers join a collaboration with native speakers, typically speakers code switch between the non-native and native language to be able to reach common ground. Yamashita et al. (2013) has shown that this is not always beneficial for collaboration. Researchers have created language support tools to transcribe and translate conversations during a collaborative effort (Gao et al., 2014). These tools help support more diverse efforts but have led to lower perceived quality of collaboration (Yamashita et al., 2013). In this dissertation work, I attempted to disentangle language and culture without making any assumptions about cultures related to the languages spoken. This is for two reasons: (1) I do not have sufficient knowledge of the cultural background of users to make assumptions; and (2) the continuous debate to define the ties between language and culture make it difficult to create these connections.

Most of the studies I described that study language, do not specifically study online collaboration and it becomes hard to untangle culture and language from one another. Previous research has shown that

collaboration in multiple languages works with varying degrees of success. This could potentially be extended to looking at how people collaborate within a language edition and using their knowledge of multiple languages to translate information and add content. All things considered; however, it is difficult to make assumptions of the cultural and geographic origins of users if they are not explicitly stated. In this dissertation, I want to demonstrate that the social and technical processes that occur online additionally create a collaboration culture that might not be seen as the cultures described in these prior studies.

Wikipedia was chosen as the site of study to control for culture. Through the evolution of the platform, Wikipedia has developed an existing culture of collaboration. This culture is specific to peer production communities, where editors can simultaneously create and share content. Currently, most research on the culture of collaboration on Wikipedia has only been done on the English Wikipedia meaning that the culture of collaboration on other language editions remains largely unexplored/without investigation.

Research has connected language and culture to show the influence that language differences can have on behavior online. Essentially, language, technology, and their influence are critical to the development of Wikipedia. I cannot make claims about the culture of the users but the social interactions, technology usage and the language of editors can start to demonstrate a model of collaborative behavior across language editions. I do not aim to just blatantly make assumptions about culture but instead use what we know about language, and editors' behaviors

Why would language editions of Wikipedia have different collaboration models?

While I cannot make claims about culture on Wikipedia, linguists have theorized that language has some influence on an individual's culture. The Whorfian view suggests that language patterns determine how individuals perceive the world and how they think about it, thus having different language systems means that people view the world in different ways (Whorf, 1997).

A strong version of the Whorfian hypothesis is linguistic determinism that came to light in the 1930s. Whorf studied indigenous languages and demonstrated a contrast in European languages and how those individuals spoke about reality (Whorf, 1956). From his work, Whorf coined the term "linguistic determinism" to show how the language we speak influences our culture or the way we conceptualize and think about the world. The Sapir-Whorf hypothesis states that our language influences and shapes our cultural reality by limiting our thought processes (Whorf, 1997). Consider the gender-associated terms and the views attached to these certain words, such as 'nurse' and 'fireman.' From the view of the Sapir-Whorf hypothesis, language influences culture, giving more reason to study language rather than culture.

However, the Whorfian hypothesis has been heavily debated. Some more recent researchers think there are two separate arguments: “*Do we think in language?*” and “*Does language shape thought?*” (Casasanto, 2008). Casasanto (2008) suggests that people do not think in language, but that speakers of different languages develop distinctive conceptual repositories because of standard and universal cognitive processes. Due to this debate over the Whorfian hypothesis and the fact that I cannot make claims of linguistic determinism, in this dissertation, I focus more on the weaker version of the Sapir-Whorf hypothesis — linguistic relativism. Linguistic relativism suggests that language affects our thinking and behavior but does not wholly determine thought. In this dissertation, I am interested in how some of the language processes might shape the collaboration culture in each language edition. Essentially, based on the theory of linguistic relativism, I can hypothesize that users of Wikipedia that speak different languages across language editions will have different ways of thinking and behaving.

The Language Processes within a Socio-technical System

In the past two chapters, I have discussed the importance of language, the role language plays on the internet, and the relationship between language and culture. In this section, I aim to demonstrate the lens I will use to observe a language community without making assumptions about the culture of the editors on Wikipedia. In Chapter 1, I discussed how Wikipedia is a socio-technical system. As shown in Figure 3.2., systems with a mix of technical and social features are referred to as "sociotechnical systems" in the field of Science and Technology Studies (STS) (Bostrom & Heinen, 1977). Using the sociotechnical framework as a lens can help draw out both the social and technical processes because technology is always accompanied by social actors (Lamb & Kling, 2002). Humans and machines are both required for any technology to function properly. The advancement of Wikipedia is defined not only by its human resources (i.e., the dynamics of editors), but also by the technological system (i.e., MediaWiki, templates, bots).

By looking at Wikipedia holistically, it is possible to demonstrate a socio-technical relationship. For example, editors may add a “controversial” template to a talk page to help others be aware that the content on a given talk page will have much more debate. In this example of “controversial” templates, both social and technical processes are helping mutually shape how coordination practices might happen. Mutual shaping suggests that society and technology are not mutually exclusive to one another; instead, society and technology influence and shape each other.

In this dissertation work, I introduce the idea that language processes also help play a role on Wikipedia talk pages. For example, consider the policy and guideline structure on Wikipedia that I

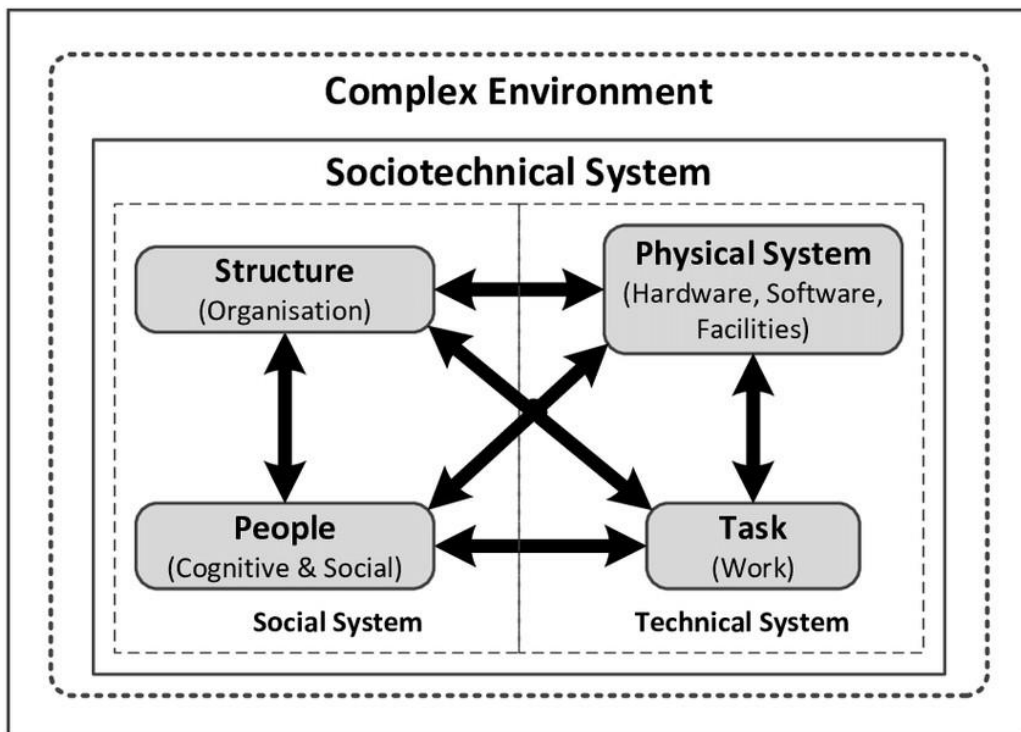


Figure 3.2. A visualization of the socio-technical system which is a combination of both the social and technical system. In this dissertation, Wikipedia is a socio-technical system; the social system includes the overall organization (Wikipedia) and the people (Wikipedia editors and readers). The technical system includes the physical system (Wikimedia) with the task (creating quality encyclopedic articles).

further explained in Chapter 2. This hierarchy of rules (policies, guidelines, and essays) is created with a combination of language, social and technological features. The technology of Wikipedia affords features such as talk pages, stylistic guidelines, and templates that inform the way people interact and collaborate. Policies and guidelines lead to new types of social interactions and editors write these rules to help guide the language they need to use in talk pages and articles. This organizational structure is a combination of language, social and technological processes.

It is important to note where language processes fall within a socio-technical system. In Figure 3.2, people fall within the social system. In this dissertation, I use language to understand people and the social processes. The fact that Wikipedia has multiple language editions shows that language may have a relationship with broader social issues. Essentially, language *and* language use manifests into new social processes across different language editions of Wikipedia. The differences that might exist in the language processes between editions is an accessible way of understanding the social processes - this has not been

adequately represented in culture research or other research on Wikipedia language editions.

Wikipedia is a socio-technical system and to truly understand each language edition, I believe it is important to draw out the language processes that occur in each language edition and influence the technical and social processes. Since I am looking at collaboration and this is collaboration enacted by people then I specifically take the stance that language processes are part of the social processes. I want to still acknowledge there are different perspectives that could suggest that language processes are both part of the social and technical systems. Language processes can be considered technical, for example, a flexible user interface would let users change language, font size or privacy preferences, as each person is a new environment to the software. Language is also social because without language, it would be difficult for users to communicate. Language can fit within the social or technical system or both but specifically for the dissertation, I see language as part of the social system as shown in Figure 3.3.

Not only do the social, technical, and language dimensions exist but they also work together — these processes are a mixture of what I can see and understand on Wikipedia. It is important to note, however, that these processes are not strongly deterministic of each other, because by nature Wikipedia is a diverse and evolving platform. In computer science, a deterministic system is a system in which no randomness is involved in the development of future iterations of the system. Wikipedia involves a mix of people from all around the world that is constantly evolving, as shown in the changes in EN. For that reason, nothing can be deterministic; there is always going to be some sort of arbitrariness in the collaboration models across languages. Furthermore, a deterministic system shows *cause-and-effect*. However, in this work, while I can show the existence of these features within EN, FR and ES, it is very difficult to demonstrate that they caused the other one to happen. I can show that there is some relationship between the various processes used on Wikipedia. In other words, I cannot distinguish if there is a directional relationship between any of the features.

To better fit with the goals of this dissertation, I extract language from the social in socio-technical and look at the social, technical and language processes separately as a lens to better understand what is happening in each language edition. This is better demonstrated in Figure 3.3. If we consider other socio-technical platforms such as Twitter and Facebook, it is possible to see how language plays a role as part of the social processes. For example, the word “privacy” makes us think about how we perceive the platform (Jack et al., 2019). This perception shaped by the culture of a platform demonstrates how important language is. Online tools have been built for the global population, but there is a need to understand the impact it has on globalization, when a diversity of language users will be working together to achieve common ground on the platform.

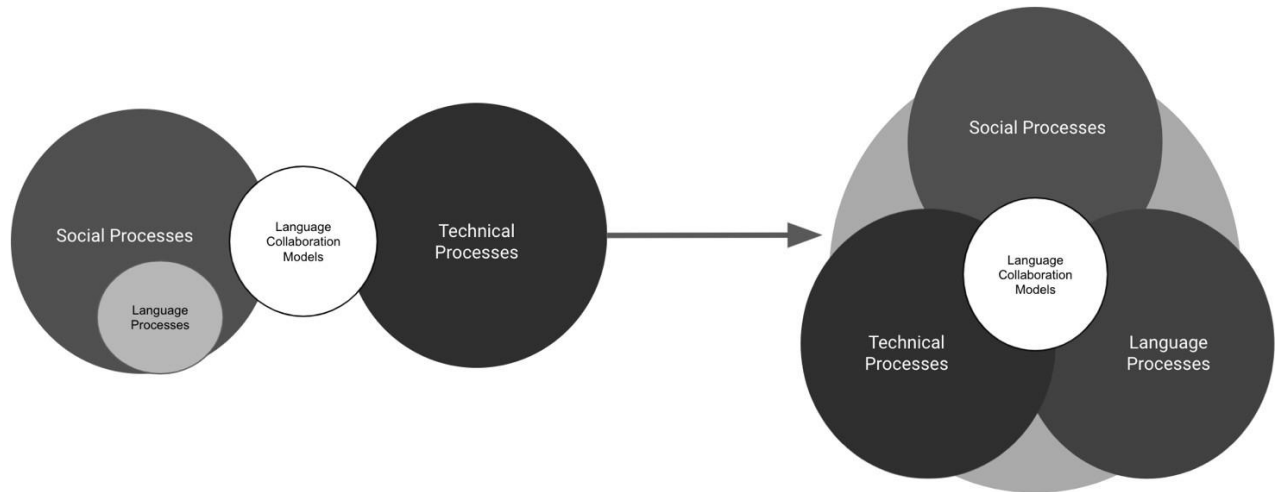


Figure 3.3. Language processes play a large role in the social system. However, as a lens, to better understand collaboration, I extract language processes and look at the technical, social and language processes separately in this dissertation. Together, I believe these features and processes work to create the culture of collaboration in each language edition.

In Chapter 4, 5 and 6, I specifically look at the findings of each study to disentangle the social, technical, and language features. For this dissertation, I characterize each of these factors as:

1. Social: Any collaborative actions. These are the interactions editors have with each other on the article talk pages and the decisions they make while collaborating and editing Wikipedia.
2. Linguistic: Includes the pragmatics of language or the rules that govern the use of language in social situations and language applications (e.g, translation, transliteration, etc.)
3. Technical: Characteristics of the Wikipedia platform pertaining to engineering and digital design.

I then discuss the relationship between these features and the collaboration model to see if a relationship exists and how these features collectively shape each language edition. In the rest of this chapter, I detail the methodology used to study editors' collaborative practices in EN, FR, and ES.

Methodologies

In this dissertation work, I want to provide a description of collaboration models in all three language editions of Wikipedia currently and over time. I use both quantitative and qualitative research methods in the three studies presented in this dissertation. In this section, I motivate my approach to examine the behaviors on Wikipedia with a discussion of the advantages of replication studies. This study is reflective

of a systematic replication to understand how two studies (Viégas et al., 2007; Kriplean et al., 2007) conducted over 10 years ago apply in EN and in two new contexts -- FR and ES. My methodological decisions were made to stay as consistent as possible with prior research undertaken to understand collaboration on EN. I explain these studies in more detail in Chapters 4 and 5. This systematic replication potentially increases the value of a prior finding by conducting follow-up experiments using procedures that are logically related – though slightly different – from the original research. I briefly describe my data sources and analytical methods: content analysis and interviews. Specific details on how these methods were used in different studies are reserved for Chapters 4, 5, and 6 themselves.

Replication Approach

Researchers have also called for comparisons of language peer production communities to understand the dynamics of social computing systems (Bao et al., 2012). However, much of this research has not considered how or whether results replicate or generalize. A few studies on replication (Kittur & Kraut, 2010; TeBlunthuis et al., 2018) in HCI suggest that the results can generalize past a specific sample (Bipat, et al., 2018), verify that these assumptions about prior work hold, and that replication is useful for training new researchers on HCI methodologies (King, 1995).

In this study, I am interested in understanding the collaboration model that exists in EN, FR, and ES. Each of these language editions has its own socio-technical structure and its evolution. For that reason, I hypothesize that the collaboration models will be different. To test this hypothesis, I replicated two collaboration models that already exist in EN to see if these models continue to exist and in what capacity they may exist in FR and ES. The collaboration models were included because we can replicate the methodologies of the original research study. In Chapter 2, I explained why these specific collaboration models were chosen and additionally explored other models that do not fit the context because they were not recorded on peer production communities or were highly quantitative.

I take two models of collaboration that have previously been uncovered from discussions on Wikipedia talk pages in EN. I leverage these models in FR and ES to outline their existence in other language editions. I then use the replication of these two models to create a larger-scale model of collaboration in EN, FR, and ES. Most prior studies have only analyzed EN collaboration and have narrowed it down to specific pieces of collaboration. By putting together multiple collaboration models, I present a more holistic picture of collaboration across languages.

Quantitative Data: Count of Edits and Talk Pages

In this dissertation, there was a small focus on the quantitative data collected on Wikipedia. Prior studies

have analyzed language editions by looking at the numerical data that can be gathered from the platform. However, from my quantitative analysis, it was easy to see that the numbers are very different from each other. However, it was difficult to explain why there were these large variations in the numbers. For that reason, I spent more time leveraging qualitative research in this dissertation. In Chapters 4 and 5, I present two small quantitative analyses, but both analyses reflect very little data collected compared to what is needed to make significant quantitative claims about any language edition.

In Chapter 4, exploratory data was collected for each article and talk page, including counts of how many posts were on each talk page, how many talk pages existed, and byte counts. I counted how many talk pages existed for a subset of articles in EN, FR, and ES. Additionally, I analyzed the percentage of edits done on a talk page to the number of edits done on the article. This was based on a prior collaboration model presented by Viégas et al. (2007) I replicated the same quantitative analysis to understand how a model in FR and ES would be expressed and if the model in EN would change over time.

In Chapter 6, I calculate a policy score to create my sample. I also did a simple calculation of policy types that existed in EN, FR, and ES to begin to understand what types of policy were being used by editors.

Content Analysis

Content analysis is a research technique used to unearth the presence of words, themes, or concepts in qualitative data. Using this technique, researchers can make replicable and valid inferences from texts (Krippendorff, 2018). Researchers can quantify and find evidence of meanings and relationships of words, themes, or concepts. According to Berelson (1952, p.18), content analysis is defined as “*a research technique for the objective, systematic and quantitative description of the manifest content of communication*”.

In my work, I used content analysis to discover patterns of behavior in talk page conversations on Wikipedia. The content analysis methodology was used two ways: (a) by replicating a coding schema that was already discovered in prior work; and (b) creating a coding schema by uncovering overarching themes from the text. In both ways, I then counted the times that a specific theme occurred in the text. This method is reflective of a methodological tool called Web Content Analysis (Herring, 2009). This methodology covers various ways to gather concepts from the text and non-textual artifacts, such as images, videos, and digital interfaces. In this work, I used the terminology *content analysis* to holistically describe the Web Content Analysis methodology.

In Chapter 4, I used a coding schema already created by Viégas et al. (2007) to parse the text data. Prior

work has shown that not all discussions on the talk pages are associated with only article editing activity (Ehmann et al., 2008). I coded such contributions as *Others*. Subsequently, some of the other content also does not fit into the posting dimensions in Viégas et al. (2007). Like Morgan et al., 2013a and Schneider et al., 2010, I thus added codes to the schema to enhance the original coding schema. After testing the robustness of the Viégas et al. (2007) schema in phase 1, I determined that a deeper analysis was required to understand what was going on in these talk page contributions. I thus re-coded the data in the other section and created my own coding schema. Motivation to develop the coding schema was based on a deeper analysis of the posts classified as other in the first coding phase. I developed a coding schema based on common themes across these posts and prior research. The codes may reflect prior research, for example, FYI (Morgan et al., 2013a) and External Sources (Schneider et al., 2010). However, these codes were picked because they are grounded in the dataset and were not drawn directly from other work. The schematic was later refined through additional coding by another research team member along with further discussion by the entire research team.

A content analysis approach can be interpretive and naturalistic; it is both observational and narrative in nature and relies less on the experimental elements normally associated with scientific research (reliability, validity, and generalizability) (from *Ethnography, Observational Research, and Narrative Inquiry, 1994-2012*). This approach is interpretative, and it requires working together with a team to build a strong coding schema. In Chapter 5, I explain how a team of researchers used discussions to come to a consensus across articles. To facilitate the discussions, I translated 10 talk page sections in each language into English and coded them separately. The team met and went through the codes together to reach an agreement. After addressing all disagreements, the individual coders of all languages were invited into the study group. I then broke the coders down into sub-groups according to the language used. Coders in each sub-group repeated the same process to code and discussed the translated talk page sections under the guidance of the lead coders. This allowed all coders, regardless of the languages used, to interpret and consistently apply the schema. Sub-groups did the second round of coding separately in their native language. I chose consensus coding over inter-rater reliability measures to evaluate and reach an agreement between coders. Consensus coding and debates on assigned codes enabled coders to achieve consistency of interpretations. This consensus was particularly deemed necessary as each conversational thread is unique, and I even expected that inter-rater reliability measures would still show high variance.

Semi-structured Interviews

While a content analysis gives a better understanding of what users do on the platform, interviews give a way to justify what and how these decisions were made and help better follow the timeline of an editor through Wikipedia. The semi-structured interview is a common data collection method. Interviews are

the most used data collection method (Taylor, 2005) and the semi-structured format is the most frequently used interview technique in qualitative research (DiCiccoBloom & Crabtree 2006).

Semi-structured interviews are a popular data collection method because it allows researchers to ask questions on the spot, making it easier to build rapport and empathize with a user. The main advantages are that the semi-structured interview method has been found to be successful in enabling reciprocity between the interviewer and participant (Galletta, 2012), enabling the interviewer to improvise follow-up questions based on participant's responses (Hardon et al. 2004; Polit & Beck 2010; Rubin & Rubin 2005) and allowing space for participants' verbal expressions (RWJF [Robert Wood Johnson Foundation] 2008)" (Kallio et al., 2016). A wide range of interview studies have been done with Wikipedians from EN to understand their motivations, the range of collaborative activities, and more (Forte & Bruckman, 2005; Schneider et al., 2011; Francke & Sundin, 2010; Forte et al., 2019). In this study, I also combined semi-structured interviews with the specific examples from the participant's editing history. With this methodology, I was able to gather qualitative feedback about certain conversations that a user has been part of. The participant was asked to recall a specific experience where I showed them a talk page conversation, they had been part of in the past. The semi-structured interview questions and the specific experiences of editors helped gain the perspective of the editors.

In Chapter 6, I draw on 31 interviews with Wikipedia editors from the English, French, and Spanish language editions. I conducted all the interviews except the interviews with ES editors. The ES interviews were conducted by native Spanish speakers as part of a directed research group in Winter 2021. I observed all those studies to remain consistent with the analysis conducted in EN and FR. The editors were recruited through two ways: (a) using conversation talk posts gathered from study 2; and (b) through the list of top Wikipedians by the number of edits in each language. I was interested in participants that have actively participated in talk page discussions in the English, French, Spanish Wikipedia editions. Most participants have recently edited a talk page. Participants were selected by examining their Wikipedia User Page, User Talk Page, and Wikipedia Edit History. I identify individuals directly by reviewing their publicly available edit history to make sure the participant meets the contribution threshold prior to individual contact. Then participants were recruited either through: (1) through the Wikipedia emailing system that sends a message through the platform to the editor's personal email inbox; and (2) through the editor's user talk pages.

The interviews were conducted through Skype, Google Meet, Zoom, and WhatsApp. The interviews were split into three different categories: a general phase to understand their motivations; given examples of their own work; and some more open-ended specific questions based around collaboration, authority, and consensus at the end. In EN and FR, the interview videos were transcribed and then were coded for

overarching themes. I used a Grounded Theory approach to analyze the interview results (Glaser & Strauss, 1967). I specifically looked for themes related to collaboration methods, authority, and power plays. The ES interviews were transcribed by native Spanish speakers and then coded in a similar fashion to FR and EN. More details about the semi-structured interview can be found in Chapter 6 (Study 3).

Chapter Summary

In this chapter, I demonstrate that while many believe English is the lingua franca of the internet, almost 75% of the internet is composed of users of different languages. As CSCW researchers interested in understanding social computing and how people interact with each other, it is our duty to understand how these other language community's work.

To do so, it is important to understand the relationship between language and culture. A lot of research currently attempts to understand the culture of the user rather than the culture produced by these language online communities. While language and culture are intertwined (Whorf, 1997), they are not the same so in this dissertation, I specifically take the focus on trying to understand an online community from the perspective of their language processes. I use the sociotechnical lens to better understand the language because language is a large part of the social processes within the sociotechnical. In each of these studies presented in this dissertation work, I draw out three processes, the technical, the social and the language to show how together these processes help structure models of collaboration in each of the language editions.

Furthermore, in this chapter, I highlighted the methodologies that I use to understand the collaborative mechanisms across language editions. These research methodologies such as interviews, replication, content analysis and more will help decipher the types of editor behaviors, disputes, policy use and overall, the interactions editors have with each other. In the coming three chapters (Chapter 4, 5, and 6), I spend time analyzing conversations editors have on article talk pages and have conversations with editors about their perceptions on how work gets done on Wikipedia.

Chapter 4: Do We All Talk Before We Type? Understanding Collaboration in Wikipedia Language Editions

(Study 1)

Louis has been a very active Wikipedia editor on the French edition of Wikipedia for a long time and he is considering the possibility of becoming an administrator. He is a bit concerned if he has the credentials for promotion and so has begun to do research on the topic. He comes across a study by Burke and Kraut (2008) that suggests a model for how editors in the English Wikipedia become promotable, and he is interested to see if it can be used as a self-evaluation model. After comparing the model to his own experiences as an editor, he determines that he is ready for admin status, but he is disappointed when it never happens. He wonders why the model was not a more accurate predictor for his case.

Louis is just one example of how a mental model of one language edition can hinder an editor's ability to edit on another. This study attempts to understand these different mental models as users collaborate and use Wikipedia in EN, FR, and ES.

This study was designed to understand the behavior of Wikipedians to allow a better understanding of the basic mental models (i.e., editors' thought processes about how something works on Wikipedia) of users who collaborate with other editors and contribute to the development of Wikipedia content. Through understanding the behavior of users in discussion pages, it is possible to recognize both how the technological structure of Wikipedia and social collaboration influence the structure and creation of content on Wikipedia. As noted by Viégas et al. (2007) the “*inner workings*” of Wikipedia allows us to structure some of the basic collaboration mechanisms present on Wikipedia. While prior research has validated the existence of basic behavioral mechanisms in discussion pages, no research does this for FR and ES (Kriplean et al., 2007). Kim et al. (2016), conducted a study to understand editing behavior in German and Spanish but focused more on the types of edits made to articles rather than the behavior models that account for what occurs on discussion pages, the locus of the collaborative culture on Wikipedia.

To characterize editor interactions, I leverage an influential collaboration model from the English (EN) Wikipedia as a lens to consider collaborative activity in the Spanish (ES) and French (FR) language editions. Through an analysis of collaborative interactions across article talk pages, I demonstrate that talk pages are used differently in these different language editions. This study raises broader questions about how results from studies of the English Wikipedia generalize to other language editions, demonstrates the need to account for variations in collaborative behaviors in all language editions of Wikipedia, and presents evidence that collaborative practices on the English Wikipedia have changed overtime.

This analysis consisted of 48 articles, 16 similar articles across all three languages. In EN there was an average of 8 talk pages (1 current and 7 archived), while in FR and ES, on average there was only 1 current talk page for the articles coded. To make sure the archival practices of ES and FR were not different from EN, I analyzed the percentage of edits done on the talk page to the number of edits done on the article analyzed in my study. EN had the highest proportion with 34.6%, while the ES and FR editions were much lower at 6% and 11.7%, respectively. Prior research suggests that several forms of collaboration and coordination are visible mainly through talk pages in EN (Laniado et al., 2011; Schneider et al., 2012; Viégas et al., 2007). However, this exploratory analysis presented in this chapter suggested these patterns may not be like those on FR and ES, as there is much less collaboration occurring in FR and ES. This study is not designed as a direct comparison of three different language editions. Each of these platforms is different, reflecting its own culture and organizational structure, and these differences ultimately make them comparable in only a reductive sense. In this chapter, I present an exploration of these disparities by qualitatively studying collaborative practice on three different language editions of Wikipedia: English (EN), French (FR), and Spanish (ES).

Research Questions

As noted in Chapter 3, calls for replication studies in the HCI research community have been prominent for the last decade. In 2011, for example, Wilson et al. (2011) observed a bias in the community that showed that the HCI community paid more attention towards studies that report novel contributions. However, Wilson et al. (2011) points out that replication studies are necessary to confirm whether prior results generalize past specific samples and to make sure that assumptions hold from older research. The call for more replication studies was repeated in 2014 (Wilson et al., 2014). The study presented in this chapter is a systematic replication that follows the initial study by Viégas et al. (2007) as closely as possible and extends that methodology to two other languages. I attempt to extend multilingual Wikipedia research by attempting to replicate a study by Viégas et al. (2007) that proposed a well-known collaboration model for EN Wikipedia. I extend Viégas et al.'s (2007) model to the collaborative practices in two other language editions of Wikipedia, FR and ES. This replication answered two questions:

First, **how has this collaboration model in EN changed overtime?** Inherently, a replication of a study performed at different points in time carries elements of a longitudinal study. While the research questions of this dissertation were not initially motivated by longitudinal issues, the attempt to replicate the Viégas et al. (2007) result provides the opportunity to raise questions about how EN Wikipedia collaborative practices have changed.

Secondly, **does the Viégas et al. collaboration model from EN exist in FR and ES and in what capacity?** Viégas et al. (2007) presented a 1:2 ratio of talk page editors to article edits in EN. This ratio suggests an editor first explains on the talk page which changes are going to be made to an article, waits a short time, then edits the article to make the specified changes, and finally states on the talk page that the proposed changes have been made. Based on the data in my Study 1, the 1:2 edit ratio as the normative collaborative practice in the EN no longer holds and based on my data, was probably never true for FR and ES. The ratio of talk page edits to article edits in EN versus FR and ES was so different in the findings of the study presented in this chapter that an additional investigation was warranted. If each language edition is different, grows at different rates, and reflects its own cultural perspective, I hypothesize that the Viégas et al. (2007) collaboration model will not generalize across FR and ES. In the following section, I discuss how a collaboration model created from EN — the Viégas et al. (2007) model — is replicated to allow a better understanding of the inherent problem with generalizing Wikipedia research based in only a single language edition to potentially other collaborations on other language editions.

Article Title	EN	FR	ES
2014 FIFA World Cup (1)	6	3	1
2016 Summer Olympics (1)	3	1	1
Sun (2)	10	1	1
Religion (2)	12	2	4
United Kingdom (2)(3)	34	1	1
Tropical Cyclone (2)(3)	6	1	1
X (2)(3)	2	1	1
Hanged, Drawn and Quartered (2)(3)	9	1	1
Psychology(2)	3	1	1
Earth(2)	16	1	2
Science(2)	9	4	2
Carbon(2)	3	1	1
Water(2)	3	1	1
Photosynthesis(2)	3	1	1
Physics(2)	9	1	1
Mitosis(2)	2	2	1

Table 4.1. Number of current and archived talk pages in EN, ES and FR for the articles coded. Articles were selected across a range of topics to make sure there was a diverse dataset. In the table, the numbers in parentheses reflect the topical category: (1) events that spanned countries where all of these languages were spoken; (2) articles on topics of universal importance; and (3) articles that were also used in the prior study.

Methodology

Phase 1: Replicating Viégas et al. Coding Scheme

Generating Datasets

I applied the Viégas et al. (2007) coding scheme to datasets of individual talk pages posts from EN, FR, and ES. The dataset was constructed by choosing articles that were similar in content and structure across all three languages. Articles were selected across a range of topics to make sure there was a diverse dataset as shown in Table 4.1. These articles met three criteria: (1) events that spanned countries where all

of these languages were spoken; (2) articles on topics of universal importance; and (3) articles that were also used in the prior study.

Articles of universal importance were those that had no ties to countries that spoke the languages analyzed. This approach assumed that influence by one language group on the topic can have an impact on the collaboration behavior and content of the article and so articles were chosen to avoid this conflict. Criteria 1 and 2 were selected to remove any bias towards the specific languages chosen in this study and Criteria 3 to ensure generalizability and adhere to the prior methodology.

I selected a given article talk page on length to avoid situations where a recent archiving resulted in minimal talk page content. I then gathered all individual posts from each talk page, using signatures and indentation levels to identify individual posts. In addition to the individual user posts on the talk page, I also included the template information boxes at the head of each talk page.

As shown in Table 4.1., every EN article had multiple talk pages (current and archived pages), while FR and ES typically had 1 current talk page, except for the Religion, Earth, and Science articles. Mirroring the method in Viégas et al., (2007), I selected one current or archived talk page for each article to include in the dataset. To select the talk page, the most recent talk page was chosen with a total length (by byte count) comparable to the average size of all talk pages for that particular article. If the most recent talk pages resulted in minimal talk page content, then the archive talk page was chosen. The archival process for FR and ES is similar to EN, where talk pages are archived when they become lengthy.

All individual posts from each talk page were gathered, using signatures and indentation levels to identify individual posts. In addition to the individual user posts on the talk page, I included the template

	EN	ES	FR
First Post	1/22/2003	10/29/2002	1/22/2003
Last Post	12/8/2017	12/18/2017	10/16/2017

Table 4.2. In this table, I include the creation dates for the first and last posts that were included in the final dataset for each of the three languages.

Posting Dimension	Description
Requests/Suggestions for Editing Coordination	Postings that help users plan editing activity
Requests for Information	Postings where the user requests information that is related to the article topic without a clear intention to edit the article itself
References to Vandalism	Postings that refer to acts of vandalism on the article page
References to Wikipedia Guidelines and Policies	References were counted whenever users pointed out official Wikipedia guidelines either by name or by linking to policy pages
References to Internal Wikipedia Resources	Postings that link to other Talk pages or archives to illustrate/explain a user's comment
Off-Topic Remarks	Postings unrelated to the article. <input type="checkbox"/>
Polls	Voting sessions organized by users to decide on controversial editing actions
Requests for Peer Review	Users hoping to elevate articles to "featured" status may solicit a peer review
Information Boxes	These are call-out boxes placed at the top of the Talk page indicating any special processes the article page may have gone through
Images	Image files posted on the Talk page.
Other	Postings that do not fit any of the above categories.

Table 4.3. Comments were classified into 11 posting dimensions taken from Viégas et al. (2007).

information boxes at the head of each talk page. According to the Wikipedia talk page guidelines¹⁸, archived talk pages include the information boxes in the original talk pages but should not include the active talk page templates. For each analyzed talk page, I counted each information box as an individual post. In total, 3407 talk page posts, 1924 posts in EN, 738 posts in ES, and 745 in FR were collected. Table 4.2. highlights the time periods when the posts collected were created. Lastly, all FR and ES posts from the talk pages were translated into English. My language proficiency in all three languages and the use of Google Translate assisted with the translation process.

¹⁸ WP: Talk page guidelines https://en.wikipedia.org/wiki/Wikipedia:Talk_page_guidelines

Content Analysis

Exploratory data was collected for each article and talk page, including counts of how many posts were in each talk page, how many talk pages existed, and byte counts. To conduct the content analysis, I leveraged the coding scheme created by Viégas et al. (2007) for 16 different articles in each English, French and Spanish. As shown in Table 4.3., the coding scheme included 11 classifications as defined by Viégas et al. (2007). To ensure coding consistency, I worked with a team of two other researchers to ensure coding consensus. We met weekly to discuss coding to make sure the coding remained consistent with the original study. Additionally, multiple members of this research team recoded select sections of the data to ensure the coding was completed as accurately as possible.

Phase 2: Unpacking *Other*

Prior work has shown that not all discussions on talk pages are associated with article editing activity (Ehmann et al., 2008). Some of the contributions were coded as *Other*. Subsequently, some of the other content also does not fit into the posting dimensions in Viégas, et al. (2007). Similar to Morgan et al. (2013a) and Schneider (2010), I extended the coding scheme to add codes to enhance the original coding scheme. After testing the robustness of the Viégas et al. (2007) scheme in Phase 1, I determined that a deeper analysis was required to understand what was going on in these talk page contributions. I thus recoded the data in the *Other* section and created an extension of the Viégas et al. (2007) coding scheme (shown in Table 4.4.). I developed a coding scheme based on common themes across these posts and prior research. The codes may reflect prior research, for example, FYI (For Your Information) (Morgan et al., 2013a) and External Sources (Schneider, 2010). However, these codes were picked because they are grounded in the dataset and were not drawn directly from other work. The coding schema was later refined through additional coding by the two other researchers working on this project and further discussed by the entire research team.

Posting Dimension	Description
Interpersonal Conflict	Bickering with other member, directed at another user. For example, a personal attack or insult.
FYI	Posting is a statement or an announcement as a fact--contains no requests or suggestions
Opinion	Opinion user formed about anything with no requests or suggestions. May include agreement / disagreement among users
External Sources	Cites sources outside of Wikipedia.
Acknowledgements	Courtesies to acknowledge another user's post
Action	Statement that an action was taken or not taken
Other 2	Does not fit into any other code; rarely used

Table 4.4. The posts classified as *Other* in Phase 1 were categorized into these 7 posting dimensions.

	EN
Edits on Target Article	7760
Edits on Talk Pages	2684.7
Size of Target Article (Bytes)	118.5 KB

	ES
Edits on Target Article	2910.6
Edits on Talk Pages	174.4
Size of Target Article (Bytes)	91.8 KB

	FR
Edits on Target Article	1748
Edits on Talk Pages	204.4
Size of Target Article (Bytes)	93.4 KB

Table 4.5. Each table consists of the overall edits for target article and related talk pages and target article sizes (in bytes) for EN, ES, and FR.

	Viégas et al. Average [28]	EN Average	ES Average	FR Average
Requests/Suggestions for Editing Coordination	58.8%	35.1% (676)	36.6% (270)	37.2% (277)
Requests for Information	10.2%	9.6% (185)	11.4% (84)	8.3% (62)
References to Vandalism	8.5%	0.9% (17)	0.7% (5)	0.6% (4)
References to Wikipedia Guidelines and Policies	7.9%	2.3% (44)	1.0% (7)	2.8% (21)
References to Internal Wikipedia Resources	5.4%	2.7% (52)	1.1% (8)	1.8% (13)
Off-Topic Resources	3.5%	0.8% (15)	0.5% (4)	0.3% (2)
Polls	0.4%	0.2% (4)	0.0% (0)	0.0% (0)
Requests for Peer Review	0.3%	0.9% (15)	0.6% (5)	1.6% (12)
Information Boxes	1.6%	6.2% (119)	15.8% (117)	11.3% (84)
Images	0.2%	1.2% (23)	0.0% (0)	0.1% (1)
Other ^b	3.2%	40.2% (774)	32.3% (238)	36.0% (269)

Table 4.6. Average from Viégas et al. (2007) and overall averages of posting dimensions across language editions. The total amount of talk page posts per posting dimension is included in the parentheses. Viégas et al. (2007) did not report the totals in the *Other* category. I reached out to clarify what seemed like a discrepancy in the total percentages for their categories and they confirmed that the missing values should be attributed to *Other*.

Findings

According to Viégas et al (2007)., an effective collaborative pattern on EN is for an editor to first explain on the talk page which changes are going to be made to an article, wait a short time, then edit the article to make the specified changes, and to finally state on the talk page that the proposed changes have been made. This pattern would result in a 1:2 article to talk page edit ratio. Based on the data (Table 4.5.), the 1:2 edit ratio as the normative collaborative practice in the EN no longer holds and based on the data, was probably never true for FR and ES.

The findings for Phase 1 (Table 4.6.) suggest that since Viégas et al.'s (2007) paper, collaboration patterns in EN have changed. In EN, the category *Requests/Suggestions for Editing Coordination* is now the second largest category, being surpassed by *Other*. However, among the non-*Other* categories, *Requests/Suggestions for Editing Coordination* is still the largest category in EN. Talk pages still appear to be the place where editors attempt to collaborate. Furthermore, based on the number of edits to a talk page; talk page edits are no longer representative of the 1:2 ratio seen in the original study. Editors are spending more time and text to discuss the topic of the article rather than explicitly discussing the edits they are making as illustrated by this editor's comment extracted from the analyzed dataset:

"The South Florida Water Management District is a regional governmental agency responsible for water quality, flood control, water supply and environmental restoration in 16 counties, from Orlando to the Florida Keys. It is the oldest and largest of the state's five water management districts." (EN)

This editor does not mention any intention to edit the article, but rather shares factual information about the Florida government's role in water management. Akin to the experiences of the editor of the comment above, I observed a shift in EN from discussing how to improve the quality of Wikipedia articles through editing coordination to debating the subject of the Wikipedia article.

Requests for information is the next largest posting category in EN; it has not changed notably since the Viégas et al., (2007) study with a decrease of 0.6%. In Viégas et al. (2007), *References to Vandalism* was the third largest posting category but in current practice, such postings have seen a substantial reduction from 8.5% to 0.9%, making it one of the least prominent contribution types on an EN talk page. This reduction may be attributed — at least in part — to the proliferation of bots in Wikipedia, which now address malicious contributions more extensively than they did at the time of the original study. The shift to discussing the content of articles rather than specific edits to the article may also explain the decrease in *References to Wikipedia Guidelines and Policies* postings. The following quote demonstrates how more discussion revolves around implicit referencing of the guidelines/policies:

“That was in 2012. This is now 2014, when consensus and enforcement may be different. An event such as a sporting event that lasts several weeks is not really “in progress” when it is an off-day, or the local time is in the wee hours of the morning, when it is highly unlikely that there may be sudden rapid changes during those hours. If we did that, thousands of articles would have current events templates constantly on 24/7 for several weeks without informational consequence.” (EN)

Rather than explicitly naming the Wikipedia Guidelines Template: Current Sport¹⁹, this editor offers a discourse about the guidelines. In direct contrast, our findings show an increase in the Information Box category.

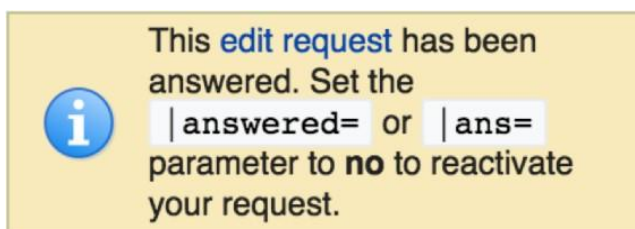


Figure 4.1. A template information box that contains talk page guidelines.

Part of this increase can be accounted for by the common practice of creating a template to explain formal guidelines or some state of the talk or article page. These templates are placed on an article talk page to simplify explanations (as seen in Figure 4.1.) rather than users explicitly pointing to such guidelines in their individual posts. While participants were less likely to explicitly state guidelines and policies, the findings show an increase in the use of templates on talk pages.

My findings demonstrate an increase in users discussing the subject matter of an article rather than the edits being made to the article. The decline in *References to Internal Wikipedia Resources* and *Off-Topic Resources* categories further support this trend. The remaining non-*Other* posting dimensions — *Requests for Peer Review*, *Images* and *Polls* — account for a total of 2.3% of the postings and differed by 1% or less from the results of the Viégas et al. (2007) study. Overall, I show that since the Viégas et al. (2007) study was conducted, the use of talk pages in EN has changed. Talk pages first emerged as a space for discussion about editing an article. Contrary to this original purpose, talk pages seem to be transitioning to accommodate Wikipedia users who are interested in discussing a particular interest with like-minded users. The largest posting dimension is the *Other* category —the category with the largest increase since the Viégas et al. (2007) study. This increase might be attributed to the shift in editor behavior on Wikipedia and gave us reason for investigating the editor behaviors represented in the *Other* category.

¹⁹ Template: Current Sport - https://en.wikipedia.org/wiki/Template:Current_sport

Overall, comparing the size (by bytes) of the talk pages that were coded and the numbers of edits, EN is much larger than FR and ES. Analyzing the posting dimensions, each language exhibits its own collaboration patterns. The difference in these collaborative behaviors may seem subtle but are

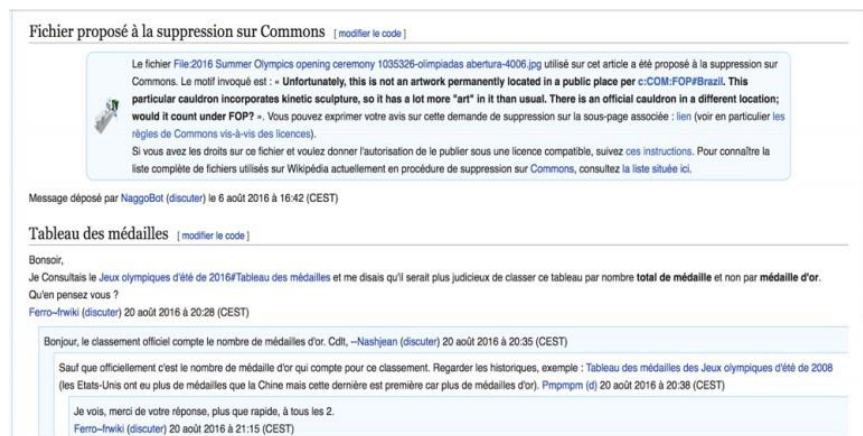


Figure 4.2. The FR talk page for the 2016 Summer Olympics article includes special boxes to organize the threaded discussion.

observable differences, especially in some posting dimensions, as seen in Table 4.6. Overall, *Requests/Suggestions for Editing Coordination*, *Requests for Information*, *References to Wikipedia Guidelines and Policies*, and *Information Boxes* were the four posting categories with the biggest impact on the foreign language collaboration models. In comparison to the other two languages, FR had the most posts classified as *Requests/Suggestions for Editing Coordination* and *References to Wikipedia Guidelines and Policies*. The greater frequency of posts in these two categories may suggest that ES talk pages follow the rules originally created for talk pages and that its editors are still focused on the editing work of Wikipedia. In the following quote, an editor of FR focused more on suggesting what edits need to be made to the article:

“Hello, in this article, it is stated that the atoms forming linkages 6 (instead of the usual 4) were observed for the first time. If anyone is interested, it can be added to the article.” (FR)

Like this quote, most of the contributions in the FR page went into elaborate detail about why the requests and suggestions for editing coordination were necessary to the curation of the article. Across the three Wikipedia editions, I detected notable differences in the frequency of information boxes in talk pages. These differences may be attributed to stylized distinctions that we saw in the language editions, in

particular FR. As shown in Figure 4.2., different organization schemes across the talk pages in FR were evident. While editors in EN and ES use indentation to demarcate between individual posts, FR has implemented technical enhancements that manifests as additional boxes outlining the threads.

Analyzing *Other* Dimension

Other Posting Dimensions	EN Average	ES Average	FR Average
Interpersonal Conflict	8.5% (66)	3.7% (9)	4.6% (12)
FYI	43.9% (339)	39.3% (93)	47.0% (127)
Action	5.8% (44)	0.5% (1)	4.8% (13)
Acknowledgements	3.5% (27)	15.6% (37)	8.6% (23)
Opinion	11.5% (89)	19.9% (48)	30.6% (82)
External Sources	25.5% (197)	19.2% (46)	0.7% (2)
Other 2	1.5% (12)	1.8% (4)	3.8% (10)

Table 4.7. Overall percentages of each new category calculated out of the original *Other* category. The total amount of talk page posts per posting dimension is included in the parentheses.

Across EN, FR, and ES, one of the most common posting dimensions was *Other* (see Table 4.7.). I implemented Phase 2 of my methods to better understand the prevalence of *Other* postings. The topmost portion of the *Other* posting dimension was *FYI*, which for all three languages consisted of around 40% or more. This frequency seems to indicate that talk pages in all three languages contained a greater amount of discussion around the topic of the target article. The second largest category for ES and FR was *Opinion*. Both ES and FR had 20% or more of their *Other* postings in this category. This frequency of opinion posts in those two editions suggests that in both languages editors show more ownership over their posts. Unlike ES and FR, EN users had the lowest number of posts classified as *Opinion*. This low frequency of opinion posts and the fact that EN users had the highest number of *External Sources* related posts may imply that EN editors are less invested in their content.

The second largest category for EN was *External Sources*, which was also substantial for ES. This finding may demonstrate that ES sticks to traditional talk page policies and using external sources satisfies Wikipedia’s verifiability policy that anything that can be challenged needs to be cited. Additionally, ES has many *Acknowledgements* postings, which abides by Wikipedia’s pillar that editors should treat each other with respect and civility. However, the large number of *External Sources* in EN was surprising because my results from Phase 1 suggest an overall decrease in the frequency of policy citations in EN

talk page posts. I suspect that this increase is connected to the *Interpersonal Conflict* category. As noted by Kriplean et al. (2007), citations are used to defend an editor's perspective on delimiting the scope of the article. Furthermore, research has shown that external sources have been used in talk pages to express disagreement with the beliefs of the other editors (Bender et al., 2011). In the following quote, external sources are used as a way for the editor in EN to support their argument when interpersonal conflict arose:

“This article is about being hanged, drawn and quartered in general, so why is it important which law they were found guilty under? And yes, they were both found guilty of high treason. Felim O'Neill [1] [2], Robert Emmet [3], Two brothers sentenced in Ireland to be hanged, drawn and quartered for high treason [4].” (EN)

This talk page user linked to outside articles to prove a point in a debate with other editors. The last two posting dimensions, *Action* and *Other 2*, represented the smallest portion of the posting dimensions. The differences between these codes do, however, further support the contention that each of the languages have their own collaboration norms.

By unpacking the *Other* category, my findings further illustrate how each language's collaborative practices vary (see Table 7). The percentage differences for some posting dimensions are very small, however, and instead show some similarity between language editions. After Phase 1, it was noticeable that posting dimensions with small numbers of posts were similar. *References to Vandalism, Off-topic Resources, Polls, Requests for Peer Review* and *Images* all had 1% or less difference in posts across the three language editions. The collaborative practices that show similarity across languages were the least prevalent in these three language editions. For example, *Requests for Vandalism* were similarly low for all languages. I suspect that this may be because each of the languages have their own version of a vandalism bot. Additionally, I suspect that practices that were present in EN as noted in Viégas et al. (2007) such as polling or peer reviews are not as commonly used on current talk pages across language editions.

While these findings have demonstrated that the frequency of some dimensions are strikingly similar, the overall collaborative practices in EN, ES, and FR are not the same. These differences are further demonstrated in Phase 2 in which the breakdown of the *Other* posts shows that while some percentage differences are small, there still exists differences across languages in the frequency of talk page behaviors.

Discussion

This study demonstrates that the collaborative practices across language editions of Wikipedia, specifically EN, ES, and FR, are varied. Additionally, these findings draw attention to a temporal disparity between the findings of Viégas et al. (2007) and more recent data. The initial research questions were not motivated by longitudinal differences; however, I highlight some implications that these findings may have for the future of research on collaborative platforms.

Evolving Behavioral Patterns on Wikipedia

My study demonstrates that the collaboration model presented in Viégas et al. (2007) no longer accurately represents practices in EN. Most notably, practices in the *Requests and Suggestion for Editing* contribution, *Referencing of Guidelines and Policies* and *Referencing of Vandalism* categories have changed. In the last 20 years, Wikipedia has evolved in size, the nature and scope of its policies, guidelines, interface and other ways. These changes have led to new forms of collaboration and article development. At the start of Wikipedia in 2001, there was an exponential increase in content and editors (Halfaker et al., 2013). However, in March 2007, there was a turning point as the rate of page and editor growth of the platform began to slow down (Suh et al., 2009). Moreover, with the rise and decline of the platform, the overall infrastructure has continued to evolve with the development of new policies and mechanisms for editing (Butler et al., 2008).

The decline in editing work has been partially attributed to the resistance of edits over time (Suh et al., 2009), the development of the platform's bureaucracy (Butler et al., 2008; Suh et al., 2009), and a decrease in active editors (Halfaker et al., 2013). Halfaker et al. (2013) demonstrate how the development of platform bureaucracy to manage the overall increase of growth has, instead, led to a downturn in participation. The quality management mechanisms and algorithmic tools used to detect damage are experienced as being too restrictive for newcomers and, in turn, have led to a decrease in the number of active editors (Halfaker et al., 2013). In addition, Wikipedia as an online community continues to grow and develop but editor behavior and norms of the platform become more fortified over time as editors spend more time developing and building the platform (Halfaker et al., 2013; TeBlunthuis et al., 2018). TeBlunthuis et al. (2018) replicated the study proposed by Halfaker et al. (2013) in Wikia wikis to confirm that norms restrict the ideas of newcomers. Moreover, as more mature editors have authority over the system management, it becomes difficult for these norms to change (Priedhorsky et al., 2007; TeBlunthuis et al., 2018). Holistically, the evolution of the bureaucratic nature of Wikipedia has influenced the motivation of editors and slowed the production of content. As with the Wikia wikis, other Wikipedia platforms have the potential to be impacted by these bureaucratic developments. For example, Wikiprojects have changed over time (Morgan et al., 2013c). Morgan et al. (2013c) used a mixed-

methods approach to demonstrate a behavioral shift from content creation to content curation that impacts the maintenance of quality content on the platform.

Collaborative practices that were prevalent in 2007 have changed. At that time, practices emphasized the use of talk pages to develop discussions about editing an article. In contrast, my 2017 findings, presented in this chapter, show that since then these pages have transitioned to spaces where users with particular topical interests can engage in discussions with like-minded users. The development of Wikipedia has led to the use of diverse stylistic features, the propagation of bots, and increased use of new system features (e.g., extensions and protected pages) are all possible reasons why the Viégas et al. model no longer accurately accounts for editor practices in EN. Furthermore, Müller-Birn et al. (2013) note that social behaviors have been formalized into algorithmic processes such as bots. These changes have led to a transition in the talk page space and open the door for the development and design of new collaboration practices. Continued focus on forms of collaboration and coordination in Wikipedia is needed to increase the quality and quantity of the articles and to improve the user experience of editors. Consistent with Niederer and van Dijck (2010), the amount of work done by system advancements such as bots across most language editions has had a great impact on the nature of the platform. Consequently, as researchers we need to further explore these developments to better understand how Wikipedia fulfills the social and technical needs of its users. Additionally, the insights developed from leveraging Viégas et al. (2007) collaborative model in EN underscore the need for replication of prior studies of user behavior in peer production communities that are constantly changing. With the development of new underlying technologies on Wikipedia and changes in the adoption of these technologies, I speculate that many of the assumptions made in past research do not necessarily hold true in the current version of Wikipedia.

Generalizing across Wikipedia Language Editions

Across all three language editions in this study, even if subtly, the collaborative practices are varied. Ultimately, across EN, ES, and FR, differences in how much collaboration is occurring are evident. While it is possible to adapt models from prior Wikipedia research to other languages, as attempted in this study, my results demonstrate that findings based on a study of one language edition cannot automatically be extended to other language editions. Research conducted on collaborative systems such as Wikipedia should not apply knowledge from an Anglo-centric (or another language) model to other language editions. Previous work has shown that collaboration is important to the creation of high-quality articles (Kittur and Kraut, 2008). By understanding different collaboration models needed to account for differences across language editions, researchers can better understand the variety of coordinative activities that may lead to quality articles across all the editions of Wikipedia. Global systems like Wikipedia must be understood as a sum of all its parts —with the language editions being separate and

different instances. Users are the primary drivers creating content on Wikipedia and these users speak many languages and edit across editions. Thus, it is important that researchers treat Wikipedia as a sum of all of its parts rather than just focusing on EN to better understand how to handle the variation of user experience across the various language editions.

Behavioral Processes from the lens of a Socio-technical Framework

	Social	Technical	Language
EN	Explicit use of policy and guidelines References to internal Wikipedia resources References to Vandalism	Images	
FR	Explicit use of policy and guidelines Opinion	Information boxes	
ES	Acknowledgements Request for Information Opinion	Information Boxes	

Table 4.8. In this table, I classify the posting dimensions discovered to have the largest impact in each language edition into social, language and technical processes. The initial study by Viégas et al. (2007) focused on the behaviors of users which strongly ties to the social and technical influences making it difficult to demonstrate language processes.

In this chapter, I manually coded a subset of talk pages to understand the behavioral processes that occur on these articles talk pages in EN, FR, and ES. Talk pages are being used as a site to plan strategic moves, coordinate writing an article and enforcement of guidelines and policies. In Chapter 3, I discussed the socio-technical framework as a lens to better understand the relationship between the social, technical and language features that can help identify how collaboration occurs across the three languages. To facilitate using this lens, I categorized the social, technical, and language features that came out of the findings from this study in Table 4.8. To compile this table, I looked across all the different posting dimensions. I included any posting dimension with a difference between languages that was greater than 1%. Using the coding schema and the extension, I demonstrate that both social and technical processes shape how collaboration occurs. Below, I attempt to describe these processes.

Influence of Social and Technical Processes on Collaborative Behaviors

In EN and FR, editors were most likely to explicitly refer to a policy or guideline. This process typically occurred when there was debate around content in an article. Editors used the policy or guideline to help

support their side of an argument. This process was also technical as editors would create linked policy and guidelines in a post so editors could go to the digital page of that specific policy/guideline. Similarly, in EN, editors referred to internal Wikipedia resources. These editors would include links to other talk pages or talk page archives. For both policy/guideline and internal resources, these led to an additional social interaction between editors and newcomers. These resources can teach newcomers about how to get work done on Wikipedia. This is consistent with the work of Morgan et al. (2013b) that effective socialization strategies of newcomers can improve the retention of these new editors.

Furthermore, in ES, editors typically used traditional talk page policies and used external sources to satisfy Wikipedia's verifiability policy that anything that can be challenged needs to be cited. ES has a large number of *Acknowledgements* posting, which abides by Wikipedia's pillar that editors should treat each other with respect and civility. This interpersonal communication was necessary in ES to help support the collaborative behaviors of the ES community.

In EN, there is a decrease in references to vandalism. In this case, the development of a technical tool, bots, has led to less interaction and discussion around vandalism. Malicious content has always been a continuous process, but bots have decreased the need for editor input.

In FR and ES, there was more use information boxes by editors to categorize and facilitate their conversations. This is a technical feature that editors have the ability to code into an article to structure their content. In FR, I even see different stylistic differences in the way conversations are threaded on the talk page. This is a technical feature of Media Wiki that FR editors can turn on if they want to use it. FR editors have manipulated this technical process to facilitate more structured social interactions. These social and technical processes are not predictive of each other, but they do mutually shape the collaboration that occurs. Looking across these languages, these are the examples present in my data that demonstrate that there are different ways that each language edition utilizes or manipulates social and technical processes to be able to get work done on Wikipedia.

Lastly, this study is a replication of the Viégas et al. (2007) study that was done on English making it hard to see the language features or make claims about language differences. However, I suspect that the stylistic differences shown in the FR example in the Findings section might be one example of a language and technical process that shapes the way people collaborate on the French Wikipedia. Threaded conversations help editors organize their language and turning on threaded conversations requires manipulating the underlying technical foundations of Wikipedia -- MediaWiki. My study does not highlight this language process, making it difficult to make this a conclusive finding. However, this is not surprising as the initial research goal of Viégas et al. (2007) was not investigating language or how people

use text and language features to present their ideas in talk pages.

Conclusion

This study has two main limitations. The data shows very small percent differences between some of the coding dimensions. Additionally, the team that coded the responses are a different group of researchers and can likely impart different interpretations on the coding scheme. Both limitations are due to the nature of qualitative research, where one interpretation by a group of researchers may not be similar to another. In this chapter, I attempted to reduce such bias by adhering closely to the method described in the Viégas et al. (2007) paper.

This study examines whether collaboration practices differ across different language editions of Wikipedia, leveraging a prior, well-known model to do so. The methods used in this chapter leveraged an older quantitative coding scheme to 48 talk pages from the English, Spanish and French language editions of Wikipedia, to offer two contributions. Firstly, the findings demonstrate a better understanding of the impact age can have on collaboration models. Secondly, behaviors on language editions of Wikipedia are different, thus it is important to be more aware of how findings are adapted from research on online collaborative systems from one language to another. Analyzing the data from the perspective of a socio-technical framework, demonstrated that language processes did not play a role in the behaviors extracted from talk pages. This may be due to the consequences that the original study by Viégas et al. (2007) did not analyze the language specifically or look at other language editions. Subsequent researchers may extend this work to apply sociolinguistic theories to delve deeper into individual characteristics such as verbosity and language structure of each language edition. In Chapter 5 I explore consensus debates. Language structure and context can influence debate, suggesting that language may impact the collaborative practices of the users. In the following chapter, language features and processes will be more visible.

Chapter Summary

Revisiting the overall research questions of this dissertation, this study helps respond to the first two questions in Part A.

R1. How have English collaboration models on Wikipedia changed over time? In this study, I demonstrate that practices have changed since the initial publication of the Viégas et al. (2007) study. Wikipedia as a technological platform has evolved with the development of templates and bots that facilitate collaboration and reduce vandalism.

R2. How generalizable are findings from English language edition of Wikipedia to other language editions? Across EN, FR, and ES, there are dramatic differences in each edition using a quantitative lens. In general, EN has much more content and many more editors, but I also see that in FR and ES, the ratio of number of talk pages and discussions posts is less than EN. Overall, ES and FR editors are not using discussion pages as much as editors in EN. My qualitative coding schema shows similarities but also subtle differences that in turn suggest that possibly the behaviors of editors on talk pages are distinct. Editors who may switch between EN and FR or ES may notice these differences, making it hard for users to contribute across platforms.

Chapter 5: Community, Consensus, Coercion, Control: Does CS*W Support Collaboration in Different Language Editions of Wikipedia?

(Study 2)

In Chapter 4, I introduced Louis, a French editor who wanted to become an administrator on FR. One of the main reasons Louis wanted to become an administrator is because he enjoys contributing quality content on Wikipedia and likes interacting with other editors. As he switched between EN to FR, he noticed that if he wanted to include something in an article, especially in English, he needed to first discuss with other editors. However, while maybe citing an additional source in English was all he needed to convince other editors that it was a valuable edit to the Wikipedia article, he realized he might need to work even harder to convince other editors in the French edition that his edits should be included in the article.

Louis' lack of understanding of the FR collaborative practices demonstrates how the collaboration styles or simply the way decisions are being made across EN and FR are different. In this chapter, I focus on the social interactions of editors, particularly collaboration and the way debates are resolved. Now that Study 1 (Chapter 4) illustrates editor behavior on talk pages, I am interested in understanding how analyzing conversations on discussion pages can help us better understand how consensus occurs on Wikipedia.

Introduction

I chose collaboration as the focus when investigating different language editions of Wikipedia after observing in Study 1 (chapter 4) that in different editions there appear to be diverging ideas about how to get things done. However, users across the EN, ES, and FR language editions continue to make requests and suggestions for editing on talk pages, indicating they are communicating with other editors about the changes they plan to make to an article. In this context, it is worth recalling what Kling (1991) noted almost 30 years ago about the nature of “cooperative work.” In CSCW (Computer Supported Collaborative Work), the second “C” is most notably known for collaboration. However, Kling (1991), observed that many different “C” words can describe how groups work together (e.g., coercive, cordial, convivial, contrarily, controlling, etc.). These different ways that editors work together are critical to the development of Wikipedia and to quality articles (Kittur & Kraut, 2007). The goal of this study reported in this chapter is to understand how collaboration occurs in multiple language editions of Wikipedia. The findings from this study help work toward the goal of further building collaborations models in EN, FR, and ES to help support the designs of systems that span globally distributed collaborative efforts.

Moreover, Viégas (2004) has shown that collaboration in Wikipedia is facilitated by technical and social mechanisms. Activity on article talk pages is influenced by existing policies and guidelines and the behaviors of the individuals collaborating contribute to the content on an article talk page. Overall, the kind of processes and policy enforcement that happens on Wikipedia talk pages seems to play a crucial role in fostering civil behavior and community ties (Viégas, 2007). In this study, I investigate how editors come to a consensus in EN, FR, and ES by leveraging editors’ collaborative behaviors and use of policy on Wikipedia talk pages. In addition, because policy is developed, disputed and enacted differently across language editions, there is a possibility to extract language processes. These language processes can then be used to better understand the language influences on the social processes in each language edition.

In all language editions, a growing list of policies and guidelines are used by the editors to shape their collaboration on talk pages. In Chapter 2, I further detailed the hierarchical structure of policy in EN, FR and ES. To conduct my study, I leverage the research methodology and qualitative model from Kriplean et al. (2007) to investigate collaborative activity in EN, FR and ES Wikipedia editions. Kriplean et al. (2007) demonstrate the intersection of policy and debates on Wikipedia talk pages, notably how the creation and use of policy help develop explicit and implicit power relations on Wikipedia. In Kriplean et al. (2007), the authors explore how editors leverage Wikipedia policies to reach agreements for article changes that are being made. They identify “power plays” as language-based interactions in which editors

gain control over an article to modify contents in their preferred ways. While policies were cited in talk pages to help create a consensus, debates arise around which policy is applicable, whether a policy is appropriate, and how the policy should be used to address a specific issue. These debates presented in the Kriplean et al. (2007) study demonstrate how policy creation and use nurture EN Wikipedia articles.

I attempt to apply the qualitative model of collaboration from the work of Kriplean et al. (2007) to the EN, FR and ES Wikipedia editions. My study is reflective of a systematic replication to understand the original study in three new contexts. The methodological decisions made in this Chapter were made to stay as consistent as possible with the original study. This systematic replication potentially increases the value of a prior finding by conducting follow-up experiments using procedures that are logically related – though slightly different – from the original research. In the following sections, I explain how the methodologies from Kriplean et al. (2007) were adapted to the contexts of FR and ES. The Kriplean et al. (2007) methodology is complex, requiring an understanding of various processes including how pages are tagged as featured articles, controversial or disputed articles, the policy environment, and the way talk pages are structured. In Chapter 2, I illustrated the contextual differences between EN, FR and ES thus the understanding of each of these processes will vary across the three languages studied in this dissertation.

In section 2 and 3 of this chapter, I briefly describe the method from Kriplean et al. (2007) and how their methodology was used to analyze EN, FR and ES talk page posts. Next, to analyze the qualitative data gathered in my study, I work through five layers of analysis to consider the similarities and differences of the collaboration models found for all three languages. The results broadly illustrate that the prior collaboration model exists in EN, FR, and ES, but there are differences identified through the work of applying the qualitative codes. The results contribute to an understanding of how collaboration models might generalize across different communities of collaboration and help unpack some language-based assumptions about online communities that could inform future research.

Replicating an English Wikipedia Finding

This study considers whether the collaborative model presented in Kriplean et al. (2007) continues to exist in EN and whether the model of “power plays” also exists in FR and ES. In this study, I attempt to apply the same methodologies as in the original study. However, as I began to apply the methods, I realized that to study each edition, the methods needed to be adapted to handle the various contextual differences across platforms. The methodology section further elucidates these changes. I briefly describe the methods of the original study in this section.

Kriplean et al. (2007) note that the diverse perspectives of editors on Wikipedia create a complex web of problems in the collaborative work of creating articles. While the use of policy has helped frame strategies and processes to help solve these problems, debates in talk pages still arise about whether a given policy applies, or which policy applies, and how that policy might apply as editors debate the quality of article content and what content belongs. Kriplean et al. (2007) analyze active talk pages to see how policies are being leveraged to create a consensus about changes that are being made on articles. These debates lead to “power plays” through which editors gain control over an article so they can delete, insert, or modify specific content. These power plays are an enactment of how the creation of policies and the way policies are leveraged by editors contribute to the growth of EN article content.

In the Kriplean et al. (2007) study, the dataset consisted of a tail sample of talk pages with 250 or more revisions. Edits to Wikipedia follow a power-law distribution (Almeida et al., 2007) and the tail sample constitutes the most active pages. Within the talk pages in the data set, Kriplean et al. (2007) define *critical sections* as portions of a talk page at a period of time when both the talk page and the associated article page have a relatively large number of revisions. Critical sections of talk pages were the subject of the analysis. The researchers then classified critical sections to allow for a purposeful sample from different categories of discussions. The category scheme included two natural categories created by the Wikipedia community: *Featured Articles* and *Controversial Articles*. These two categories are attached to articles following Wikipedia defined processes. The third category was based on the density of policy mentions in the full set of critical sections. Every critical section could be marked as (a) *Featured* or *Not Featured*; (b) *Controversial* or *Not Controversial*; and (c) *Policy-rich* or *Policy-lean*. For a visual example of how this classification scheme can guide sampling, see Figure 5.2. below.

Kriplean et al. (2007) then analyzed a sample of critical sections using a Grounded Theory approach (Glaser & Strauss, 1967). They used open coding and axial coding to identify a range of behaviors and categories that characterize a range of power play types that they defined. My study attempts to replicate this approach on EN and extend the power play findings on FR and ES by adapting and applying the methods from Kriplean et al (2007).

Methodology

I used the coding schema developed in Kriplean et al. (2007) to analyze article talk pages in EN, ES, and FR. I chose to replicate Kriplean et al. (2007) because their research paper clearly demonstrates collaborative mechanisms that could help better understand policy use, consensus disputes, and power plays in three language editions of Wikipedia. Furthermore, Kriplean et al. (2007) present a clear collaboration model that has been impactful in the Wikipedia research community. Kriplean et al’s (2007)

work is one of the few papers presenting a collaboration model cited in the Wikipedia: Academic Studies about Wikipedia article.

Additionally, the presentation of the Kriplean et al. (2007) study makes it possible to systematically replicate. The authors provided a detailed methodology, and I had access to an author of the original study to ask additional clarifying questions. For the study I present in this chapter, I followed the Kriplean et al.'s (2007) methodology as closely as possible. However, it was not possible to conduct a direct replication of the study because socio-technical features differ among EN, FR, and ES. These differences include (1) article classifications; (2) talk page structure; and (3) policy descriptions in each language edition.

Article Classifications

Across the various Wikipedia language editions, articles can be tagged with a template in many different ways. One important template is that of *Featured Articles*. *Featured Articles* are often determined through a peer-review process where the quality of the article is judged. *Featured Articles* represent the best articles produced in that language edition. Another important template is the *Controversial Template*, which is applied to denote articles where editors have differing opinions. The *Controversial Template* is often applied when there are “edit wars”²⁰ among editors. An edit war typically occurs when editors disagree about the content of a page and then repeatedly override each other's contributions by reverting their edits. In each language, different articles are considered featured and controversial, and these classifications are debated and decided by the editors of each language edition.

Talk page structures

For FR, ES and EN, the overall structure of the talk pages is the same. However, in ES and FR the sizes (in bytes) and the number of talk pages are much less than in EN, as shown in Study 1 (Chapter 4). Article talk pages can have more than one associated talk page because talk pages that become too long will be archived. Although the archival process follows the same general rules in each language edition, the template is not the same in each language. In Figure 5.1., I show how in English there are three ways to Archive, in FR and ES, the structure of the archived pages is similar. There are 3 types of archiving (with different templates): increment archiving, static archiving and archiving by date. Additionally, in each language there are different bots that facilitate the archiving process. In FR, the automatic archiving is done by a bot called Orlodrimbot²¹. In ES, there are two bots that can automatically archive MABot and Raystormbot.

²⁰ WP: Edit Warring - https://en.wikipedia.org/wiki/Wikipedia:Edit_warring

²¹ WP: Archivage par Bot: https://fr.wikipedia.org/wiki/Mod%C3%A8le:Archivage_par_bot

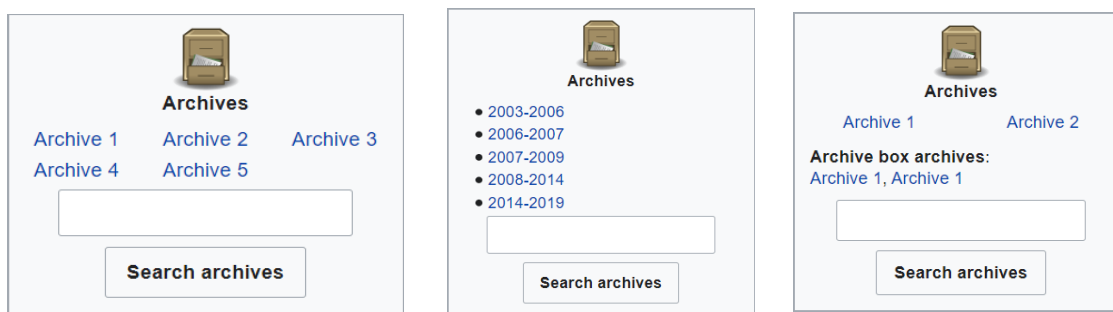


Figure 5.1. Across each language there are multiple ways of formatting and organizing different archives. The images are three ways archives are organized in EN and I observed these same organizational structures in ES and FR include organization by number and/or date.

Policy Differences

All the languages are still based on five fundamental pillars that began with the inception of the platform in 2001. These pillars are non-negotiable “laws,” which are at the topmost level of the policy regime of the platform. They are also a summary of the key principles of the platform. Each of these pillars in FR and ES are direct translations of the pillars initially developed in the English edition. Wikipedia also is guided by policies and guidelines that are created by the community in each language edition. While the pillars are the same in EN, FR, and ES, there are differences in policies and their descriptions on the policy article page across languages. Across the language editions, some policies may have the same name or title but the way they are described, classified, and used may be different. For example, a rule that is classified as an official policy in EN might only be a guideline in FR. Additionally, each of these languages have their own policies that might not exist at all in other language. For example, WP: Proposed Deletion²² is a policy that exists in both EN and ES but I could not find an official policy in FR.

Lastly, the five pillars are commonly used to defend edits on articles and are highly valued across language editions. However, other policies and guidelines might be viewed differently across language editions and in turn, used in different ways. For example, while NPOV (neutral point of view) might be a policy to cite if religion is under debate in one language edition. In language editions where religion is highly debated, there may be another policy or guideline in existence to deliver a better response to the debate. While the policies might look quite similar, there are differences in the overall policy regimes. This study does not compare the specific differences in the policy regimes, but that would be valuable as future work. Below I describe my methodology for finding policies across the languages. In the following

²² WP:Proposed Deletion: https://en.wikipedia.org/wiki/Wikipedia:Proposed_Deletion

sections, I document how I account for these three features between language editions when collecting active talk pages for the dataset.

Collecting Active Talk Pages

The data gathered is taken from the 2018 live Wikipedias for each language edition. These are publicly available datasets of Wikipedia that include all the articles, talk pages, and edit history. All the discussions from the most recent active talk page for all the *Controversial* and *Featured* articles (n) in each language were collected and a control sample of pages, approximately $2n$ in each language.

Collecting lists of featured and controversial articles

The data collection effort started with collecting all the *Featured* and *Controversial Articles* in all three languages. These natural categories, which were labeled by the editor community, reflect on well-formed and successful collaboration mechanisms among editors.

Data collection began with the compilation of all articles included in *Controversial* and *Featured* categories for each language edition. These categories are article-level classifications that are decided by editors. Similarly, to the policies, each language edition does not have the same categorization schema. To gather the list, I used either the list of categories or a Wikipedia quarry to gather all the names of the articles within a specific category or scrape the editor created list on the specific Wikipedia list article. When using quarry, each article that is classified is tagged with a template, so I collected all these pages. However, since the tagging of templates is a manual process on the platform, it is not always done by editors. I additionally collected pages through the *Controversial* and *Featured* list articles²³. To make sure that the list of *Controversial* and *Featured* articles was complete, I then compared the list of articles gathered from quarry and the list of articles gathered from the editor- curated lists on the controversial and featured list articles to create the final list of *Controversial* and *Featured Articles*.

Collecting control articles

Next, I collected a sample of control articles. I collected this sample to control for potential biases that stem from analyzing the talk pages of *Controversial* and *Featured Articles*. *Featured Articles* require considerable editing to gain that status and thus may have more evidence of debate on the talk pages. Likewise, *Controversial Articles* typically have lots of debate and may have more policy references or authoritative or persuasive mechanisms to shape the article or to help editors come to a consensus. In general, *Featured* and *Controversial Articles* might foster different or more conversations than a typical Wikipedia article. In EN, FR, and ES, control articles had to fit the following criteria:

²³ WP: List of Controversial Issues – https://en.wikipedia.org/Wikipedia:List_of_controversial_issues

Sampling Variables	English			French			Spanish		
	<i>n</i>	<i>M</i>	<i>SD</i>	<i>n</i>	<i>M</i>	<i>SD</i>	<i>n</i>	<i>M</i>	<i>SD</i>
Control	15528	2.170	2.303	3536	0.370	0.760	2834	2.589	3.784
Featured	5408	1.029	2.301	1733	0.150	0.722	1107	1.831	2.578
Controversial	2401	1.820	2.301	41	0.878	0.760	331	3.320	3.434

M = mean, *SD* = standard deviation

Table 5.1. Descriptive statistics for the policy factor score in the article-level classifications (Control, Featured, Controversial) in EN, FR, and ES. The descriptive statistics demonstrate how many articles talk pages were included in the dataset and the mean policy factor score across the different language editions for each category for an article. In this table *n* represents the number of articles within the sampling variable, *M* is the mean policy factor score and *SD* is the standard deviation of the policy factor score.

Variable	<i>t</i>	<i>p</i>
English		
Control vs Controversial	6.944	< 0.05
Controversial vs Featured	14.007	< 0.05
Control vs Featured	31.385	< 0.05
French		
Control vs Controversial	4.255	< 0.05
Controversial vs Featured	6.374	< 0.05
Control vs. Featured	10.233	< 0.05
Spanish		
Control vs Controversial	3.357	< 0.05
Controversial vs Featured	8.495	< 0.05
Featured vs. Controversial	6.132	< 0.05

Table 5.2. Within-sample t-test comparison of the policy factor scores at each article-level classification in all three languages. The policy factors scores were significantly different for all classifications in EN, FR, and ES. In this table, the t-value measures the size of the difference relative to the variation between article categories. For each of these tests, the p-value was less than 0.05, demonstrating no significant difference between article categories.

1. Control articles cannot be classified as stubs, lists, or disambiguation pages.
2. Control articles and associated control talk pages needed to both be at least 5000 characters long.
3. Control articles needed to have at least one included image or one infobox.

To reflect the majority of Wikipedia articles that do not fall into a specific category, I randomly selected 15528 articles in EN, 3536 articles in FR, and 2834 articles in ES that are neither *Featured* nor *Controversial*.

Table 5.1. provides some descriptive statistics of the collected data. The descriptive statistics demonstrate how many article talk pages were included in the dataset and the mean policy factor score across the different language editions for each category of article. The policy factor score was used to understand if articles were policy-rich. I describe how this score was calculated in the following sub-section. Table 5.2. shows a within-sample comparison of the policy factor score. Since the policy factor score is a function of differing editor behavior, Table 2 illustrates significant differences in the amount of policy use, suggesting that focusing analysis on any one sampling variable would likely lead to some unclear bias in the analysis. Using all three classifications in the data set achieved a more holistic representation of each language platform.

This purposeful sampling allowed for sampling from pages with potentially more active discussions (i.e., controversial and featured), and pages with lower potential of active discussions (i.e., control articles). This sampling strategy reflected a more purposeful segment of Wikipedia that emphasizes both collaboration and lack thereof. Studying a sample space that included all of these categories allowed us to capture various forms of collaboration that might exist in each version. Additionally, the sample articles were segmented into two categories based on how heavily editors relied on policies in their discussion: Policy-rich and Policy-lean. Studying these categories allowed examination of the collaboration forms in both presence and absence of policy use. This sample of talk pages presented a large number of articles in all three languages. For qualitative coding purposes, I coded a sub-sample of these pages, which I further describe below.

Collecting Archived Talk Pages

In the dataset, I also collected the archived talk pages. As observed in Study 1 (Chapter 4), across all languages, editors archive parts of discussions, especially in active articles with active talk pages. FR and ES consistently have fewer archived talk pages and less content on active talk pages than EN.

I created a threshold for the size of article talk pages across each language edition because shorter talk pages in all languages may contain threads created by bots or shorter conversations that would not lead to

valuable debates between editors. These thresholds are in line with the fact that other language editions have fewer archived talk pages and less content on active talk pages. Additionally, not all content on talk pages is editor created some posts on talk pages may be created by bots. To account for these differences, the selected active talk pages and articles needed to have a size more than 5000 bytes in EN, FR and ES.

Policy Collection and Calculating the Policy Factor Score

The second step of data collection was a collection of a list of policies for each language. Each language does not necessarily have the same policies. There are multiple ways to gather these lists and required triangulation of multiple techniques. On Wikipedia, few language editions already have compiled lists of all policies and guidelines. These lists are maintained by editors and may be incomplete.

To gather the most accurate lists, I used data provided from these lists, along with other data gathering techniques. This included using the interlanguage links on EN as it had the largest and most comprehensive set of policies. Additionally, I could scrape policies if they were listed under a particular category. I used all of this data to compile the most current and comprehensive list of policies for each language. For each policy, I collected the link to the page, the shortcuts and the full name of the policy article. I used the Wikipedia quarry tool²⁴ to collect data from a particular template or category. Each policy could potentially be tagged with a template²⁵ that cites what type of policy it is. Lastly, I categorized types of policies, limited to guidelines, policies and processes. I compared each language as accurately as possible but based the final categorization decisions off the English language interlanguage links because it holds the most comprehensive set of policies.

In all three languages, I collected a list of known, defined policies. To automate the process of calculating the policy factor, I collected a comprehensive list of policies and guidelines with their full names, the link to the policy page, the shortcuts related to the policy in each language, and related templates. All talk pages were parsed to find instances of policy use by reference (i.e., Wikilink to policy page) or by mention (i.e., policy title or policy shortcuts). Then, I calculated the policy factor score for each talk page using the method described in the Kriplean et al. (2007) paper. While the policy factor score by Kriplean et al. (2007) was used to differentiate between critical sections that were laden with policy and those that were not, in this study, I adapted this score to control for the diverse sizes of language editions. Then these scores were used to identify which talk pages were policy-rich.

Next, I identified the number of mentions, explicit Wikilinks or in text mentions of Wikipedia policies

²⁴ Wikipedia Quarry – <https://quarry.wmflabs.org/>

²⁵ WP: Templates – <https://en.wikipedia.org/wiki/Wikipedia:Templates>

and guidelines in a talk page ("pl"), and then the number of revisions to the talk page ("rev"). Using the following formula, the policy factor score was calculated for each article talk page:

$$\text{policy factor score} = (\text{pl}/\text{rev}) * \ln(\text{pl}*\text{rev})$$

For each language, the policy richness threshold was set as two times the average policy factor scores for all the article pages. A page was classified as “policy rich” if the policy factor score was higher than the policy richness threshold and “policy lean” if not. Thus, our dataset was then segmented into eight groups:

1. Policy-rich, not Featured nor Controversial
2. Policy-rich and Featured
3. Policy rich and Controversial
4. Policy-poor and Featured
5. Policy-poor and Controversial
6. Policy-poor, not Featured nor Controversial
7. Policy Poor, Controversial, and Featured
8. Policy-Rich, Controversial, and Featured

Talk Page Sampling

In all three languages, I gathered all *Controversial* and *Featured* article talk pages and a sample of control articles. For each of the articles in this large dataset, I collected the most recent active talk page. An active talk page was based on length of the talk page in bytes and the threshold for the size was dependent on the average taken from 50 sample talk pages. In each language, the threshold for article and article talk page was 5000 bytes. This resulted in a dataset too large to manually qualitatively code, so a sample of this dataset to test was chosen. Figure 5.2. shows a breakdown of the number of articles in each category and the number of articles coded in parentheses.

In Kriplean et al. (2007), the authors relied on a policy factor score to identify *critical sections* in talk pages and then coded a subset of talk page critical sections from the set of talk pages. However, in both FR and ES, the talk pages are small, so relying on critical sections would not result in an adequate volume of coded data. Consequently, I applied the policy factor to select the entire talk page. A sub-sample of each article category was selected for qualitative coding of the threads in the talk pages. The number of articles chosen in the sub-sample was impacted by three variables: (a) number of articles in the article categories presented in Figure 1; (b) the length of articles; choosing longer pages allowed for more amount of discussion; and (c) number of available coders within a 10-week coding process — more coders available allowed for more sampling. Each of the variables were different in each language

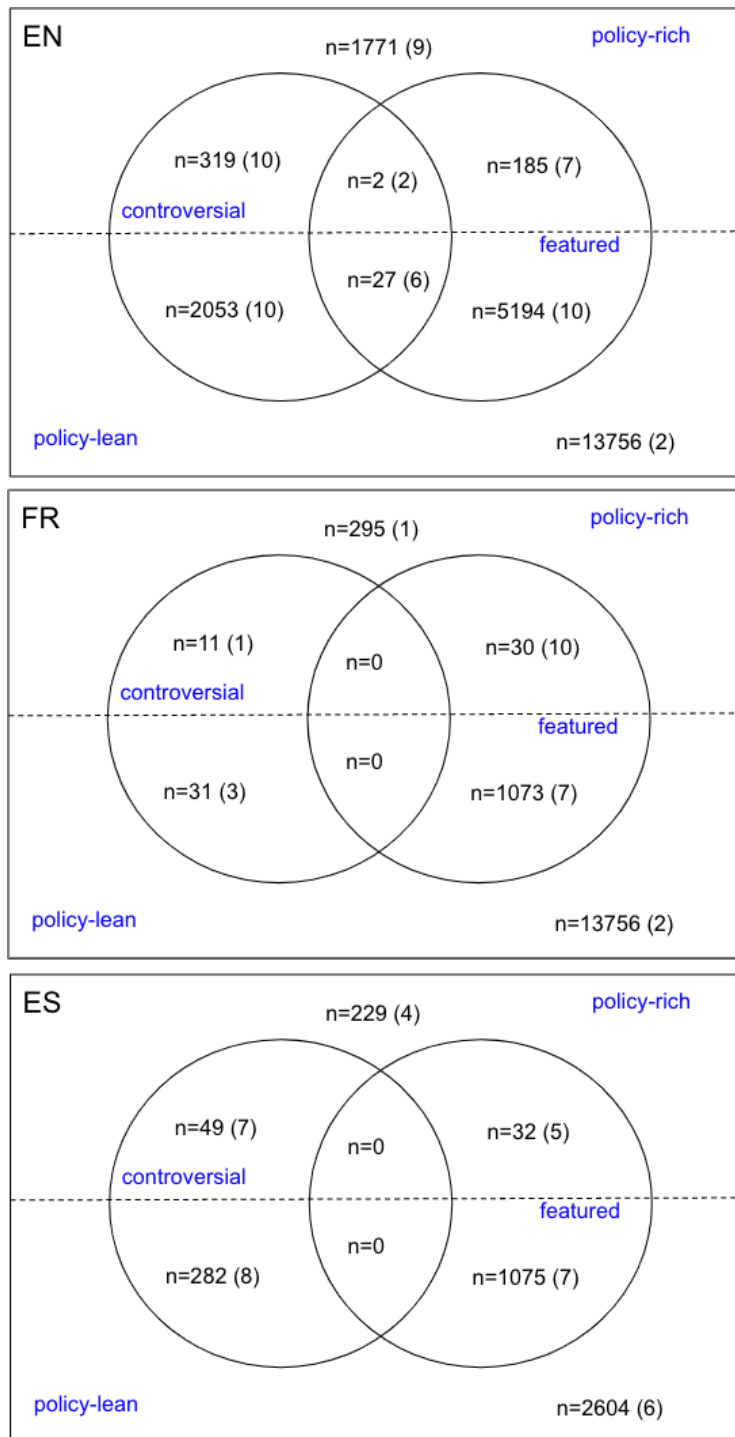


Figure 5.2. The breakdown of size of the entire dataset collected initially in each category, with the number in parentheses representing the number of articles coded in the purposeful sample. The sample was chosen so each article categorization had similar representation, but ES and FR did not have articles that were both controversial and featured.

Data Coding

Power Play	Definition
Article scope	Central and peripheral content is strictly delimited by an individual or core group of contributors.
Prior consensus	Decisions made in the past are presented as absolute and uncontested.
Power of interpretation	One sub-community commands greater authority than another.
Legitimacy of contributor	Traits of a contributor (e.g. expertise) are used to bolster or undermine a position.
Threat of sanction	Threatening to use sanctioning mechanisms (e.g. blocking) or to pursue formal arbitration.
Practice on other pages	Content organization on other articles is used to validate or discredit contributions.
Legitimacy of source	The cited source is discredited.
None	Conversation is only one editor, no debate or does not contain any of the above power plays.

Table 5.3. Definition of power play types from Kriplean et al. (2007).

reflecting a difference in sampling numbers.

The data coding was conducted by three teams of researchers: one team in each language. All researchers were native speakers of their respective language. I trained all the coders using sample datasets. Furthermore, all researchers completed a Wikipedia training course prior to beginning coding to familiarize themselves with the online language editions.

Following Kriplean et al. (2007), all qualitative coders were trained on a sample dataset and stuck as closely as possible to the original definitions. The power plays are identified in Table 5.3. I wanted to

	Total Talk Pages Coded	Total Posts Coded
English	56	916
French	36	539
Spanish	37	598

Table 5.4. The size of the sample dataset coded in each language.

remain as consistent as possible to the original study, so I asked clarification questions of an original co-author of the study as needed.

When analyzing each talk page in every language, two researchers separately coded each conversation thread. To ensure reliability in coding, these two researchers would compare their classifications in-person. When discrepancies occurred, those threads were brought to the entire research team. Together,

the team discussed these until a consensus was met. This method encouraged collaboration within coding during the research. No one coded one page alone, and everyone was held accountable for the pages that they were coding and could rely on each other in creating consistent codes. Table 5.4. highlights the size of the sample dataset coded.

As a check on the coding consistency, a third reviewer sampled 20% of the three largest categories of power plays to measure the error rate. The three largest categories were *Article Scope*, *Power of Interpretation* and *Legitimacy of Source*. From the extra sampling, very small error rates were found (<2% in the article scope and power of interpretation categories). However, I found that the definition of *Legitimacy of Source* had been misinterpreted by members of the research team in the initial coding, so a third coder went back and re-coded all posts that had been previously coded with *Legitimacy of Source*.

Data Analysis

I qualitatively coded all article talk pages in our sub-sample regardless of policy factor score. While the Kriplean et al. (2007) study did not have a percentage of frequency of power play, I felt that it was the best way for us to see how collaborative mechanisms might be different in EN, FR, and ES. However, through analyzing the data, I found some interesting conversations that existed that were not mentioned in the original study by Kriplean et al. (2007) that warranted additional layers of analysis. Some of this additional analysis is due to specificities of FR and ES. For example, in FR and ES, there were many

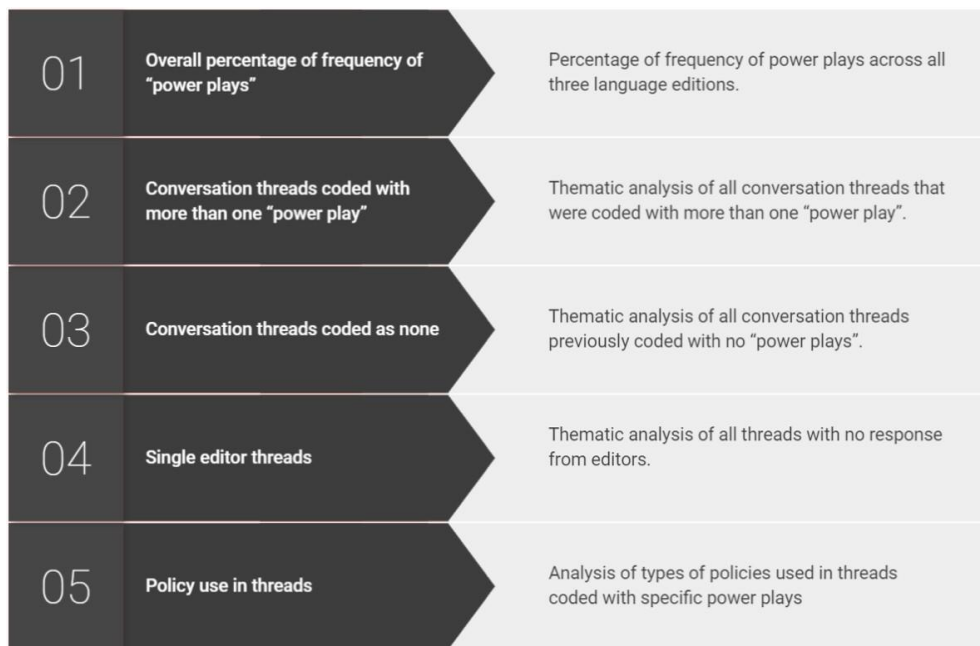


Figure 5.3. Five layers of analysis were performed to qualitatively understand the collaboration model in each language.

conversations that only included a single editor with no response; I was interested in better understanding these types of posts.

For structuring the data analysis, as shown in Figure 5.3, I began by analyzing the frequency of the power plays used in the talk pages in all article categories. The next step to gain insight into the dynamic of collaboration was to further analyze the threads that were classified as *none* in the Kriplean et al. (2007) scheme. The *none* classification means that the discussion did not fit into any category of power play. To further analyze the talk threads with no power play, I expanded the data analysis to meet the specificities of FR and ES and understand the types of contributions on talk pages. Moreover, I analyzed a subset of threads with single editors to understand how those threads might contribute to edits on articles. The last step of the analysis was finding the most used policies in the discussion threads and the potential relationships among policies and the power plays used by editors.

	English	French	Spanish
Article scope	14.0%	14.2%	8.7%
Prior consensus	0.9%	0.0%	0.8%
Power of interpretation	9.9%	12.2%	13.9%
Legitimacy of contributor	0.9%	1.6%	1.8%
Threat of sanction	0.2%	0.6%	0.0%
Practice on other pages	1.4%	4.1%	1.5%
Legitimacy of Source	6.1%	3.7%	2.3%
None	68.0%	61.6%	70.9%

Table 5.5. Percentage of frequency of power plays across all three language editions.

Findings

Prior work has shown that talk pages are a place through which at least two coordination mechanisms occur; interpersonal communication and policy usage (Kittur et al., 2010). In the first step of my analysis, I characterized power plays that accompanied the coordination work in the talk pages. I found that although different power plays manifested in different frequencies in each of the three versions of Wikipedia, power plays exist in more than 30 percent of the discussions in talk pages. This notable percentage of power plays shows that these mechanisms play a significant role in shaping articles and in the coordination work among editors. These findings also confirm that power plays, as influential coordination mechanisms, exist in Wikipedia editions other than the English version.

Editors use both Power of Interpretation and Article Scope power plays (EN)

too few information and only positive aspects,better to translate spanish version and put it here. [edit]

This page has so little information it looks as an attempt to hide bad things done by the United States and only show the good aspects which are actually fewer than the the bad ones that the spanish article shows. Seems USA does not want their children to see what they do. In other countries, the Spanish article is much more complete and has much more information. It seems that American imperialism extends to Wikipedia by hiding information to their own people. http://es.wikipedia.org/wiki/Imperialismo_estadounidense Talks about much more than what is in the current page. And has better references. And other countless things that could be considered as imperialism. [U1] (talk) 23:14, 5 June 2015 (UTC)

The Spanish article has a lot of un cited sections that looks like a lot of just personal opinion, there are things that can be added to this article but just adding a lot of pov into the article doesn't improve it, also you need to relate things to actual american imperialism, you can't just be say that all the bad things America has done have been because of imperialism, there actually has to be some relation. Also lets remember this is not a forum. - [U2](talk) 23:28, 5 June 2015 (UTC)

there are things after ww1 but they are inside other parts,and not enough mentions of meddling in latin america. besides,this are a lot of references to the main things,just see them. and if you say that invading countries to change their goverments directly for their resources,using mass media such as cnn as propaganda to help in a coup or to get a positive view of an invasion,financing counter revolutionaries and oposition persons and dictators that have commited genocide is not imperialism then what is it? you also have not said anything about the united states training counterrevolucionaries and dictators in the school of the americas ive left a link to the english wikipedia article,training other countries troops to keep dictatorships in power in exchange of favour for american companies is not imperialism?William M.hijo (talk) 00:25, 6 June 2015 (UTC)[U1] (talk) 00:25, 6 June 2015 (UTC)

This is seriously just you using the talk page as a place to spew your POV, constructive suggestions would be welcome, your personal POV isn't. [U2] (talk) 19:51, 20 June 2015 (UTC)

I don't speak Spanish and have not looked at the Spanish WP article spoken of above. To the extent that this article might overlook mentioning "invading countries to change their goverments directly for their resources", "using mass media such as cnn as propaganda to help in a coup or to get a positive view of an invasion" (this item in particular strikes me as questionable – it brings to mind a picture of master manipulators in the U.S. Government controlling CNN and other parts of the U.S. news media from behind the scenes, which I very much doubt is happening), "financing counter revolutionaries and oposition persons and dictators that have commited genocide is not imperialism", "the united states training counterrevolucionaries and dictators in the school of the americas", etc., perhaps there should be mentions, or more mentions, or more prominent mentions relating to those areas here and WP:SS links (or more links, or more prominent links) to detail articles on or fitting with those sub topics. The question of whether this article gives due weight to the viewpoints expressed by some reliable sources that the U.S. has acted and still does act in an imperialistic manner probably does deserve some consideration. Perhaps the Views of American imperialism section could use some expansion and balancing. [U3] (talk) (earlier Boracay Bill) 23:43, 20 June 2015 (UTC)

I've never been impressed with editors whining about an article and then suggesting other people do things to improve it. The suggestion here is that someone else do some translating and editing. That's just lazy. Nothing is stopping you from making edits yourself.[U4] (talk) 08:58, 30 August 2016 (UTC)

J. ACM, Vol. , No. , Article . Publication date: 2020.

Figure 5.4. Example taken from EN to demonstrate the use of Power of Interpretation and Article Scope power plays. Further examples can be found in the Appendix A.

Layer 1: Overall Percentages of Power Plays

The first layer of analysis included overall percentages of the frequency of power plays from the coded data sample. As shown in Table 5.5., the overall percentages of the frequency of power plays across EN, ES, and FR include similarities and subtle differences. EN and FR had the highest instances of *Article Scope*, both at approximately 14.0%. EN, FR, and ES all have similar *Prior Consensus* frequencies. This similarity suggests that Wikipedia editors in all language editions hold relevance and proof as the most important reasons for changes and the addition of information to articles. All of the language editions had a very small frequency of *Threat of Sanction*; ES, FR, and EN have less than 1%. *Practice on Other Pages* in EN and ES both represent less than 2% of conversation threads, and *Legitimacy of Contributor* less than 2% of conversation threads across all three language editions. In all language editions, editors are collaborative and open to debates, which is a behavior that has continued to exist since the original study conducted by Kriplean et al. (2007). The overall percentages of the frequencies also show some minor differences among the language editions. While *Power of Interpretation* has the highest frequency in ES, both EN and FR had more frequency of *Article Scope*. Moreover, there is a small variation in frequency for *Practice on Other Pages*, *Legitimacy of Source* and *Threat of Sanction* power plays across all three language editions. These differences only reflect a small percentage of the sample coded and suggest that each of the language platforms is separate with its own characteristics.

Layer 2: Conversation threads coded with more than one power play

Analyzing secondary codes, I found that *Power of Interpretation* and *Article Scope* were power plays that coders could not distinguish between in some conversational threads. In Figure 5.4., which includes text from the EN article on American Imperialism, the editors note that there is not enough information in the current article, and that the current content is biased towards only “positive aspects.” These editors do not agree that the editor who started this thread has suggested the right plan of action to fix the EN article. They do agree that the content from the EN and ES article might need further verification and may be missing content (*Article Scope*), but they do not agree that the right thing to do is translate from one language to another. Each author contributes their own opinions to this argument based on their respective interpretations (*Power of Interpretation*).

Layer 3: Conversations Threads coded as *None*

One of the most notable similarities between all three language editions was that over 50% of the coded samples had no power play. The third phase of analysis showed even more similarities between the language editions to better understand what type of conversations occurred during the examples that were coded as *none*. In this analytical phase, I re-coded approximately 50% of each post that was categorized as *none*. Most posts were conversational contributions about the topic of the article, rather than being focused on editing the article. These posts included questions about the topic of the article, vandalism,

Thread with no power play (FR)

The Meiji era toilet [edit]
 Does anyone know how the toilet of wealthy Japanese people work near Nakatsugawa . Really, I have no idea what we can do with this. - [U1] December 4, 2005 02:10 (CET)
 I am very happy that the curiosity of the Wikipedists is carried to this so useful furniture! [U2]

Figure 5.5. Example taken from FR to demonstrate a thread with no power play. Further examples from ES and EN can be found in the Appendix A.

Editor uses Power of Interpretation and WP:NPOV (ES)

Remove the tag [edit]
 It is totally neutral. The reference to the pejorative character of the word 'pseudoscience' is nothing more than a description and note of the evolution of the meaning of the word .- [U1] (discussion) 19:48 Aug 14, 2010 (UTC).
 No, it is not neutral at all. Someone has dedicated himself to modifying the article again, doing a barbaric work like modifying a reference to say something that was not originally there (see in the history the change made to the first reference on the original Truzzi article). I will check it again. Greetings, [U2] - comments? 08:08 Sep 23, 2010 (UTC).
 Done. I have deleted spurious comments, without referencing, falsifying references and simple personal opinions. I reset the countdown to see if there are objections to the withdrawal of the non-neutrality template. Greetings, [U2] - comments? 08:20, September 23, 2010 (UTC).

Figure 5.6. Example taken from ES to demonstrate a thread where editors are debating the neutrality of the article (WP: NPOV). Further examples from FR and EN can be found in the Appendix A.

article topic debate, bots, discussion about a relevant source, or minor fixes. Across these posts, there was no debate occurring and/or it was not clear what was being edited. Figure 5.5. highlights a thread from the FR article on Japanese toilets. An editor asks a question about how a toilet is used and one person responds. However, neither of these authors discusses a contribution that will be made to the article. The large frequency of conversation threads coded as *none* may be due to the fact that I also coded non *critical sections* -- sections that did not have much debate or policy use.

Layer 5: Policy use in threads

In the fifth layer of analysis, I wanted to understand how policy is being used in each of the language editions. I conducted a policy analysis of 20% of three largest power plays (*Power of Interpretation*, *Legitimacy of Source* and *Article Scope*). The findings show some similarities. In all three language

editions, the WP: NPOV (neutral point of view) policy is frequently used. Furthermore, there is a clear connection between *Power of Interpretation* and WP: NPOV. In Figure 5.6., from the ES article, Pseudoescepticismo, editors discuss removing the NPOV template from the article. They are debating whether the article is neutral and use their own interpretations of the state of the article to validate their arguments. These results confirm that neutrality is still a top pillar of Wikipedia across language editions and show that other language editions seemingly follow the regulations that were initiated in the original EN edition.

Discussion

The five layers of analysis presented in this chapter show strong similarities in collaborative practices related to article content disputes across EN, ES, and FR language editions of Wikipedia. The first layer of analysis focused on understanding the differences in overall power play percentages. It was difficult to make any statistically significant claims from the percentages because they showed some striking similarities and interesting subtle differences across power plays and language editions.

Reflecting on this finding and the original model of power plays suggests something deeper. Kriplean et al. (2007) propose a qualitative model of power plays and demonstrate where they are at work. By picking up Kriplean et al.'s (2007) model and applying it across these three different language editions, I begin to demonstrate support for the argument that the model is complete and adequately accounts for collaborative behaviors across the three different language editions. There were no consistent, uniform omissions of any categories across all the languages, and a careful reanalysis of the *none* category, which we did to identify any new types of power plays, did not yield additional categories. This is relatively strong evidence that this model fully characterizes the space of policy-mediated argumentation during the creation and maintenance of Wikipedia articles on three different language editions.

Prior research from Study 1 (Chapter 4) shows that a replication of a collaboration model from EN does not currently quantitatively exist in EN and might never have in FR and EN. Qualitatively, the model had both strong similarities and differences in all three languages. Unlike Chapter 4, this chapter provides an empirical contribution that highlights a strong qualitative replication of a prior collaboration model.

Finding strong support for the completeness of the Kriplean et al. (2007) model is valuable, but this work also illustrates the value of conducting qualitative work in more than two language editions. By considering this same scheme across three different languages, I have demonstrated stronger support for the value of the coding scheme and how it describes the collaborative activities of Wikipedia contributors regardless of whether they are working on EN, ES, or FR.

The similarity between the language editions highlights how independent the power play argument structure is from the policy regimes. Across language editions, policies were not used in strong relation with various power plays. I highlight some implications that these findings may have for the future of research on collaborative platforms.

In Study 1 (Chapter 4), differences in how much collaboration was occurring were evident and demonstrated that it is possible to productively adapt models from prior Wikipedia research to other language editions. The study in this chapter further shows that findings based on a study of one language edition alone cannot automatically be extended to other language editions. In this study, we had to adapt the methodology of the Kriplean et al. (2007) model to be able to systematically replicate it within other language editions. Beyond this, the findings from this study show that with deeper qualitative analysis, the practice of collaborative consensus making is quite similar across at least three language editions, specifically EN, FR, and ES. However, there are subtle differences that show that across the language editions the consensus process is not the same. The frequency of percentage of power plays were different and I demonstrate these differences further in the findings section and in Section 6 of this chapter.

All three of the language editions follow closely to the “Five Pillars” of Wikipedia. The finding of the WP: NPOV policy’s prominence in discussions across all three language editions helps illustrate the adherence to the “Five Pillars.” The reasons the NPOV pillar holds true across editions may be that it is a principle that runs deeply through the Wikipedia project, through encyclopedic traditions, and down into Western beliefs about the freedom and availability of knowledge. The NPOV pillar is one of the oldest governing pillars on Wikipedia and according to Jimmy Wales, this pillar is "non-negotiable". Many other policies such as WP: Verifiability and WP: Original Research have foundations in NPOV. The idea of neutrality is not completely lost. As I found this consistent finding across the three languages that I analyzed, I began to wonder again whether there are Wikipedias in other languages, perhaps Chinese or Arabic, that might exhibit a slightly different collaborative structure than what validated across English, Spanish, and French.

A global system like Wikipedia must be understood as a sum of all of its parts, with the language editions being sub-instances that are distinct. Users distributed around the globe working in different languages create content on different editions, so it is important that researchers treat Wikipedia as something more than what is evident in the EN instance of the system. A perspective that is inclusive to all languages will allow researchers to better understand how to handle the fluidity of user experience across the various language versions of a given platform. While I have demonstrated that there are some similarities across Western Romance languages, future research needs to further explore languages that might not fall within these Western European language norms.

Limitations

I acknowledge there are several limitations in this work. The limitation of translation is inherent. As I conduct research on language platforms, the data analysis relies heavily on translating discussions written in other languages into English. There are limitations in what and how much can be conveyed to other people. To get the best translation possible, I included 1) native speakers to code and translate the articles, and 2) group meetings to interpret the power plays through translation. The second limitation is that I adopt the annotation scheme from Kriplean et al. (2007), but my interpretation of the scheme might be different than Kriplean et al. (2007). This limitation reflects the nature of qualitative research.

Lastly, I acknowledge the limitations in my quantitative policy analysis. I believe that a true study to understand the different policy mechanisms in other language editions of Wikipedia should be an entirely full and original study to itself. Future work should understand the different policy regimes in each language and how editors use them in talk pages.

Power Plays Through the Lens of the Socio-technical Framework

The concept of a power play is innately a social process — editors attempt to find a way to convince other editors that this is what you are going to want to do. My first assumption is that there is not much to suggest about the technological influence that shapes the consensus debates that editors have. Similarly, to the methodology in Chapter 4, I built a table to explore the major differences in power plays across languages shown in Table 5.6.

	Social	Technical	Language
EN	Article scope Legitimacy of Source		
FR	Article Scope. Power of Interpretation Practice on Other Pages (translation)		Practice on Other Pages (translation)
ES	Power of Interpretation		

Table 5.6. In this table, I classify the posting dimensions discovered to have the largest impact in each language edition into social, language and technical processes. The initial study by Kriplean et al. (2007) focused on the “power plays” which strongly ties to the social and language processes making it difficult to demonstrate the technical processes.

Consensus Debates are a Social Process

In EN and FR, there was a high volume of *Article Scope* posts. There are a couple of processes that may occur that lead to *Article Scope* posts. First, in each language, there is a guideline size of an article page to help make articles concise and readable for Wikipedia users. Furthermore, in EN, there is the use of WP: Notability that leads to discussions about whether content warrants its own article or a separate article. Furthermore, *Legitimacy of Source*, references the NPOV pillar. The social process of verifying and debating sources determine alone the individual behavior of editors that in turn lead to the development of quality articles or at least decide what happens in another place.

In FR, I begin to show the mutual workings of language needs and social processes. *Practice on Other Pages* occurs when editors get content or practices from other parts of Wikipedia including other language editions. Is this power play a representation of translation - possibly? Demonstrating how conceivably language translation influences the way people discuss and come to a consensus might trigger new social processes.

Conclusion

In this chapter, I show that across three languages, there are differences in how editors claim legitimate control over the content. Primarily, I delineate the subtle differences in the collaboration mechanisms between ES and FR, and the largest language edition, EN. In this work, I specifically try to disentangle the relationship between policy and power play from the perspective of an editor. I present an analysis of talk page conversations annotated for types of power plays and policies in each language. I have also described and reflected on the iterative process on how I analyzed the types of power plays. The findings show that the combination of the power play and policy mechanisms better demonstrates the collaborative efforts of editors. In all three languages, I distinguish subtle differences in the collaborative model, demonstrating that the interplay of these mechanisms is not bound by a specific language, size or maturity level.

Chapter Summary

In my study presentation in this chapter, I further describe the differences between the collaboration models in EN, FR and ES. The contribution of this chapter is a response to the second research question of this dissertation:

R2. How generalizable are findings from English language edition of Wikipedia to other language editions? While some of the overall structure of Wikipedia, the policies and collaboration mechanisms

remain the same, there is a difference in how they are used. Across the three different languages, the overall percentages of frequency of power plays were the largest difference. There was a variation between the frequency of power plays being used and this suggests that editors in EN, FR, and ES use different methods of how editors claim legitimate control over the content.

In Chapter 2, I demonstrate that there has been previous literature that focuses on understanding Wikipedia collaboration from the lens of policy, interpersonal, and power play mechanisms in EN. However, the work of power play is underrepresented in the literature and there was no focus on power play mechanisms in other languages. In this work, I specifically try to disentangle the relationship between policy and power play from the perspective of EN, ES and FR. I believe there is a gap in the literature on how collaboration is theorized. There needs to be a focus on the marriage of policy and power play.

I also want to note that previous literature has focused on interpersonal communication mechanisms to understand collaboration. While I did not necessarily focus on interpersonal communication, prior work has shown the importance of communication in any organizational system (Rader, 2020). On Wikipedia, editors communicate directly through talk pages (Viégas, 2004; Schneider, 2010). This communication typically occurs at the beginning stages of an article, which demonstrates that interpersonal communication might be more effective and strongest at the beginning of article development. The increase in editors on an article may then lead to the ineffectiveness of interpersonal communication (Kittur et al., 2008).

During collaboration on Wikipedia, editors exchange information through interpersonal communication. This happens primarily on talk pages or user talk pages. Affective processes are interpersonal as one editor's emotional state can trigger a reaction from another editor. These processes represent all feelings and responses, positive or negative, related to emotion-laden behavior, knowledge, or beliefs. Affect can alter an editor's perception of situations, which can lead to fueling, blocking or terminating a chosen behavior.

In EN, policy, power play, and interpersonal mechanisms help editors control content and mediate consensus disputes. In this study, this is also true in other language editions of Wikipedia. In all three language editions, editors use content, editing and conduct policies and guidelines to help guide their collaborative efforts. I also demonstrate that power plays exist in different facets across the three language editions. I show the bridge between policies and power plays by showing how conflict over policy definition leads to the rise of the use of power plays. These findings hold true across FR, EN, and ES, demonstrating that these collaborative mechanisms are not tied to any of these language edition, no matter

the contextual differences.

Power Play Mechanisms

Power plays help bridge interpersonal and policy mechanisms. I can begin to fill in the gaps of collaborative mechanisms using power plays. While this paper does not focus on design implications, I believe that this empirical contribution can help future designers consider how to build for this new type of mechanism, power plays, in different language editions of Wikipedia.

In Kriplean et al. (2007), the researchers did not report the frequency of power plays in EN. In the second layer of my analysis, I analyzed the frequency of each power play that existed in the original study by Kriplean et al. (2007) and found that the power play model is complete — no new power plays existed in EN, FR, or ES. However, the findings show that the frequency of power plays is not the same across the three languages.

Through the analysis of the *none* category, there are no new types of power plays, but the contributions from editors on talk pages are different across language editions. While I see that the Kriplean et al. (2007) model fully characterizes the forms of policy-mediated argumentation during the creation and maintenance of Wikipedia articles, I also now see that contribution types from editors in different language editions can be different.

Prior research noted that debates on Wikipedia were controlled by the community and the collective resolve by using official Wikipedia policy pages (Viégas et al. 2007). However, in the study by Kriplean et al. (2007), the authors demonstrate that power plays exist when there are different interpretations of policy. These varying viewpoints lead to a breakdown of consensus and policy references may not lead to a resolution. These power plays or power relationships do not reflect this collective resolve.

Chapter 6: Typology of Collaboration Work and Perceptions Authority in EN, FR and ES

(Study 3)

In Chapters 4 and 5, two well-known collaborative models (Kriplean et al. 2007; Viégas et al., 2007) discovered in EN were replicated on three language editions of Wikipedia: EN, ES, and FR. In Study 1 (Chapter 4), I found similarities and differences between the behaviors editors portrayed on talk pages. The results show that the original model accounts for a different magnitude and these differences lead to the expansion of the model. The contribution was a second layer of posting dimensions that highlight new behaviors that occur on talk pages. These new dimensions show the evolution of the EN platform and that FR and ES may never have been similar to EN. My extended model accounts for how talk pages are currently being used and the behaviors that occur on a post-level in talk pages. In Study 2 (Chapter 5), I found that editors take control of their content on talk pages similarly across each language. The original study presented a list of “power plays” found at a conversation level on talk pages. The qualitative coding of a dataset in EN, FR, and ES shows that these *power plays* still exist, and no new power plays were discovered in any of these language platforms.

Through these two studies, I demonstrate the existence of the particular model, whether that be the expanded model in Study 1 (Chapter 4) or the original model found in Study 2 (Chapter 5). Both models

were discovered in talk pages. I hypothesize that both models exist simultaneously in all three languages and can represent a more comprehensive model of collaboration.

To be able to give a more complete look at the collaboration models in EN, FR, and ES, the objective of this study is to gather the voices of editors — through semi-structured interviews — from each language edition to better understand their perceptions of how collaboration occurs on Wikipedia. Thus far, the collaborative behaviors I described in past chapters are solely supported through the analysis of talk pages; through this semi-structured interview study I will be able to draw out the unfiltered voices of the editors as they communicate and collaborate on Wikipedia. I hope to answer two questions:

- 1. What types of collaborative behaviors do editors typically participate in on talk pages?**
- 2. What types of social, technical and language processes empower consensus on EN, FR, and ES?**

This study helps fill the gap of understanding the user's perceptions and processes that help drive their interactions and work on Wikipedia. In this chapter, I discuss prior literature related to processes that support collaboration in online communities. I then describe the methodology and recruitment strategy. I dive into the findings of 31 interviews with editors from three Wikipedia language platforms. The findings characterize who the participants are, their descriptions of editor interactions they have been part of and their perceptions of how consensus building occurs on Wikipedia. The contribution of this study is a typology of collaboration practices through which I can highlight social, language and technical factors that editors believe influence consensus building.

Relevant Literature

Wikipedia is written and maintained by a community of editors, who ensure that the quality of the articles can be conserved. On Wikipedia, collaboration is critical to the development of quality articles. Research has shown that social and technical processes play an important role in making decisions and coming to a consensus — part of good collaboration. Both the social and technical processes are key aspects of collaborative behaviors shown in prior work. In Chapter 2, I discussed some of the key technical features of Wikipedia including the editor's use of templates and threaded talk pages all based on the foundations of MediaWiki.

I also began to discuss some of the social processes in the prior chapters, as I discussed what type of work people do and how they communicate and debate with each other. For example, “power plays”, policy usage and interpersonal communication are all social mechanisms that influence the way

collaboration occurs on Wikipedia. In the following sub-section, I further detail some work that I have not yet touched on about social features or more specifically, the social roles on Wikipedia.

Social Processes

In Chapter 2, I discussed the hierarchy of the human administration on Wikipedia. This is the formal structure of roles on Wikipedia. However, there are also various social roles on Wikipedia formed through the sociotechnical structure of the system. These social roles can be broken down into multiple ways including both gender differences and overall experience of editors on Wikipedia. Researchers have demonstrated that it is difficult to retain newcomers due to many not fitting into the typical gender and demographics of current editors (Morgan et al., 2013b). Socialization tactics may help newcomers feel more comfortable and help persuade them to make edits on articles (Ciampaglia & Taraborelli, 2015; Choi et al., 2010). Newcomers are just one type of social role on Wikipedia. The roles on Wikipedia vary and research has shown that the various social roles can portray different psychological processes. Some roles have more power than others which can impact how collaboration is done.

One example of a power role is administrators. Authors found that administrators maintain a rather neutral, impersonal tone, while regular editors are more emotional and relationship-oriented; that is, editors use language to form and maintain connections with one another. Female editors communicate in a way that allows them to promote social affiliation and emotional connection more than male editors. Finally, editors tend to interact with other editors having similar emotional styles (Iosub et al., 2014). Effective socialization of new contributors is important for the long-term sustainability of open collaboration projects (Morgan et al., 2018). Research has shown that newcomers to Wikipedia can face many barriers to participation. Sociotechnical features can impede the entrance of newcomers, especially as they need to navigate a complex policy regime. Understanding social roles in the process of onboarding of newcomers is critical for the development of all platforms.

Moreover, gender differences online have shown to have different behaviors. There has been a lot of research on gender bias on Wikipedia. A lot has to do with the lack of female-based biographies, but even more females may have less say in collaboration (Callahan & Herring, 2011). Prior research finds that females and males display different participation patterns online on different platforms (Panyametheekul & Herring, 2003). Females tend to participate less and receive fewer responses than males do in mixed-sex asynchronous discussion forums (Herring, 1993). However, in chat rooms, females sometimes participate more actively and get more responses than males do (Bruckman, 1996). The social roles of editors on Wikipedia can help identify how governance and gender play a role in coming to consensus on Wikipedia.

In the following chapter, I interview 31 Wikipedians in EN, FR and ES to better understand these social roles and practices. Furthermore, the interviews will give me the firsthand perspective from editors on what types of mechanisms they consider help reach consensus on Wikipedia.

Methodology

In this study, I employed a semi-structured interview technique. Using this methodology, I was able to gather qualitative feedback and probe users about the specific experiences and interactions they had been part of. In FR and EN, I conducted the entirety of the study. For ES, I worked with a group of Spanish speakers to help recruit, interview and analyze the data. This group was composed of undergraduate students from the University of Washington that were interested in learning about qualitative research methods and online language communities.

Participant Selection

I selected participants for the interviews who were currently active editors in talk page discussions in the French, Spanish and English Wikipedia editions. An active Wikipediaian meant they had made an edit within the last two months. There were two ways that participants were selected (a) if their conversations were coded as a “power play” in Study 2 (Chapter 5); and (b) if they are currently in the list of top Wikipedians²⁶ based on the number of editors on any platform. I began this study looking for specifically only participants from group A or those that had participated in a power play conversation in Study 2 (Chapter 5) but that specific study included conversations that could have happened at any time in recent years so many of the participants were no longer active on Wikipedia. To help support the selection process, I also then sampled from group B, the list of top Wikipedians. After a participant was selected, their eligibility was screened by examining their Wikipedia User Page, User Talk Page, and Wikipedia Edit History. I reviewed the editors’ editing history to make sure the participant met the contribution threshold prior to individual contact. An editor met the threshold if there were at least three conversations that the editor had participated in on talk pages and those three conversations discussed an article edit.

Participant Recruitment

Participants were recruited via Wikipedia. In FR and EN, I recruited all the participants, while in ES, a member of our research team reached out to participants via email. Participants were contacted either through the Wikipedia emailing system that sends a message through the platform or their user talk

²⁶ WP: List of Wikipedians by number of edits: https://en.wikipedia.org/wiki/Wikipedia:List_of_Wikipedians_by_number_of_edits

page. The final recruitment led to the participation of 13 editors from ES, 8 participants from FR, and 10 participants from EN. The number of participants from each edition is a result of the combination of approaching data saturation and a sense that additional information from more participants would not be sufficiently useful to warrant the extra time.

Gathering data from the user edit history and user page

I extracted quantitative data to help understand the editor's background and see if they were qualified for this study. Through the user's profile, I gathered the number of edits the participant had made and the length of their tenure as a Wikipedia editor. Additionally, through their edit history, I gathered 3-5 conversations they had participated in on talk pages. These conversations had to include actual interaction with another editor and a debate about the relevant article and content that needed to be included or excluded in a specific article.

Interview Study

In this study, I used semi-structured interviews to understand the collaborative practices of editors in each of these language editions. These interviews allowed me to elicit the experiences and skills that Wikipedia editors have as they collaborate with other contributors to edit various articles. I conducted all the interviews except the interviews with ES editors²⁷. I observed all the ES studies to ensure consistency with the analysis conducted in EN and FR. The interviews were conducted through Skype, Google Meet, Zoom, and WhatsApp. Furthermore, each interview was recorded resulting in a video or audio file.

The one-hour interview was divided into three phases. Phase 1 focused on general questions about editing experiences on Wikipedia and their basic interactions with other editors. In Phase 2, participants were shown 3-5 old talk page conversations that they participated in. I tried to choose various examples of their conversations from throughout their editing experiences (e.g., their most recent conversation, a conversation from approximately a month prior, and a conversation from a year ago). Phase 3 focused on understanding how they think consensus is reached on Wikipedia and what drives the interactions they have with other editions. As shown in Table 6.1., I split up the contextual interview into three parts based on what is generally known about the more comprehensive collaboration model under investigation.

Interview Analysis

To analyze the data, the videos were fully transcribed and relevant quotes pertaining to the research questions were separated by the three phases of the study. The relevant quotes were gathered by first

²⁷ ²⁷The ES interviews were conducted by native Spanish speakers as part of a University of Washington Directed Research Group in Winter 2021 - <https://www.hcde.washington.edu/research/archives/mcdonald#wikipedia-wi20>

<p>General Overview of Wikipedia Usage and Editor Motivations</p>	<p>Tell us a little bit about yourself. How long have you been editing on Wikipedia? How do you interact with other editors? How familiar are you with policy and guidelines?</p>
<p>Overall, How Does Collaboration Occur?</p>	<p>Participants were given 3-5 examples of older conversations on talk pages and asked to answer the following questions: Can you tell us the story behind this post? What is the resolution of this conversation, if there was any? Why did you choose to actively participate in this discussion? Is this conversation typical of your interactions with other editors?</p>
<p>Understanding How Consensus is Built</p>	<p>How would you describe power? If you could give a piece of advice to newcomers to help them actively participate in discussions and come to a consensus, what would it be?</p>

Table 6.1. Example of interview questions. The full study protocol can be found in Appendix B.

splitting the transcript into different segments. Each segment represented a phase in the interview study. I began by pulling out only the quotes most relevant to the questions asked and then using these relevant segments to build a coding schema. Each segment of quotes was categorized and then I looked across the codes to find the most interesting themes. The common set of themes emerged from the data through a thematic analysis (Braun & Clarke, 2006).

The overall inductive data analysis started with the ES data because a research group of native Spanish speakers helped conduct the reading and analyzing of data. The codes that were developed from this edition were the basis for the analysis in the two other languages. It was not intentional but by starting with the most marginalized group or the smallest Wikipedia edition, I expect it allowed for a greater opportunity to see more differences within the codes.

To validate the codes and themes, two researchers met on a weekly basis to extract and refine the coding schema I fully analyzed the data from EN and FR, while the Spanish research group helped analyze the ES data. For the ES dataset, each week, we met to continue refining the themes extracted from the data. The final quotes described in the finding’s sections were translated by native Spanish speakers in the research group to be included in the final report.

Findings

I structure the results in terms of who participants are, their motivations for editing, their collaborative behaviors, and their perceptions of how collaboration is supported on Wikipedia. The results are supported by the data gathered from the semi-structured interviews. Furthermore, I used data gathered from the user talk page of each participant to better understand their history on Wikipedia. As I speak about the findings, I use the words “many”, “most” or “some” to describe how often this data point showed up across participant interviews. I use the words “many” and “most” when over 50% of the participants in each language edition noted the same thing. I use the word “some” for less than 50%.

Participant Demographics

Each language study was run separately. I started with EN in November 2020 and then ES and FR followed back-to-back starting January 2020 and ending April 2021. First, in EN, 13 participants were interviewed averaging 15 years of experience and approximately 156,000 edits on Wikipedia articles. One EN administrator was included in the dataset. Next, 13 participants were recruited from the Spanish Wikipedia, 3 of those participants were administrators. Participants averaged 61,200 edits and 13.7 years of experience. Lastly, 8 participants were recruited from the French Wikipedia with an average 13.5 years of editing experience and about 82,607 edits.

While I did not ask specifically for demographics, across each language, most participants self-reported themselves as male to show their observations of a male-centric Wikipedia. For example in EN, one participant mentioned

“One thing Wikipedia has shown me is that the world is white and male. I know I am male too but I now understand who helps control the information on the internet.”

Across EN, FR and ES, most editors discovered Wikipedia while searching for content online. Upon reading articles, they felt like something needed to be edited or added. One participant from EN noted that:

“I was looking something up and saw something that wasn't quite right. And that was the bit of sand in the oyster ... [I] saw something that needed correcting or expanding and got it.” (EN)

Similarly, in FR, a participant used Wikipedia in her master’s program and through that experience found a part of an article that needed to be corrected. That was the very first edit she made:

“I first discovered Wikipedia through lessons. I did a master’s degree in science, information and communication technologies and during seminars, another student presented Wikipedia. It was in 2005. From then on, I am sometimes consulted. And then, one fine day, I wanted to correct a mistake. When I had a spelling mistake I did it under IP and then I found it funny. I said to myself maybe I can contribute other things and I cried out to Europe, but I started to contribute.” (FR)

This participant started with small edits fixing spelling mistakes in articles. Similarly, participants noticed small mistakes that needed to be fixed and sometimes they just wanted to add some of their own knowledge. Some users were surprised by the collaborative aspects and liked that the pillar of NPOV on Wikipedia allowed for a neutral stance on articles. For this reason, they decided to continue being involved in the platform. As this one user noted, Wikipedia is an innovative platform and he wanted to contribute:

“I decided to contribute to Wikipedia, which I knew [about] for some time. It’s the most revolutionary idea that has occurred in the last 25 years.” (ES)

Most editors choose articles to contribute to an article based on their own specialties, hobbies, and interests. If an editor had an interest in music, almost all their edits would be related to that topic. Another EN editor was a professor of linguistics and spent most of his time on Wikipedia editing linguistics’ topics.

All the editors interviewed had been on Wikipedia for over five years and noted that their behavior had evolved overtime. For some editors, there were not as many articles when they started editing so it was easier to create new articles or add novel information. Now, they usually try to fix or add to articles that are mostly complete:

“Everything I wanted to do was done already, so I moved more towards completing articles that were already created.” (ES)

In EN, one Wikipedian noted that they have become more of a WikiGnome²⁸ overtime. He no longer felt the need to add entirely new articles and instead spend more time fixing small, incremental issues throughout many articles.

²⁸ WP: WikiGnome - <https://en.wikipedia.org/wiki/Wikipedia:WikiGnome>

In ES and FR, the addition of new tools like Google Translate has also helped editors add information to articles. Editors can now use content from other languages, translate that information and add it to their own editions. One participant in FR noted that there was much more content in the German edition of Wikipedia and used more complete content from that edition to improve articles in the French Wikipedia:

“I almost always found a lot of good, very technical and very detailed information on German Wikipedia, and also in English. Sometimes [the content in French] was not bad, but it was less complete and less precise than in German at the time.” (FR)

In all three languages, editor behavior has evolved during their years of experience. In ES, some editors became administrators. Two other editors additionally got more involved with other Wikipedia-related organizations like WikiData and Wikimedia. In these cases, the editors’ work changed from making edits or additions to articles to more maintenance-type work, such as making sure graphs were formatted consistently and checking flagged articles.

“Normally what I do is complete data or add references, homogenize adding tables, that kind of thing...” (ES)

Another editor in EN shared their experiences creating specialized bots to help clean up Wikipedia, and another editor from ES, discussed how they use Wikipedia as a tool to teach their college students about organizational behavior online.

The editors that participated in this study have contributed their time to Wikipedia and their contributions and collaborations have led to the development of EN, FR, and ES. The following sections of the findings section discusses how each of these editors interact with editors and their perceptions about factors that influence consensus building.

Types of Collaborative Behavior that occur in Talk Pages

Each article page has a talk page on Wikipedia so that editors can communicate and track changes to the article, as well as collaborate on larger edits. Conversations on talk pages start from noticing errors as small as orthographic and stylistic errors to larger-scale issues such as factual inaccuracy, lack of (or improper) references, and relevance of information on a talk *page*. Across all three languages, similar types of conversations were happening in talk pages. In this section, I explain the different themes of collaborative conversations and give examples from the language platforms they occurred in.

Conflict Resolution: In Phase 2 of the semi-structured interview, we asked editors to describe their experiences surrounding specific examples that we shared with them. All the examples that I pulled from talk pages were debates about what type of content needed to be edited, added, or removed from an article. Not surprisingly, all three languages included many cases of conflict, and these participants were specifically working toward coming to a resolution. For example, in ES, an editor was reprimanded for using harsh language in his response to a critique of his perspective in a previous discussion. The editor stood by his statement and reiterated his original opinion that the article should not have its name changed:

“It is important to understand that even though I don’t agree with the other editor, that doesn’t mean one of us is wrong, better put, it’s not a competition.” (ES)

Although proud of their edits, most editors answered that they would stay away from conflict and were polite and composed when discussing moments of conflict. Editors frequently decided not to get involved, as aggressive comments *“wouldn’t lead to anything good for anybody,”* and usually resulted in a gray area if a compromise could not be reached.

In EN, conflict also arose because editors felt a strong need to follow the platform’s guidelines and policies, especially concerning how content is written. One EN editor shared how they participated in a conversation where they debated how editors should describe gender on Wikipedia. There were two different sides of the conflict, one where editors were part of the *“English language reform camp, you know, we’re like, you know, the language itself should change in deep ways to account for the feelings and needs, especially of transgender, non-binary and genderqueer people.”* The opposing side was more prescriptive where the gender descriptions should be based on publishing companies like the Associated Press and Oxford University Press. This editor entered this conversation to try to bring their knowledge of how content is written on Wikipedia:

“Wikipedia is not a bureaucracy and it’s not, you know, like a battleground for advocacy points of view. And, you know, any time there’s shifts in our guidelines about how we write about people, they still have to be within the policies like guidelines and especially things that aren’t even really guidelines, but just wiki project essay pages on, on style and appropriateness and tone and things can’t trump our core, core content policies. So that’s why I get involved [in these conversations].” (EN)

This argument is an example of the common descriptivist versus prescriptivist debate, in this case looking at how people use language in real life for trans, nonbinary and genderqueer people versus relying on Associated Press and publishing companies to determine how that language should be used. This editor

noted that Wikipedia is not the place to be having these discussions about language and would rather have them align with the current policies and guidelines of Wikipedia.

Furthermore, in EN, conflict typically arose because of “*POV pushing*” (EN), the idea that editors would strongly advocate for their own point of view and believed that was the content that should be included in an article. Essentially, there are different views that come from different sides; however, it is most important to abide by the policies. Another example comes from an FR participant who noted that that the French language is very specific to how gendered nouns are represented; this conflict arose because there was a disagreement among editors how the language of an article would represent a transgender individual.

“This person was recognized as a boy and then felt like a woman and then said that she actually is neither male nor female. It is non-binary, but in French, it is necessary [to be specific about gender] when one characterizes it. Put the words masculine or feminine, or try to use words like nonbinary personalities, which are neither masculine nor feminine. But if we want to say that it is someone who works in the field of cinema as an actor or actress, we have to say something. And there, it is very difficult to write an entire article without using any masculine or feminine words. And so, the one that I was arguing with, I believe this time, I believe it's a man. I'm no more sure than that. I thought that the fact that... it was not correct, but in the category below, it was said that she was an actress. So, I don't see why you don't want to say that she is an actress in the article since she is categorized like that. (FR)

In this conversation, the editor wanted to make a final decision based on the categorization of the trans individual and how to address them, but this problem was bigger than just this conversation and was very typical of other types of conversations.

Citing Sources. In EN, FR, and ES, many of the conversations and debates were about sources. In all three languages, the editors continuously repeated the importance of sourcing information and that one of the most used policies other than NPOV is Citing Sources. Editors from all three language editions mentioned that the citing sources policy was something they use to promote discussions and that many of the conversations they have are around poorly cited content or lack of sources.

An overarching theme seen in conversations on talk pages addressed source validity. One participant in ES talked about an interaction she had initiated with another editor in a talk page, addressing the topic of two medieval characters with very similar names. She had a background of significant knowledge of medieval history and noticed that someone had cut the information she had input and pasted it into a different article, removing the sources completely. The editor she was arguing with in the talk page was

making baseless claims on details of the article, without giving sources *“for what appears to be his own hypothesis,”* while the editor who started the conversation supplied her argument with cited evidence.

The participant mentioned in the interview that she stands by what she argued.

In ES, regarding an article about a sports team, an editor had to tell another editor that even though some facts are obvious — like a sports team winning certain championship titles — the statements have to be backed with sources. The participant stated that editors still have to use other sources to have the information written be valid. The participant had said that the other editor:

“needed to understand that Wikipedia is not a primary source. Therefore, Wikipedia cannot say that something happened [without sourcing].” (ES)

The participant felt that he had to make clear to the other user that once valid sources were included with the information about soccer championships in the article, that he *“didn’t have a problem.”* The same participant also said that he had been seeing recurring issues of lack of source validity or lack of sourcing entirely on other pages on the platform. Multiple participants felt that it was their duty to advocate for properly sourced information. As one participant in EN noted:

“I’m a big fan of citing secondary sources. I’m also a big fan of removing trivia like the popular culture stuff. And that’s what I was doing here.” (EN)

Similarly, in FR, a participant noted that an editor copied content from one article to another article but did not source the content properly:

“It’s content that he didn’t originally write, but when he copies it from one article to another. And in this case, one of Wikipedia’s rules is to put the author’s credit, to report it. Basically, that it comes in our article and that it was transported to another article so that we can then find the contributor who wrote the original source. As he did not write in the article on the case, we still have to find the origin of the information. So, I blame him on this contributor because he said so. Besides, he had already done it on an article I was going to write, and I had already pointed it out to him. So there, I see doing it again.” (FR)

Lack of sources or source validity go hand in hand with other issues like a non-neutral point of view, according to some editors. In regard to an article about rock music and how music genres are described, a FR participant had initiated conversation on the talk page because the article had mentioned opinions from the musician relevant to the article. On top of that, the articles linked to the musician’s opinion was not an accredited source, according to the editor calling it out. After making the other editor aware of

their wrongdoing, the conversation ended there, and there was no resolution or consensus achieved.

Debates that lead to no resolutions: In ES, editors referred to “abandoned” cases as cases where conflict arose, and no resolution was reached. Occasionally, the best thing for the article would be to abandon the proposed changes for a variety of reasons, including maintaining the status quo, and because editors’ time could be better spent on other tasks. Another reason for abandoning a discussion was because there were ongoing events in the real world; editors emphasized that Wikipedia is not a news source or opinion site, therefore articles cannot be written until there are verifiable, objective sources on it. An example of this was a discussion of merging two articles, but the decision to abandon the discussion was made as both topics were under intense pressure from the public in that particular country at the time of the discussion.

Participants also noted similar thoughts in FR. One participant noted that there is no resolution currently because in general the article was too long, and no one wants to put in the work:

“For now, no, not really, because hey, that's also what I expected there. It is above all that the others, a redaction. So far, no one has come forward as the article is long. Either way, I understand you. The problem with Wikipedia is like volunteering to have people relish articles that you know, it's a bit complicated to find people.” (FR)

There were fewer examples of debates where there was no resolution in EN. Many of the articles discussed were much more developed and over time, new changes to the article have overridden some of the conversations discussed. However, the few conversations that were not resolved were ongoing. As one participant mentioned, currently, “*they were still arguing*” and no consensus had been reached.

Debates over Translation Issues: In ES and FR, translation-related issues were dealt with collaboratively. Several edits that sparked conversation on the talk pages involved using information from the corresponding English Wikipedia article to the Spanish or French edition. This reliance on using work from the English Wikipedia and translating it shows that the English edition serves as a standard for other language editions. When incorrect information drawn from English articles were translated into Spanish and placed in articles, editors took note of the factual inaccuracy of the information (or of the incorrect translation, depending on the situation). For example, one ES editor noticed that someone had included false information from an English article about Yellowstone National Park into the Spanish article — confusion about the relevance of a petrified wood forest was unintentionally transferred to the Spanish edition. The editor pointed out the mistake in the talk page and the editor who made the translation said thank you, and the issue was resolved. When asked about how the conflict was resolved, the editor said:

“It wasn’t a question of authority, it was a question of logic, of reasoning.” (ES)

The only reason why the participant was able to point out the inaccurate information brought about via translation was because he has an extensive background in geology.

Minor issues: When a user talked about proposing a name change to a different article, the user called it a “minor issue”. Users were typically giving their opinion of the issue on the talk page. The user said that in interactions, users on talk pages “*don’t impose their opinion unilaterally, of course, they always have to arrive at some sort of consensus.*” This thought process is applied to work on Wikipedia as a whole. As one ES editor said, “*We [as users] try very hard to reach a consensus ... to focus on the same line of thinking.*” The overarching goal when engaging in conversations on talk pages is to have a civilized discussion and conserve the integrity of Wikipedia, with relevant information, valid sources backed by factually accurate information, and neutral points of view.

In FR, an editor noted that he had been working really hard on an article, so he used the discussion page to discuss minor edits to just continue improving on the article:

“I did a proofreading of 200 articles and I made comments. Surely. The article was good, very good even. So suddenly, I don’t have a lot of comments to make. He got it right on some really pointed, chronological issues that I had to research for the other article as well. So, I discussed it a bit with him and I hope it goes bad. I think it will help improve the article.”

In general, some editors are using talk pages to just confirm minor edits and these conversations are done in a very professional manner.

Constructive, flexible and positive conversations: In several interviews with editors, they mentioned the importance of flexibility in resolving an issue; “*The most important thing is to be flexible,*” and the goal seemed to be to reach a mutual understanding rather than change someone else’s mind. One editor noted that although there are editors with self-serving aims, they usually create their account for a specific edit, and are more of a nuisance than a cause for conflict, whose edits can be easily reverted. The interview participants seemed to have an intuitive sense for who was serious about improving the article and who had created an account with the intention of expressing their own opinions. It is important to note that although these positive and constructive conversations do occur, they are not the norm. Active editors seek to improve Wikipedia and talked reverently at length about the importance of Wikipedia as a platform. As for compromising, “*It’s not ideal, but it is a solution and we can’t spend forever discussing*

it,” one editor said in reference to his comment about usage of a word to describe a moment in history. Editors frequently have full time jobs as professors, accountants, and television producers, although a couple from ES had joined Wikipedia after retirement. Because of the communal nature of the platform, it is very difficult for a self-serving or malicious editor to reach a position of authority. Compromises are generally reached by source validity. If an edit does not have a source, it most often signals it is an opinion of an editor, therefore it is easier to diffuse the situation by requesting a source, using a practice that occurred on other pages, or using an internal Wikipedia resource to resolve the issue.

In FR, conversations on talk pages are a place for editors to be extremely constructive:

“There, it is a discussion which took place in an extremely positive way or the French interlocutor as someone very open to the discussion, very constructive. And finally, we made a separate article at the end, as he proposed at the very end, it was not possible to continue in the line we had started. And we went there. It was a very, very nice article, it was really an extremely positive and constructive teamwork.” (FR)

Editors’ Perceptions of Factors that Lead to Consensus Building

Across EN, FR, and ES, there were differing views on consensus achieved on Wikipedia and who holds authority to make such decisions. In EN, FR, and ES, there were differing views on where power is being held on Wikipedia and which factors help editors become more likely to reach a consensus.

Where does Power Lie on Wikipedia?

Administrative Power. Some of the participants mentioned that administrators are the ones that hold the power in Wikipedia by using the policies and the five pillars of Wikipedia. To become an administrator in EN, FR, and ES, editors have to request adminship and be elected by fellow editors. Once an editor becomes an administrator, they support other editors to reach consensus, organize articles, and enforce violations of the rules in edited articles by suspending, deleting, or blocking accounts.

In EN, some participants said that administrators have the power to guide conversations:

“Well, there’s [an] actual ability to do things. People with things like administrator access. Yeah, there is the power that comes with, with knowledge that you can sit there and say what I’m doing is right because and point to a policy or a guideline.” (EN)

In the ES, there are currently 68 administrators; however, only a third of them are currently active as highlighted by an editor in ES.

“[Wikipedia] is harder to control and organize. A complaint is that there are few administrators. There are few administrators whose job is to patrol and maintain Wikipedia, given the number of articles that Wikipedia already has.” (ES)

Editors in ES understand the benefit of an administrator but realize there are too few. However, choosing an administrator is a difficult process. Editors recognize that it is important to have a thorough review of the potential administrator candidates because it is challenging to take away the power that comes with being one, as explained by a participant:

“People are afraid to vote for a new administrator (they need 75% approval to vote in a new admin) and it is very difficult to remove the privileges/power from the admins.”

“There are administrators who are very biased and those who are very neutral.”

“Administrators are usually chosen by vote, but I usually don’t get too involved.” (ES)

This, however, also creates a fear or hesitation to vote for an editor that has been part of the community for a short period of time. On other occasions, editors often just want to edit and submit articles and, though they know that they could vote, they choose not to engage or participate in those matters as described by a participant:

“The process of voting should be changed because administrators end up voting their friends. And other administrators are not voted or considered because they do not vote for them or because they are in a fight with some, and they vote against them.” (ES)

Nonetheless, community pressure comes with the administrator role. Because there is a breadth of responsibilities and expectations that come with being an administrator, the role of an administrator has led to the increase of their power or authority. Similarly, to the problem of voting, there are often not many volunteers to become an administrator. One participant explained this as an administrator, who voiced his concern on the amount of work he needs to do as an administrator and the expectations other editors have in administrators helping them reach consensus:

“So, by demanding higher personal qualities than previously expected, it means that we have few administrators and that means that those that exist have an excessive power because there’s much more that is required of them, especially in the sense that administrators have to review and delete hundreds of articles a day. (ES)

Sources of Information as Power: In FR, participants noted that having good sources and access to appropriate information was power:

“In a way, power is access to information; another is reputation, but that does not exhaust the subject. The main tip for finding editor consensus is to research sources further, not to limit yourself to one sentence and one source.” (FR)

For this editor, a convincing argument required a good secondary source and that would be enough to convince other editors of the value your edit would contribute to an article.

More experience is equal to more power. In FR and EN, editors (2/8 in FR and 5/10 in EN) noted that editors with more experience, in terms of time spent on Wikipedia, the number of edits they contribute, and the depth of their research allows for power in talk page discussions. One FR participant mentioned that an experienced contributor would take the time to create a structured argument:

“Authority, in the end, it came back to the people, to the contributors who had spent time or who had researched or who wrote something that is structured, that is understandable. There is a path, there is an idea, a reasoning or several lines of reasoning, and they are very clear.” (FR)

The ability to create a concise and understandable argument comes with experience and time. Similarly, in EN, one editor discusses how an inexperienced editor added poor content to an article, but more experienced editors went and reverted those changes and cleaned up the article:

“more experienced editors, they most likely incorporated the edits, they removed a lot of the tone and they did leave some of it. But in today's version, it is almost completely absent. All of that has been diluted and just edited away over time.... the experience of experienced editors led to the final resolution and their handling of the dispute from the point where I raised concern to them.” (EN)

In EN, one editor suggests that those with more power will eventually be able to use their position to block users and make sure that an agreement can be made:

“Sometimes it's just calling out the policies and then maybe they don't if they don't change, then people upstairs take notice and, you know, they eventually get blocked, or I convince more people of my position. And so, more and more people begin to agree with me.” (EN)

Users with more experience also typically have the power to explain to users with less experience giving them more power to teach and control what ends up in an article:

“Certainly, you know how to speak Wikipedia which sometimes helps in conversations. And sometimes when people have problems with Wikipedia, my main job is to translate that into Wikipedia speak so that the other editors can address it.” (EN)

This editor used their own experience to leverage others’ work in their arguments. Lastly, another editor believed that they held power on Wikipedia because they had so many edits:

“Oh, I mean, in many ways, one of them is I have some yeah, you know, that is that is no lie. I mean, I got 300,000 edits. I’ve been here forever. Yeah, I’m in the top one hundred I think.” (EN)

Groups of Editors. In EN, editors (4/10) mentioned that *“power is in numbers”*:

“Some people have groups of editors that work together to achieve certain goals, whether they’re good or benign or malevolent. I don’t tend to engage much in that, although I often find agreement on a given page just because good editors tend to be in agreement.” (EN)

One participant mentioned how multiple people would disagree with someone and the disagreement continued so much that the person just stopped doing their thing:

“So, he kept proposing changes and other people kept saying, you know, I disagree. Yeah, and when I went out, like 20 people have said they disagree with you, it’s pretty obvious that whatever you wanted to have happened isn’t going to happen.” (EN)

According to this participant, a topic that can be defended by a group of people is more likely to be accepted and reach a consensus.

Technical and Social Structures. In EN, editors also use WP: RfC templates and ArbCom to help manage consensus. WP: RfC is a process for requesting outside input concerning disputes, policies, guidelines or article content. RfCs are a way to attract more attention to a discussion about making changes to pages or procedures, including articles, essays, guidelines, policies, and many other kinds of pages. This participant noted that having an RfC process on an article helps build consensus.

“And I say take it up on the top page, start a neutral RfC. And if you’re right, it’ll come out and then we can codify that. So, yes, I think top page agreement and a, and a sort of a consensus agreed upon and

preferably arbitrated by an independent voice. That's always the best way to do things.” (EN)

Another participant in EN, shared that editors were debating over appropriate sources in a religious article and that when the “*discussion became uncontrollable,*” it was easier to bring in ArbCom in to manage the situation. ArbCom provided experienced editors to the conversation to resolve the dispute about editors.

Clarity and Quality Content. According to editors in EN, “*if you do a lot of good work that gives you more leverage.*” Participants in EN and FR noted that typically having a clear and structured argument was enough to win a dispute. One EN participant noted that a long, windy response would mean that “*people just wouldn't want to read them*”. This participant noted that having a clear voice is really powerful on discussion pages:

“I find that a being that is structured in discussion is the most powerful. OK, weaponize may not be the correct word to use, I again, I don't want to frame it. But, you know, I don't see people as enemies or opponents. But it is. I mean, there's a few moments where, you know, I've been in sort of highly political discussions that have some debates that have lasted for four weeks where you have hundreds of different or different entries, the top page entries and I find that being on one side. Using a tone that it's hard to correct that is moderate, but trying to be factual, structured.” (EN)

Similarly, in FR, if editors can put more time and research into their edits to make them the best, they feel that they are more likely to be able to reach consensus and have content imputed into an article:

“First, because I think, the one who wins the decision is always the one who will devote enough time to do research. Which means, as far as I'm concerned, I think it's the general rule that I've always seen serious people, they are all the same those who make French Wikipedia and the articles that remain are written by rather serious people. Want serious people, they respect the work. It means that work is the time that has passed. So, first of all, there is the quality of the writing, but above all there is especially the people who research books and who like it.” (FR)

This editor believed those that spend the time and have a passion for the topic will ultimately have the best argument.

Policy Usage. Across languages, all editors used policy to promote their point of view in a discussion:

“Sometimes it's just calling out the policies and then maybe they don't if they don't change, then people upstairs take notice and, you know, they eventually get blocked, or I convince more people of my

position. And so, more and more people begin to agree with me.” (EN)

One of the most important policies that is in constant conflict is the source reliability. Wikipedia verifies data through references, and, because of this, editors are held accountable by fellow editors and administrators alike for putting trustworthy references, verifying those references, and making sure that their arguments in talk pages are backed up by them.

An ES participant showcased this when he was frustrated with editors that wrote about geography and that, in his opinion, “*didn’t know what they were talking about.*” However, since they used sources, there wasn’t anything he could discuss and so he felt there was no choice but to accept it. This echoes that policies and the five pillars are respected and inherently enforced among editors and administrators.

This high value placed on references is also seen in a collaboration another ES participant had with a collaborator. They wrote an article about two members of the Wikipedia Cycling Project and put a lot of information about that cycling team with a lot of detail and well-structured information. An editor in ES mentioned that this became a featured article with a lot of information due to their agreement on what type of information should and shouldn’t be included and including the necessary verifiable references. Ultimately, this type of dynamic within editors echoes the authority of Wikipedia’s policies and five pillars. Editors and administrators alike respect the decision of keeping or removing information based on the references provided. It is a priority for all to have trustworthy, verifiable sources.

Discussion

In the findings section, I show that across all three language platforms, the types of discussions and interactions editors have with each other are similar. This similarity is not surprising as many of these editors have been on Wikipedia for a long time and are guided by a structure that is common across the language platforms like the five pillars of Wikipedia. They also work within the same technical boundaries; the structure of talk pages is essentially the same across languages with a few stylistic differences identified in Chapter 4 (Study 1). The biggest difference from the interviews with editors is the varied ways editors consider how consensus is driven or where the authority lies within each platform. In Table 6.2 and in this discussion section, I draw out the more prominent consensus-driving factor in each language edition that I provided in the above findings section.

I can begin to suggest a couple reasons why the way editors perceive power is different across languages. In ES and FR, smaller languages run into new problems such as language translation issues as editors attempt to translate content from larger language editions to smaller. The type of content and where they

	Consensus-driving factor
ES	Administrators helped other editors make decisions and reach consensus.
EN	More experienced editors used their own knowledge and expertise to help guide debates.
FR	Overall, less authority and more about sources and the structure of the argument.

Table 6.2. The largest differences across languages were on how editors perceive how consensus is driven. This table demonstrates three different consensus-driving factors that were most prominent in each language.

are sourcing their content from becomes drastically different than in EN because they are working with user-generated content from editors on a different language edition. A couple of other factors that may drive this difference in mental models include some of the social and technical structures of the platform. The editors in EN, FR, and ES have the power to build some of their own social processes like policies and some of their own technical structures like the templates and the committees they use to organize their content.

In ES, there are only 68 administrators or librarians, so relatively few administrators are enforcing rules leading to a decentralized community with a democratic dynamic. Editors strongly believed that administrators (called librarians in ES) were powerful and were symbolic to ES:

“The symbol of the librarian is a broom like a person sweeping a street. Not like the person in charge of the library. And then, in that sense, there are also periodic discussions to increase the requirements to have the right to vote, that is, it is increasingly difficult for a user to vote.” (ES)

Unlike the French and English Wikipedias, the Spanish Wikipedia does not have an Arbitration Committee. A local version was created in January 2007 (comprising seven members, chosen by public vote), and dissolved in 2009 after another vote. There is no other power to be able to resolve disputes, giving administrators more power or authority to referee conflicts that may occur on discussion pages. This may be one reason that administrators in the ES page have such a huge influence. In EN, technical structures that exist such as the RfC template and ArbCom help drive consensus. Many participants noted that if there was a problem, they would call in a reinforcement, someone else that they needed or

had more experience to come and help. These social and technical structures have developed over time and help support the work on EN. The interactions that editors have with each other, the governance structures, and organization structure lead to the eventual outcomes that show up in the articles being created.

In Study 1 (Chapter 4), FR users have a lot of stylistic differences on their platform. FR editors I interviewed did not really have a clear idea where the authority and power lie on Wikipedia, but they did continue to mention the importance of structured and clear content. Having a good, concise argument was the way they were able to create consensus.

Across the three languages, these different social structures, different technical features and language styles affect the way editors perceive how content is being created and negotiated. Consider a user that would need to switch from one language to another. I speculate, for such an editor, it might be hard trying to validate an argument if they are not completely sure what the other person values. Even though they are doing the same types of editing on similar content, the way they perceive how they do it and how they get things done is different.

This study will help contribute a deeper understanding of how collaboration occurs on three different language platforms. From a broader perspective, the implications of this study can lead to new technical development of each individual language platform and how each collaboration model can be supported.

Limitations

I acknowledge there are several limitations in this work. First, the sample size of editors across languages was small. There is a large variety of editors on Wikipedia with different backgrounds and experience levels. It is difficult to be able to recruit and interview across three languages to understand this wide diversity. However, this study will be synthesized with the two prior studies, allowing better understanding of the breath of Wikipedia.

There is also a potential limitation on how the interviews are interpreted. I focused on consensus between editors and used the term consensus to describe the interactions between editors based on Wikipedia's consensus policy. However, participants used a range of terms to describe their consensus-like behavior. Due to this variety in terminology additional future analysis may be warranted to see if there is merit in revisiting the term consensus

Understanding Editor Perspectives from the Lens of the Socio-technical Framework

	Social	Technical	Language
EN	Large groups Policy usage (Manual of Style policies) Arbitration Committee	Use of Templates	
FR	Policy usage		Language translation Language structure Language clarity
ES	Administrative power Policy usage		Language Translation Language structure

Table 6.3. The main social, technical, and language differences across EN, ES, and FR based on my perspectives from interviewing Wikipedia editors and administrators.

The methodology from this study is different than in the prior two chapters (Study 4 and Study 5). There is no breakdown of codes or percentages to extract the social, technical, and language practices. Rather, I use my own perspective from semi-structured interviews to highlight some of the most interesting differences that I observed, and I classified these features in Table 6.3. to better understand the social, technical, and language processes at play in the conversations between editors. I spend some time delving into these major differences to describe the processes a little more and explain their influences on a collaboration model.

In EN, the use of Wikipedia templates such as WP:RfC, a technical feature. With WP:RfC editors can place a template at the top of the article talk page to let other editors know that they would like outside input concerning disputes, policies, guidelines or article content. Based on the data, using this template, editors were brought to a conversation that led to a consensus or social process between editors, which in turn impacted the development of an article. Furthermore, in EN, there is a high reliance on policy and there were many references to Manual of Style guidelines²⁹ when debating article content. The Manual of Style on Wikipedia is Wikipedia's very own style guidebook that helps editors write and maintain articles with precise and consistent language, layout, and formatting. The use of Manual of Style

²⁹ ²⁹WP: Manual of Style - https://en.wikipedia.org/wiki/Wikipedia:Manual_of_Style

guidelines demonstrates how the social processes of using and enacting policy allow structuring a page, which is also in part shaped by MediaWiki, and the technical foundations of the platform. This example demonstrates both the social and technical influences on Wikipedia.

Similarly, in ES, EN, and FR, policy usage especially around citing sources is very common. One of the most important pillars of Wikipedia is to have a neutral point of view, which means having no original research and properly citing sources. Many of the conversations across language editions centered around this pillar. Using WP:Citing Sources was a result of interactions between a group of editors who need to validate why content is included and if it is properly included in a Wikipedia talk page.

In ES and FR, debates around language translation and language structure occurred. Specifically, the process of translation impacted the conversation between editors has led to the development of additional collaborations such as the Wikiproject: Traduction, a project with the aim for members to coordinate actions with a view to translating articles from other language versions of Wikipedia into FR. The sociolinguistic practice of translation has led to the development of new structures, but also yields additional social interactions that require debating how translation is done and how it fits within a particular article topic. Furthermore, the need to understand how to integrate the French and Spanish language into Wikipedia may require the need of style guidelines to help support these working tasks.

In ES, administrative power or the hierarchy of users was a large factor in how collaboration occurs. A person in charge, selected by editors, helps guide that conversation and ultimately decides about how things happen. However, the lack of an ES Arbitration Committee may mean that power and decision-making rules come from other sources such as the group of administrators that clean up a lot of Wikipedia articles and resolve disputes between editors. These examples of technical, social and language processes on Wikipedia are based on my conversation with users. Across each language, it is possible to witness the co-influence of these processes and the ways in which they shape how collaboration occurs.

Chapter Summary

In this chapter, I gathered the unfiltered voices of editors to better support the data gathered from Study 1 (Chapter 4) and Study 2 (Chapter 5). This study begins to answer two of the overall research questions:

R4. What similarities and differences exist across English, French and Spanish language collaboration models? Across all three language platforms, the findings show that there is a lot of similarity in the type of discussions and interactions editors have with each other. However, there are

different factors that influence how consensus is reached across the three platforms.

R5. How do these comparisons hinder or motivate collaboration on Wikipedia across different languages? Furthermore, this chapter discusses how differences in social and technical features of the platform lead to differences in how users collaborate. These disparities can lead to better collaboration, such as the help of templates to better organize conversations between editors or policies to help educate editors on how to work within the boundaries of Wikipedia. Alternatively, some mechanisms can hinder collaboration, such as having too many editors or even editors who believe their expertise is sufficient argument for reaching a consensus.

In the next chapter, I will present a synthesis of the findings from Chapters 4, 5 and 6 and further illustrate the collaboration models in each language.

Chapter 7: Collaboration Models in EN, FR and ES

Introduction

In this chapter, I use the findings from the three studies (Chapters 4, 5, and 6) to describe how models of collaboration can be envisioned as in EN, FR, and ES. The purpose of these collaboration models is not a comparison of the collaborative behaviors, but rather a way to demonstrate how assumptions of collaboration in one edition may not necessarily be accurate in another. The models presented are a combination of the findings from the studies presented in the last three chapters.

In Chapter 3, I used the socio-technical framework as a lens to better understand the language processes that are enacted across different language editions. Revisiting this diagram from Chapter 3 (shown in Figure 7.1.), I demonstrate the role between social, technological and language processes and further detail how each influences the culture of collaboration supporting the peer production work of Wikipedia. The framework is descriptive to better extract these three types of processes and show their influence across multiple language collaboration models.

Previous literature focuses on understanding Wikipedia collaboration from the lens of policy, interpersonal and even power play mechanisms in EN. However, these mechanisms are underexplored in research on other languages. In this work, I disentangle the relationship between editor behavior, policy use, and power play in three different language editions. This work helps fill the current gap in the CSCW literature on how collaboration is theorized on Wikipedia in language editions other than EN.

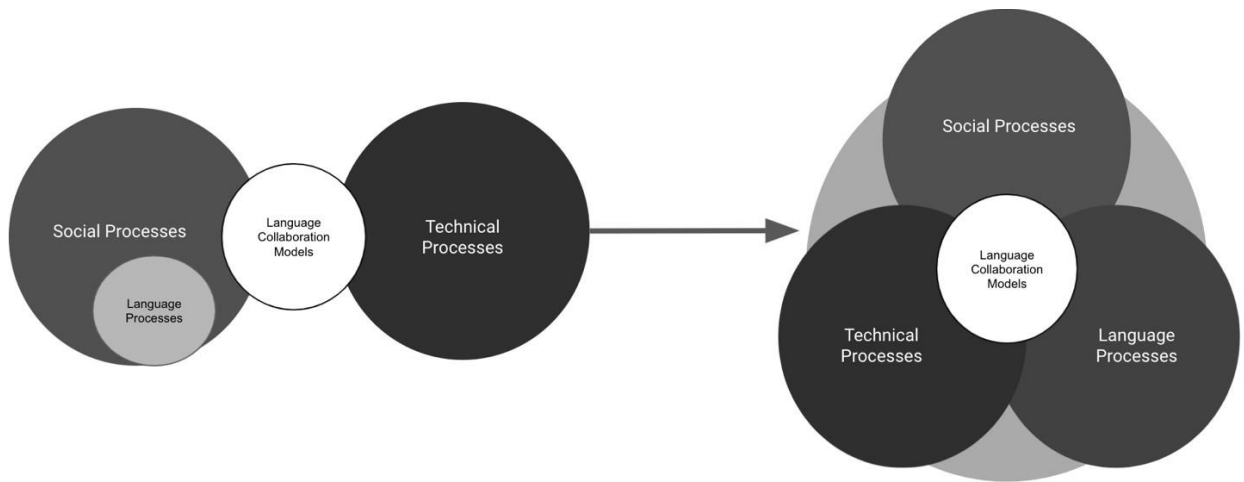


Figure 7.1. Revisiting the socio-technical model that was presented in Chapter 3.

Previous literature has focused on interpersonal communication mechanisms to understand collaboration. While Chapters 4, 5, and 6 did not necessarily focus on interpersonal communication, prior work has shown the importance of communication in any organizational system (Kittur and Kraut, 2010). On Wikipedia, editors communicate directly through talk pages (Viégas, 2004 & Schneider, 2010). According to Kittur (2008), this communication typically occurs at the beginning stages of an article, which demonstrates that this is when interpersonal communication might be more effective and strongest during development. The increase in editors on an article may then lead to the ineffectiveness of interpersonal communication.

In EN, policy, power play, and interpersonal mechanisms help editors control content and mediate consensus disputes. In this dissertation, I have shown that this is also true in two other language editions of Wikipedia. In FR, ES, and EN, I have shown that editors use content, editing and conduct policies and guidelines to help guide collaborative efforts. I also demonstrated that power plays exist in different facets across the three languages. I showed the bridge between policies and power plays by showing how conflict over policy definition leads to the rise of the use of power plays. These findings hold true across FR, ES, and EN, showing that these collaborative mechanisms are not bound to the language or expertise level of the editors participating on these editions of Wikipedia. To better demonstrate the relationship between the findings in Chapters 4, 5, and 6, I use data-driven storytelling to elaborate the models of collaboration.

Data-driven Storytelling

To be able to highlight what collaboration looks like, I designed three different narratives for each of the

language editions that demonstrate the type of interactions users have, the purpose of the conversation, and how consensus is reached. Through data-driven storytelling, I can provide insights in a way that is easily understood but also pave an easy path to understanding how to empathize with editors across language editions.

I use data from the three studies to build the narratives of editors in EN, FR, and ES. This method helps to easily see how even though there is a similar idea about what needs to be done, there are different ways of thinking and behaving that are highly dependent on the social, technical, and language features of each language edition. Within each story I list the data used to support the story. I specifically call out the points where data supported what is occurring in the story using bracketed numbers, [X]. At the end of each story, I explain where the specific data came from and how it supports the story for each bracketed number.

The stories in this chapter are not representative of absolutely everything occurring on talk pages in EN, FR, and ES. These narratives are exaggerated to point out the provocative, subtle differences that occur in these three language editions. I want researchers to further understand that making assumptions based on an Anglo-centric collaboration model cannot adequately account for what is happening in other language editions.

This chapter is a way to illustrate the empirical evidence from the three studies into a format that can demonstrate to researchers the usefulness of understanding multiple online language communities. In the following sections, I generate the stories of three editors from EN, FR, and EN and use a visualization to highlight some of the key features in each language and how they influence collaboration.

A Debate over Legitimacy of Source in EN

The first story is of Brad who spends most of his time editing on the English Wikipedia. Brad is an experienced Wikipedia editor who has been editing Wikipedia for over 15 years. He started editing on Wikipedia because he was interested in adding new articles about topics that he enjoyed reading and writing. However, overtime, he has become more of a WikiGnome and spends more time filling in content gaps or cleaning up older articles. Currently, Brad is invested in editing articles centered around hurricanes — he is part of WikiProject Tropical Cyclones³⁰. He is an atmospheric scientist, so he has his own knowledge about and experiences with hurricane-related topics to be able to contribute and improve these articles.

³⁰ WikiProject: Tropical Cyclones -https://en.wikipedia.org/wiki/Wikipedia:WikiProject_Tropical_cyclones

In Brad's scenario, he was working on cleaning up a particular hurricane-related article and noticed that there was an entire section not properly sourced and not written from a neutral point of view. Another editor had written a paragraph about their own research into the wind speed of tropical cyclones.

According to Brad, this entire section violated the primary pillars of Wikipedia. Brad headed over to the talk page to find out why this content was included in the article [1].

After Brad shared his thoughts on the talk page, another editor that initially added the content disagreed and believed that his own expertise in hurricanes was enough to be able to include that content. This other editor really wanted to insert information into an article but only had a primary source to include and felt like that was all that was needed to add that content into the article [2].

Brad attempted to use other external sources to help defend his case that the other editor's content should not be included in the article. This action only heightened tensions as the other editor really wanted to have his research included in the hurricane article [3]. As Brad and the other editor continue to argue, four other editors with varying experiences on Wikipedia and with the topic of hurricanes joined the conversation to debate this topic. These other editors on Wikipedia typically add articles that they are interested into their watch list. They were notified those changes were made to this article and came to see what all the discussion was about. Like Brad, these authors also enjoyed discussing these topics with like-minded editors.

As these other editors joined the conversation, they all agreed with Brad that the topic itself was not needed or needed to be properly cited. These editors attempted to explain the reasoning for why a source was needed for this content [4]. These five editors were trying to educate the new editor about the policy of Wikipedia and what it meant to cite sources correctly and be neutral in the content added to Wikipedia. The conversation continued to go back and forth, but the new editor finally decided to retract his edits after learning from five other experienced editors [5].

The data that helps support this EN story

[1] Based on findings from Chapter 4 (Study 1), the purpose of talk pages has shifted from mainly a site of editing coordination to a place for editors to discuss the topic of an article or content that they would like to debate before or after editing the related article. EN editors are spending more time and more text discussing the topic of the article rather than explicitly discussing the edits they are making. While the 1:2 talk page ratio³¹ noted by Viégas et al. (2007) no longer exists, editors may still go to a talk page to resolve a dispute that might be occurring on the article.

³¹ This talk page ratio was mentioned in Chapter 4. Viégas et al. (2007) found that editors in EN would first go to a talk page to speak about their edits, make the edits on an article and then come to a talk page to say the edit has been completed.

[2] Chapter 5 (Study 2) demonstrates that EN had a high number of *legitimacy of source* conversations. That is, conversations on talk pages include power plays where cited sources are discredited.

[3] In Chapter 4 (Study 1), EN had the highest number of external sources' posts; this increase could be due to the additional interpersonal conflict. As noted by Kriplean et al. (2007), citations were used to defend an editor's perspective on delimiting the scope of the article. Furthermore, research has shown that external sources have been used in talk pages to express disagreement with the beliefs of the other editors (Bender et al., 2011).

[4] Rather than explicitly naming a policy or guideline, these editors offer a discourse about the guidelines as shown in Chapter 4 (Study 1). The more experienced editors spent more time trying to explain the policy rather than just linking to the Wikipedia policy article on the article.

[5] As shown in Chapter 6 (Study 3), power can come in numbers on Wikipedia. These editors with more experience used their persuasive power to educate the new user. Additionally, a topic that is defended by a larger group of editors is more likely to be accepted.

Based on the findings from the three studies, the model of collaboration in EN is mainly impacted by the interplay of technical and social influence. This interplay influences the specific collaboration model in Brad's experience as shown in Figure 7.2.

Chapter 4 (Study 1) also demonstrated the increase in the use of information boxes since the original study, Viégas et al (2007). Editors now spent less time explicitly stating policy and guides, but rather spent time explaining the process explicitly or by using infobox templates to highlight the importance of a conversation. Furthermore, there are more references, on article talk pages, to internal Wikipedia resources such as links to other talk pages or talk page archives. In turn, by sharing these internal sources, more experienced editors can teach newcomers on Wikipedia about the social processes on Wikipedia. Prior work on newcomers to the Wikipedia platform has shown that feelings play a large role in transforming new Wikipedians into editors. As a new member of an online community, newcomers may feel intimidated by other members which can lead to negative affective processes and a decline in the want to contribute (Morgan et al., 2013b; Preece et al., 2004).

Moreover, as shown in Chapter 4 (Study 1), EN exhibited the highest amount of interpersonal conflict, demonstrating how an interpersonal mechanism is important to theorizing collaboration. The use of external sources (technical process) and ArbCom (social process) help bridge these high-tension conversations.

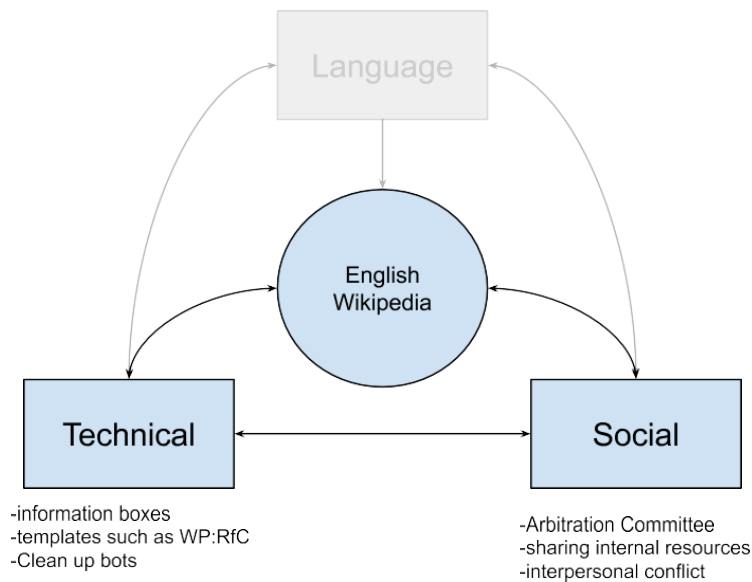


Figure 7.2. EN Collaboration Model based on Brad’s interactions on an EN talk page. Within the three studies and Brad’s narratives, I did gather empirical evidence of language processes.

Since Viégas et al. 's (2007) study, the model of collaboration has shifted to more discussion about the topic itself and less need for cleanup work that is taken care of by technical and social processes. In the story above, Brad brought up an edit that needs to be taken care of, but there was also a lot of debate between Brad and the new editor about the topic itself — tropical cyclone wind speed — and the relevant accurate information.

Wikipedia was initially developed in English so much of the content and processes come from just the technical creation of the platform but additionally, now the behaviors of editors joining overtime influence the development of the platform. The following two examples in FR and ES better describe how language can play a role in how the culture of collaboration develops on different editions of Wikipedia.

Translating content from EN to include in FR

My second story is centered around Alexander. Alexander has been an editor on the French Wikipedia for over 12 years. Alexander spends most of his time adding content to French articles. More recently, he has been interested in filling in the content gap on Wikipedia. He has found that in other language editions, specifically in German and English, there is a lot more structured content across Wikipedia articles. He has been expanding FR through adding in translations of content from EN. In this scenario, he found the

article for Tacoma, Washington in EN³². Tacoma is a city in the US making it less surprising that currently the FR Wikipedia has almost no content about it. While the EN article has a very clear structure with a lot of detailed information about the town and its history. Alexander makes it his personal mission to be able to get such articles up to the standards of the French edition of Wikipedia.

He started editing by translating content from the English Wikipedia article and transferring it to the French Wikipedia. He typically worked alone, but after adding the translated content to FR, another editor immediately reverted his changes. In this case, he decided that he needed to find out what was happening and headed over to the talk page to voice his concerns.

Alexander asked through the talk page why his edits were being reverted [1]. Another editor was concerned that the content that Alexander was not properly sourced. The second editor explicitly brought up the verifiability policy and suggested that the content being transferred from EN is not properly sourced [2]. The current content inserted by Alexander was from EN and had no sources. In FR, it is necessary to add second-hand information that describes, interprets, or synthesizes primary sources with actual sources of the primary sources.

The content that Alexander included only had article content from English but did not correctly reference where that information was coming from. The second editor clearly explained the issue with additional sources that could be cited so that Alexander could better understand his mistakes [3]. Through the detailed explanation given by the second editor, Alexander began to understand his problem and realized what he needed to do to update the article properly.

For Alexander, a convincing argument required a good secondary source sufficient to convince other editors of the value an edit would contribute to an article. Alexander noted that it was really important to have a clear and structured argument to better teach others on Wikipedia how to edit an article.

Additionally, this second editor had more editing experience to help teach Alex his wrong. Ultimately, clarity and the most legitimate source won this argument, and the article was updated with correct information using proper sources. Content from one language edition could not just be added from one language edition to another without finding and referencing proper information.

The data that helps support this FR story

[1] In Study 1, FR had the most editors using talk pages for requests for editing coordination.

³² Tacoma is not a major city in the United States, but it is the third largest city in the state of Washington demonstrating the contrast of importance locally versus relative obscurity on a national, let alone an international level.

[2] In Chapter 4 (Study 1), there were numerous references to Wikipedia guidelines in FR. FR editors tend to follow the guidelines and work hard to get their edits compiled into articles when discussing on a talk page.

[3] As shown in Chapter 4 (Study 1), FR participants noted that having good sources and access to appropriate information helped empower editors to come to a final consensus when deciding how to edit an article. Wikipedia does not rely on raw information and first-hand evidence.

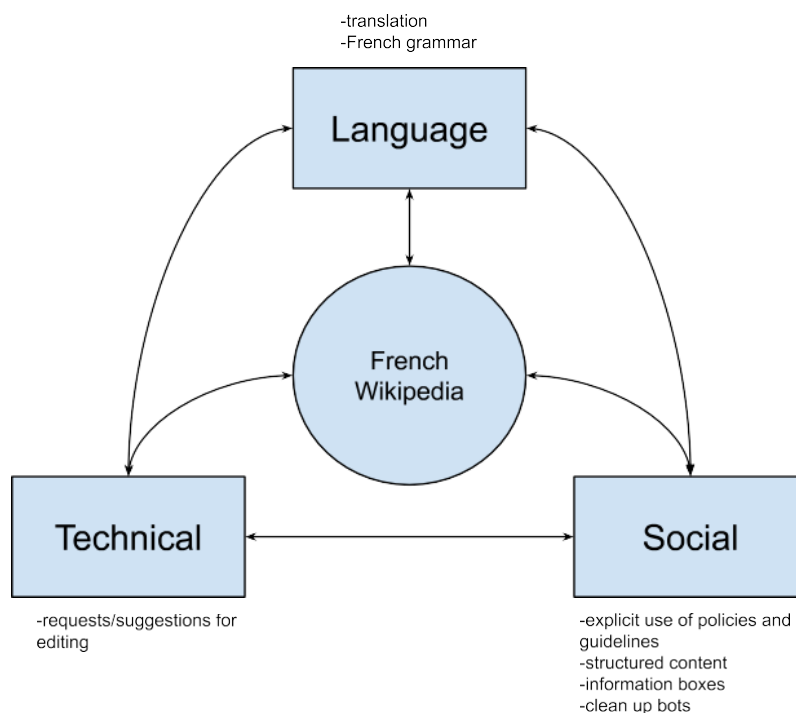


Figure 7.3. FR Collaboration model based on Alexander's interactions on the FR page.

In Alexander's experiences from FR, I can show that the technical, social, and language processes work together to build the culture of collaboration in this talk page conversation as shown in Figure 7.3. The major difference between the other language editions is the technical influences on FR. FR had stylistic differences, simply looking at the structure of the talk pages.

FR had the most posts classified as *requests/suggestions for editing coordination* and *references to Wikipedia guidelines and policies*. The greater frequency of posts in these two categories may suggest that FR talk pages follow the rules originally created for talk pages and that its editors are still focused on the editing work of Wikipedia on article talk pages, as shown in Study 1 (Chapter 4).

While EN and ES use indentation to demarcate between individual posts, FR has implemented technical enhancements that manifest as additional boxes outlining the threads (Study 1). The MediaWiki technical foundations are the same but FR has turned on the option to be able to do that.

FR editors interviewed in Study 3 (Chapter 6) noted that a concise and structured argument was enough for users to persuade others about editing that needed to be done. I hypothesize that their use of technical features such as templates, info boxes, and other MediaWiki features of Wikipedia help create a more persuasive and structured argument and facilitate the coordinative actions of the collection.

The findings based on FR demonstrate how the French collaboration model has additive properties to the EN collaboration model because collaboration is being done in French. So, language influences begin to become more apparent, deviating from the EN model of collaboration. In this story about FR, the process of translation specifically impacted the conversation between editors (a social process) and has led to the development of additional collaborations such as the Wikiproject: Traduction. This is a project with the aim for members to coordinate actions centered around translating articles from other language versions of Wikipedia into French-speaking Wikipedia. As noted in Chapter 3, this work is not deterministic but this example from FR begins to demonstrate linguistic relativism (Whorf, 1997). In this example, the language spoken by the editors affects thinking and behavior (in this case, the social behaviors on Wikipedia) but does not necessarily determine thought (the way editors make decisions and come to a consensus).

Administrator Helping make Decisions in ES

Pablo is a Wikipedia editor who has been a member of the Wikipedia community for approximately 12 years. His contributions on the Spanish Wikipedia started with just minor edits but now as he has more practice on Wikipedia, he has begun making large edits and reviews to articles. His time on Wikipedia has led him to become an ES administrator or librarian. His role as an administrator means he usually goes in to help other editors with opposing views come to a consensus, review articles and make sure that content is being produced smoothly.

Pablo feels a lot of ownership over his own content and feels strongly when he adds something to a talk page. For that reason, he typically uses a talk page to discuss the changes after an edit is made [1]. He also strongly believes that talk pages are places for editors to be civil to each other. It is important to Pablo that editors have the highest amount of respect and civility for each other [2].

Pablo is tagged in a conversation by some editors that he is familiar with and have had interactions with. As he entered the argument, he noticed that they are arguing about gendered nouns [3]. However, the article is a biography of an individual who does not identify as either a man or a woman, leading to disagreements between editors on how pronouns in the article should be written. These arguing editors call Pablo in to help them handle the situation. Rather than thinking about scoping the article, Pablo refers to other instances that this same issue has occurred and discusses how other editors have handled the situation [4].

In this scenario, the editors find that in other articles, other editors used a gender neutral -x at the end of nouns to denote the relevant pronouns. The editors of this article decided that this approach is the best course of action to take. In this case, prior consensus from other editors on a different, previously edited article helped consensus be reached. Ultimately, the final decisions were made through the power of administrators [5].

The data that helps support this ES story

[1] In Chapter 4 (Study 1), ES editors used talk pages as a place to make requests/suggestions for editing.

[2] In Chapter 6 (Study 3), ES editors noted that talk pages are an important place for editors to respect and be civil with each other. It is important that conversations on the talk page are polite and constructive.

[3] In the Spanish language, nouns have a grammatical gender operating on the gender binary, signifying that nouns can only be either masculine or feminine.

[4] According to Chapter 5 (Study 2), ES editors rely on prior consensus — decisions made in the past are absolute and uncontested.

[5] In Chapter 6 (Study 3), administrators have a huge role on the Spanish Wikipedia; they end up having to review and edit hundreds of articles a day.

In this story, Pablo's collaborative practices are influenced by language, social, and technical factors as shown in Figure 7.4. ES sticks to traditional talk page policies and uses external sources to satisfy Wikipedia's verifiability policy that anything that can be challenged needs to be cited. ES has a large number of *Acknowledgements* postings, which abides by Wikipedia's pillar that editors should treat each other with respect and civility (shown in Chapter 4).

Furthermore, ES editors had the highest number of instances of power of interpretation or that one sub-community commands greater authority than another (Viégas et al., 2007). Connecting this finding to the interviews from Study 3 (Chapter 6), I hypothesize that those with higher power on Wikipedia have greater control. More specifically, administrators have great control over how consensus is reached and can help improve the social processes on Wikipedia.

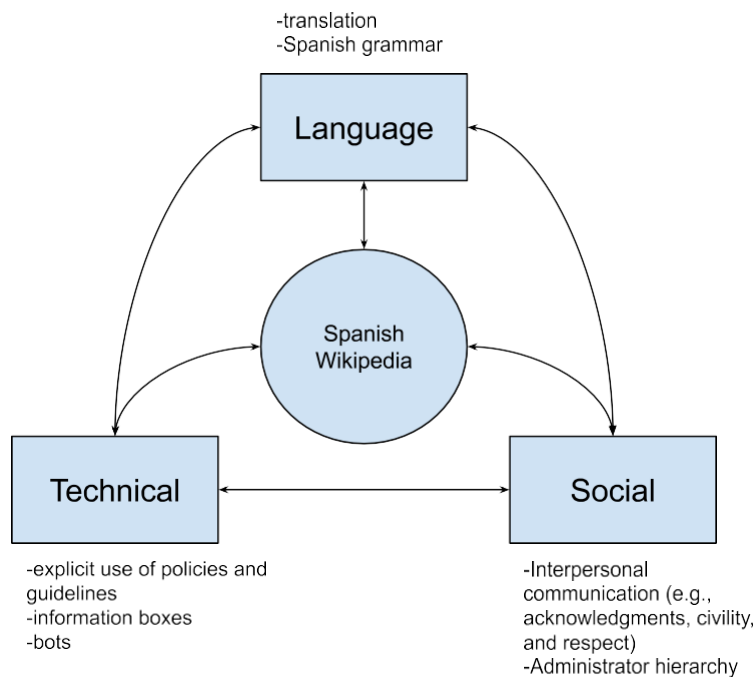


Figure 7.4. ES Collaboration Model based on Pablo’s interactions on the ES community.

This discovery about ES demonstrates how a social process such as the hierarchical structure can help guide how collaboration occurs and is facilitated. In the Pablo example, Wikipedia functions more like a bureaucracy than it does on EN, or FR. Editors on ES rely on a system in which most of the important decisions are made by administrators (such as Pablo) rather than just other editors.

As with conversations on the FR and ES talk pages, the language features comes from the pragmatics of the language structure. In the scenario with Pablo, the rules that Spanish speakers normally follow do not completely fit with the structure and style of other Wikipedia editors on other language platforms. This led to new types of problems that required coordinate activity to solve the issue and in turn edit the content on the article.

Chapter Summary

Brad, Alexander, and Pablo’s experiences are just three examples of how collaboration occurs on each of

these language platforms. I used these stories to demonstrate the most provocative differences between each language platform and started to hypothesize on why these differences occur.

In each of the narratives, I consider the language, social, and technical features at play. In each of these models it's clear that the collaboration is socio-technical, but additionally if we take a deeper dive into the social, there are language processes at play in ES and FR. The collaboration models in each three languages help predict editors' practices.

The second goal of this chapter was to respond to the third overall research question. **R3. What are the properties of a model synthesized from Study 1 and Study 2?** By creating these narratives around editors from each of these language editions, I begin to demonstrate how post-by-post editor behavior and conversation level power plays exist across languages but manifest differently.

The two collaboration models presented in Chapter 4 (Study 1) and Chapter 5 (Study 2) are complementary to one another. Not surprisingly, most debates or power plays are only happening when requests/suggestions for edits are being made. As shown in the narratives above, the ultimate goal of these three conversations in the different editions was to make an edit or fix an edit to a current Wikipedia article. Furthermore, as editors have their own perspective, interests and experience, there is likely to be more informational or opinion posts. As editors try to convince others of their own opinion, they are more likely to use their own expertise. As shown in the EN and FR example, an editor with more experience used their knowledge to convince the other editors of what needed to be done on the article.

Using the three stories told above, I can further show that the behaviors from Chapter 4 (Study 1) and power plays from Chapter 5 (Study 2) are complementary to one another. As shown in the ES example with Pablo, when an editor was using their own opinions to take control of the edits, these matched with both the *Opinions* posting dimension and the *Power of Interpretation* power play. Pablo had his own *opinions* about what needed to be done and how to do it. This led to an overall debate and in turn each editor had their own opinion. In some of the conversations, *the power of interpretation* was strong as editors from one sub-community wanted to believe that their *opinions* had greater authority over the beliefs of others. However, finally, the *practice on other pages* helped determine the final solution. It is important to mention that the stories demonstrated in this chapter are not representative of everything occurring on talk pages in EN, FR, and ES. One example of conversations not represented in these narratives are conversations that are not tied to power plays. In many of those cases, it is not clear what is being edited — someone is just giving information and there is reference to internal information and no debate is happening. These conversations typically had no power play and no editing behavior.

The examples given in FR and ES are common across those specific editions. The commonality suggests that other language platforms have developed their own practices to help support the differences that are not simply repeated from the English edition. In the FR and ES stories, the findings from Study 3 (Chapter 6) are used to dramatize two types of events that were shared by interviewees, based on actual experiences where collaboration evolves among editors speaking a language that is not English.

In these stories, I am attempting to draw out these small but provocative differences in each edition-specific collaboration model that I learned from analyzing individual posts, conversations and speaking with editors. I use these stories as an attempt to synthesize all the data gathered across these dimensions from each language platform. However, the ES and FR cases presented are different and are only one example of the types of conversations that can happen in FR and ES. Additionally, the example that I used in FR is something that could also happen in ES as editors also have to deal with translation issues. I used these examples here to better highlight and exaggerate the differences across collaboration models.

In the following chapter, I explain why these subtle differences between language editions are important to study but also why the similarities between language platforms are essential to the development of the platform as a whole. In short, technical, social, and language processes influence the culture of collaboration on Wikipedia.

Chapter 8: Contributions & Conclusion

In Chapters 4, 5, and 6, I presented two ways to get the various dimensions of how collaboration occurs and the behaviors they encompass, through analyzing conversations on article talk pages and gathering the voices of editors from EN, ES, and FR.

In Study 1 (Chapter 4), I analyzed individual posts that editors created on article talk pages to understand what talk pages were being used for and the behaviors of editors in each of the three languages. In Study 2 (Chapter 5), I analyzed power plays or vies for control over edits that are made to articles. In Study 3 (Chapter 6), I considered how collaboration occurs on talk pages by speaking with editors and having them describe in detail their perspectives about debates and how a consensus is reached. Finally, in Chapter 7, I used the results of the three studies to present a picture of how collaboration occurs in EN, ES, and FR. Chapter 7 is used to help present each collaboration model in a way that can be used by designers and researchers in the future.

Furthermore, in this dissertation, I introduced the language as an analytical concept of a socio-technical system in Chapter 3 to look at how coordination practices occur and their influences. Using language as an additional analytical lens can help scholars better understand federated social networks where anyone, speaking any language can use the open-source code to create and maintain content on that specific system. Within a federated or distributed network, there are multiple social websites such as on Wikipedia with its multiple language editions. Using language as a core component of the socio-technical system can better help understand how communication and collaboration occurs within each of these sites.

In each of the studies presented in this dissertation and in Chapter 7, I demonstrate how Wikipedia is a federated and decentralized community with individual editions. To better understand each edition, I detailed the various social, technical and language features that impact how users behave. In the three narratives that I presented in Chapter 7, I illustrate that actual behaviors are quite similar across the editions but there are these small differences (i.e., how consensus is reached, use of different technical features and various language social processes) that have a high effect on the perceptions of editors. While dissecting each of the study's findings, it was possible to show the social, technical, and language features and their influence on collaboration. Each of these features are related to each and they work together to better demonstrate a more comprehensive model of collaboration in each language edition. Furthermore, I took two studies that were done in EN that presented EN collaboration models but through my work, I showed that these models exist in EN, FR and ES. However, while I could show that there are definitely different features that highlight different collaboration models in each language, none of these mechanisms were deterministic of each other. Instead, they are complementary and work together in many ways to provide the collaboration model in EN, FR, and ES.

In this final chapter, I attempt to better explain why I believe these similarities and differences exist and how that impacts the culture behind EN, FR, and ES. I also present the empirical, methodological, and validation contributions of my dissertation research and show how these contributions address my research goals. Finally, I discuss future work that is needed including additional research to keep understanding language editions of Wikipedia. As well as work that I have pursued that aids in continuing the understanding of non-Western language peer production platforms.

Empirical Understanding of Collaboration Models

The 3,000-foot view: The Anglocentric Foundations of Wikipedia

By looking at the results of each study at a 3,000-foot view, I observe strong similarities in the collaborative practices related to article content discussions in EN, ES, and FR. In Study 1 (Chapter 4), the results showed that in individual posts, editors from all three languages have similar ways of behaving. In Study 2 (Chapter 5), the same power plays existed and there were no new power plays. In Study 3 (Chapter 6), participants shared similar types of debates and conversations that occurred in each of the language editions' talk pages. The similarities among the collaborative practices on these different language editions are not that surprising as the technological foundations of the platform are English language and US-based.

For example, Wikipedia began in the English language by two American men, Jimmy Wales and Larry

Sanger in Florida. Furthermore, according to WP: Reliable Sources, there are more US corporate media sources such as the New York Times, CNN and Fox News that are considered reliable and neutral sources in Wikipedia entries despite all being American and US-founded. Furthermore, the technical foundations through the development of MediaWiki, a custom-made, free, and open-source wiki software platform were written in PHP and built upon the MySQL database system in English and the designers were from the United Kingdom.

In direct contrast, the initial goal of Wikipedia is to be a global platform not with only a US, English-based perspective. As Jimmy Wales noted, Wikipedia is meant to share information to many people in all different languages. Overall, the goal of serving all different languages is ambitious, but at a bird's-eye view it looks like it has been accomplished — the platform itself is in over 300 different languages. The identity of each of these platforms paves the way for different content in each edition. As noted in Chapter 2, in CSCW, there has been research to understand the content differences in each individual language edition of Wikipedia.

Prior researchers have shown that *the global consensus hypothesis* is false — the encyclopedic world knowledge is largely not consistent across cultures and languages (Hecht & Gergle, 2009). One reason this hypothesis is false is that switching between different language editions is hard for users, especially those editing in their non-native languages. Hale et al. (2015) demonstrated that edits produced in the non-native language of users was smaller and more restrictive than their normal edits (Hale, 2015). Thus, editors might include more content in the language edition of their native language. Furthermore, Massa & Scrinzi (2012) noted that different categories of articles such as historical or controversial articles might bring forth different points of view across languages. Essentially, there is a lack of global consensus and across languages there are different perspectives based on the cultures of the editors.

The variation in world perspectives can turn into debates about the quality of content in articles. For example, Kittur et al. (2009) showed that religion is among the most highly debated topics on Wikipedia. There is a lot of conflict around the world perspectives on religion and what should and should not be included on Wikipedia. This leads to debates about what type of religious content makes a quality article. Such variations give me even more reason to want to understand how these debates occur differently across different language editions of Wikipedia.

Thus, while content might be different, there are a lot of very similar behaviors influenced by the development and foundations of Wikipedia. In other words, the way editors express themselves and coordinate their actions online is as nuanced and productive as the peer production platform allows. The

social and technical features that make up the platform limit the range of collaborative behaviors of editors.

Another reason for this consistency is the fact that research has shown that there are multilingual editors who switch from one language edition to another. Thus, their behavior needs to switch based on the edition they are currently editing in. They may also learn about new technical or social processes that work in one edition and try to implement these new processes in other language editions. This movement of editors can lead to the moldability of each language edition until they all become not surprisingly very similar. Behavior of editors across the editions becomes consistent as traits seep into one edition from another.

While this dissertation has shown similarities across language editions, there are also subtle differences that demonstrate that Wikipedia is a global platform that includes different perspectives from users around the world. It is important that researchers treat Wikipedia as a collection of distinct and individual language editions to truly understand the fluidity of user experiences across each instance.

Non-English-speaking editors can influence the collaborative system

The last three studies allowed a deeper look into the collaborative practices by implementing collaborative models that already existed from Viégas et al. (2007) and Kriplean et al. (2007) Through diving deep into the conversation, posts, and perspectives of the editors, it is possible to delineate these small provocative differences. Many of these differences between FR, ES, and EN are based on the evidence that FR and ES editors were not speaking English, the language the platform was initially created in.

In the case of editor behavior, language processes such as translation impact the conversations that editors have and the debates that might occur. These variations also could lead to the development of new social processes to help mitigate the impact of these language processes. In ES and FR, entire Wikiprojects are devoted to organizing and maintaining articles that have been translated from one language to another, demonstrating how the fact that an editor is not speaking in English leads to novel systematic practices.

Furthermore, many of the social and technical processes that editors abide by right now are features that were developed at the inception of the platform such as MediaWiki and the five pillars of Wikipedia. Those policies and systems remain largely unchanged and have structured the way language editions are developed across other language editions that came after EN. However, just in the nature of what it means to speak a different language, there must be additional social and language practices to continue to follow

the structure of Wikipedia.

There are also some thought provoking differences that are harder to explain, such as the stylistic differences that exist in FR. While EN and ES rely on indentation to denote conversation posts, FR has specially designed boxes to highlight conversation threads. This feature in FR demonstrates how each edition is its own community with editors who have created their own mannerisms, structure, and hierarchy to work with. As a researcher, the data I gathered does not tell me enough to explain why some of these differences exist, but it does show that each platform will ultimately have its own specific set of characteristics.

While this dissertation does not focus on design implications, I do believe that thinking about the contribution of this dissertation can help both designers and researchers consider the importance of looking across language platforms. There will always be subtle differences that CSCW researchers can better support. Furthermore, these findings help better describe in what capacity online culture exists on the different editions of Wikipedia and how it is possible to conduct research on Wikipedia without making simplistic, EN-based assumptions about the cultural or geographic identities of the editors. This expanded view opens the door for a whole new body of research that integrates the fields of sociolinguistics and CSCW.

So, what is the collaboration culture in each Wikipedia language edition?

One of the challenges of writing this dissertation has been navigating around the word *culture*. The goal of this dissertation is not to better understand how the culture of individual editor's impact content creation or their interactions online, but rather what are the cultures produced by the social, technical, and language features and how those online cultures vary because of the change in language across Wikipedia editions.

Prior research in CSCW discusses culture, but most of these studies look at co-located, global teams that interact across different mediums. Because individuals have different cultures, global teams need to find ways to address this diversity to help support collaboration. Prior work has described how a user's cultural differences in terms of power relationships, conversation styles, and work styles can impact how collaboration occurs and if it is successful (Gallus & Bhatia, 2020). Even with this type of work in existence, many studies are still rooted in Anglocentric and Western ideals, making it hard to make claims about a global perspective.

The similarities and differences found in these three studies are part of the collaboration culture specific to Wikipedia editions and Wikipedia edition talk pages. In this study, I specifically acknowledge that the collaboration culture is partially composed of the interaction's editors have with each other. A culture manifests on Wikipedia editions starting from the technical foundations of the platform that were initially developed in 2001 and the continuous development of the platform created by the editors who help shape the way other users should behave.

Validating Collaboration Models

The second contribution of this paper is validation of prior work from the CSCW/HCI community. In Study 1 (Chapter 4) and Study 2 (Chapter 5), I conducted a systematic and approximate replication of models that already existed. This work demonstrates that these models still account for what is happening on talk pages but in different capacities. In Chapter 4, the findings demonstrate an additional extension to the coding schema presented by Viégas et al (2007). In Chapter 5, the replication demonstrated that the coding schema still accounted for observable behaviors, but I also explored the data a little further through five layers of analysis to understand the coordination mechanisms in EN, FR, and ES.

In the last two decades, researchers have explored so many different venues in EN, but the gap in the literature regarding Wikipedia is research centered on language editions other than EN. In HCI/CSCW, researchers keep digging for new or “novel” contributions and value that much more than replication since its inception. Technology plays a role in this bias as technological development often moves quickly, leaving the human aspect of HCI to play catch up. Thus, for some of the findings in HCI, pure replication may not even be possible. Some HCI researchers have tried to understand how Science, Technology and Science (STS) researchers conduct replication and note that one of the biggest flaws with replication and reason for the present crisis is the lack of an explicit definition of “valid” replication. Methods to rely on or even an “algorithmic” model do not exist, so absolute security of results from a replication study is never guaranteed (Greiggenhagen & Reeves, 2014).

Though some researchers call on replication as the way to help generalizability and validity (TeBlunthis et al., 2018), there is still not enough explicit recognition in the CSCW/HCI research community. As discussed in Chapter 3 and 4, calls for replication studies in the human-computer interaction research community have emerged in recent years (Wilson et al., 2011; Wilson et al., 2014, King, 2015). The two systematic replication studies explored in this dissertation begin to help fill this gap for replication work with the HCI/CSCW community. One of the main reasons for conducting a systematic replication was because I could better disentangle the geographic culture of editors from the culture

produced in the online community. Through a replication, I did not observe who the editors were, instead I tried to see how a prior model existed in FR, EN, and ES. Below I list some additional benefits and challenges of being able to conduct a replication study and how it helped support the original research goal of understanding collaboration in various language editions.

Replicability and reliability: The replication studies (Chapter 4 and Chapter 5) clarified two important facts. Not only could I start revalidating the results found in the original studies, but I could also begin to see the evolution of Wikipedia talk pages. Hence, the dataset that was used was not the same as the one that of the original study because with the new dataset, I additionally included the latest developments of the platform.

Moreover, my replication findings suggest that the EN platform has its own set of characteristics that do not directly influence user behaviors in other language editions. In response, I question whether EN needs to be included as the comparator in multilingual research. Currently, most of the multilingual work rely on EN because of its expansive scope and the quality of its articles, but I call for future work to dig deeper into the other 312 active language editions of Wikipedia. Furthermore, I recommend additional qualitative work that analyzes more than 2 language editions. By focusing their research on only 1 or 2 language editions of Wikipedia, investigators can perpetuate a negative bias towards multilingual research in the HCI community. Currently, most of the multi-edition research with more than 2 editions is quantitative; however, I contend these studies do not do justice to how behaviors actually happen on these platforms. Quantitative, multilingual research can illustrate the organization and frequency of behavior but the collaborative patterns in different language editions are not numerically comparable. The collections of edit counts or edit sessions for a particular period of time do not represent the same behavioral patterns in different languages. Similarly, as shown in this work, the passage of time influences when and how behavioral changes occur, and quantitative research cannot strongly reflect the time progression of user behavior in the editions. Additionally, by including the breakdown components of the behavioral organization, I can propose suggestions for why these differences occur.

Implications of a qualitative replication: The goal of this dissertation was to highlight the different collaboration practices across Wikipedia language editions. This work can have serious implications for current events articles or any articles that may impact the rest of the world. Ultimately, this paper demonstrates that language editions of peer-production platforms, particularly Wikipedia, cannot be developed under assumptions found from the English edition. This assumption is bad design and can

poorly influence the cross-sharing of information, which in turn may influence the quality of articles and hinder the maintenance of Wikipedia's neutral point of view.

Technical difficulties: The platform is different in each language so building with new contexts means adapting to different technical specifications. The FR Wikipedia page had stylistic differences not seen in ES or EN. Furthermore, each edition had its own specific, specialized bots to do most of the clean-up work on each platform. Replication done in each language adapted for these technical changes. The technical changes allowed better understanding of technical features and how these variations between platforms might determine coordination tactics.

Cultural implications: Researchers note that adding context to replication can add novelty. In this work, I expanded the initial EN study to FR and ES to add novelty to our replication to further our chances of acceptance in the community. However, this leads to cultural implications of working across different languages or different contexts. With replication, it was important to find universality in the population and context that was used.

Disentangling individual culture from the culture of the platform: As noted above, Wikipedia supports its own cultural identity through its structure. Through a replication study, I was able to use prior data and methods to be able to understand the platform without considering who the editors were. I made no assumptions about their identity, geography, or cultural heritage but rather used what we already knew about Wikipedia to understand the platform better.

The similarity and divergence of the models from the original studies presented in Viégas et al. (2007) and Kriplean et al. (2007) help build the models of collaboration in each language.

There are now many calls for replication studies, but there is a lack of information about what type of studies should actually be replicated. I hope that this dissertation can demonstrate the importance of understanding new contexts through replication. Furthermore, I spent time initially explaining the methodology in Chapter 3, allowing future researchers to gain more knowledge on the value and methodology of replication. One of the main concerns listed with replication studies, is that replication is not clearly defined. There is not one algorithmic model that can be systematically followed. Part of this problem is that when replication is discussed, it is discussed as a method that can be used across a wide range of phenomena. This makes it difficult to create a consistent replication technique.

Furthermore, some people have tried doing large replication projects (Open Science Collaboration Project, 2015). This study demonstrates one way to consider studies that should be replicated. We now can expand the definition of replication to include replicating to add new contexts. This brings on a new set of questions that can open the door for new and different studies to be replicated. The existence of the findings from Viégas et al. (2007) and Kriplean et al. (2007) demonstrate that the collaboration models found in 2007 still exist but may exist in different capacities. By picking up that model and applying it across these three different settings, I begin to demonstrate support for the argument that the model is complete and adequately accounts for collaborative behaviors across the three different language editions.

There is a replication crisis occurring without any actionable movement towards increasing replication in the field of HCI/CSCW. I have outlined a few ways that can begin to help solve these problems including making novelty, transparency, and openness more visible in our research to make the pathway easier for replication within the field.

Multi-site Methodology

Doing good research across multiple platforms and cultures means that researchers must adapt their methodologies to fit with each site. These methods must take into account different populations, varying regulations, changing behavioral patterns, and collecting large quantities of data across multiple platforms. Such adjustments require added work and additional data that can demotivate researchers from doing multi-site research.

Most cross-linguistic and comparative social computing studies published today focus on datasets from a single site and consider differences within a specific period of time. Such studies are valuable, illustrating that social computing platforms are characterized by many different populations, cultures, user behaviors and features; however, studies of behavior within a single site — regardless of how sophisticated they are — do not inherently yield insights into the numerous other platforms on which comparable behavior seems to exist. Several researchers have previously noted the difficulty of multi-site research for online collaboration systems (Morgan et al., 2015). I extend this call by discussing how to mitigate the difficulties of this type of research. My intention is to address the challenge of making studies of social computing sites more robust by moving beyond the paradigm of understanding a single site at a certain

period of time. I am interested in exploring the means of transferring such methods to more robust studies of comparable social computing sites to understand online social behavior at a broader scale.

My hope is that this dissertation can give additional insights in how multi-site research can be pursued and the challenges faced when working across different communities and language boundaries. I begin to highlight some of the challenges I faced while conducting this multi-site dissertation below:

Matching the demographics of different populations: Each language edition of Wikipedia has its own user groups, which can lead to challenges with collecting similar samples across the different populations of multiple platforms. In each study, it was important to find similar populations. In Study 1 (Chapter 4), I found articles of similar size and structure and used editors discussing those relevant articles talk pages. In Study 3 (Chapter 6), I had to find active users across all three editions with relatively similar experience and prior experience interacting with other editors on talk pages. Furthermore, ES and FR had much less content than in EN, but to mitigate population or content biases, I needed to make sure there was similar representation across sites. With multi-site research, there is the challenge of reaching out to more vulnerable populations.

Policies and guidelines differ across platforms and can influence the behavior of users: Policies and guidelines help structure social platforms and illicit varied user behavior (Butler et al., 2008). However, across many language communities the rules are different and can have varied influences on the participants. Each Wikipedia language edition has its own set of guidelines and policies which can impact the content that goes into that edition's respective article. Furthermore, the policy and guideline structure is dynamic: These social processes continue to evolve, adding new challenges to conducting this type of research.

Data analysis: Each of the studies presented in this dissertation was mainly qualitative. For that reason, it is necessary to collect a lot of qualitative data for each platform. This will require more resources to analyze a large dataset. A study analyzing user posts as shown in Study 1 and Study 2 required an extensive dataset from each individual platform. Furthermore, with multi-site research, triangulation of data does not only occur across research methods, but additionally across sites. This opens new challenges around separating and engaging with sets of results for each individual site because it was necessary to reconcile data schemas across sites. This need for reconciliation leads to additional challenges around resolving conflicts when results do not align.

In this work, it is important that construct validity remains across each language edition. In this dissertation, I leveraged language as a first-class analytical concept to a socio-technical analysis to better

understand all the data gathered in each study and better highlight differences across each context. Using this lens, it is possible to better understand the collaboration culture across each language edition. This is especially true since roughly each language edition is similar from a high-level perspective so many of the language and social processes may be difficult to discern. Using the socio-technical analysis gave an opportunity to systematically draw our relevant and subtle findings in each edition.

Presenting multisite research: In each one of the studies presented in this dissertation, I had three sets of findings for each language edition. To be able to properly present my findings, I had to find a way to tie them all together. This was a difficult task because I needed to produce a chapter that reflected the size of the contribution. In a lengthier research paper, researchers must be able to justify or support the number of findings needed to compare sites in multisite studies. However, multi-site research disproportionately suffers from the reviewer bias. Reviewers often penalize multi-site studies, as they may perceive comparisons as not compelling or in-depth enough, and the data collected at each site as not large-scale enough to support the findings.

Limitations of this research

In each individual study presented in this dissertation, I described the limitations of collecting and analyzing the data sets. However, there are three significant limitations to this dissertation more holistically. The first limitation is that most of the data analysis and presentation of findings was conducted by one person. While I am a native speaker of English, I was only taught French and Spanish in school and through my community. My knowledge of each individual language does not meet the threshold of expertise a native speaker would have. I tried to mitigate this impact by having native French and Spanish speakers gather and analyze data and we had weekly conversations to reconcile the findings.

Secondly, the collaboration models presented are predominantly based on male behaviors. As shown in prior research Wikipedia's demographics across language editions is predominantly male (Antin et al., 2011). The research presented in this dissertation highlights three models derived from male collaboration. There currently is no comparative platform with a non-male majority population so the results of this study currently represent an unbalanced gender but consistent Wikipedia model.

Lastly, this dissertation represents a very Western Romance language-centric perspective of Wikipedia and language collaborations. While English, Spanish and French languages are spoken all over the world and not just in the Western world, each of these languages fall in Western Romance languages family (Dalby, 1999) and all use Latin scripts. Based on linguistic relativism as discussed in Chapter 3, there is a

debate around the relationship between language and thought and using this theory, I can hypothesize that the farther a language is from the root of its origins then the collaboration and thought would be different. However, in this dissertation I study only Western Romance languages making it difficult to prove linguistic relativism directly. However, in my findings, I do show that there are both similarities and differences across different language editions. Thus, indirectly, my findings illustrate this debate around linguistic relativism: the similarities between editions show support for the theory while the differences demonstrate opposition to the theory.

I focused on EN, FR and ES because those were the languages, I had proficiency in, but they do fall within the top 10 largest Wikipedias and both have been around for over 10 years. The global perspective might also be a factor of age of the platform. There has been enough time for consistency to be met as each of these platforms become more and more like the EN platform. To help better address the language origins gap, I have also replicated Kriplean et al. (2007) in the Farsi (FA) and Chinese (ZH) editions of Wikipedia. These two languages come from different language families and better demonstrate linguistic relativism. This work is currently accepted to CSCW 2021 (Bipat et al., 2021).

Current Extension of this Work

In this work, I demonstrated how models developed from a Western Romance perspective generalize to non-Western Romance languages. In this study, I leveraged a native Farsi and Chinese researcher to gather and analyze conversation threads on those language editions. I specifically refer to *we* in these sections to demonstrate that this work was conducted by three researchers, each researcher in charge of a separate language edition.

In ZH and FA, we begin to see how policy and power mechanisms are driven by the distinct contextual considerations. FA and ZH have varied maturity timelines and different textual and linguistic issues. Both languages are written in non-Latin scripts and have language structures that are not the same as many Western languages.

The findings of the study show that across the three languages, there are differences in how editors claim legitimate control over the content. Primarily, we delineate the subtle differences in the collaboration mechanisms between the two non-Western and non-Latin script language editions, and the largest language edition, EN. One example of this is that the sources viewed as reliable, what is considered neutral, and overall content decisions are strongly tied to the Chinese and Farsi languages. Both Chinese and Farsi are languages that are strongly tied to one specific country and the laws and structure from each

country do govern some of what happens on Wikipedia. However, it has been shown that editors on FA and ZH are distributed in various regions of the globe. While there may be local restrictions in place, Wikipedia remains a global platform with the perspective of users from around the world.

Through understanding non-Western languages, it shows that there is the possibility that collaboration models can be impacted by more than just language features, but also by geographical concerns. Further, geopolitical concerns sometimes impact access to and participation in ZH and FA. At times, the countries with the largest number of Chinese and Farsi speakers have limited access to Wikipedia at their electronic borders. These periodic interruptions could mean that ideas and perspectives may not be well reflected in some policies and some articles.

Future Work

Understanding non-Western and smaller language editions is just one example of future work that needs to be done. It is important to view Wikipedia as one large platform made up of a subset of distinct language editions with different users and social and technical processes. Furthermore, the contributions from this study can help pave the way for future research on:

Multilingual Wikipedia: Prior research has shown that users switch from platform to platform and may even edit in their non-native language (Hale, 2015). Future work should understand how a melting pot of users with different language abilities might influence the collaboration models and the dynamic of how things get done on Wikipedia.

Understanding policy across languages: In this dissertation, I focused on power plays, collaborative behaviors, interpersonal communication, and policy mechanisms. Combined all of these mechanisms build what the model should look like in each language. However, there needs to be future work to truly understand what the policy regime looks like in each language and how that may impact collaborations.

For example, there are different categorizations of policy and guidelines in each language. It is important to understand how these categorizations compare and how users value different policies across languages. The classification and categorization of policy, guidelines, and essays are not the same and requires further investigation.

Understanding the linguistic landscape of each language platform: It is also important to take a more sociolinguistics or linguistic policy approach to understanding each language edition (Ivkovic et al.,

2009). As Wikipedia is free and available to everyone, the use of language creates a dynamic and very specific landscape. Understanding the linguistic landscape of Wikipedia will allow better understanding of the multilingual capabilities of the platform and additionally help better dissect the distinct characteristics of how users speak across the editions of the platform.

Wikipedia is only one example of a peer production platform: Lastly, Wikipedia is a peer production platform, but it's not the only one that exists online. Looking at the findings from a broader perspective, the methodology implemented in Chapters 4, 5 and 6 can help better understand other peer production platforms and their various language communities. This helps CSCW researchers better understand collaboration on the internet as a whole.

Conclusion

This dissertation is written with a specific audience in mind, scholars who are interested in collaboration on peer production platforms. Ultimately, Wikipedia is just one instance of a peer production platform. If one is interested in understanding how editors in peer production platforms work, then the knowledge of how these communities work across different instances that have varying demographics such as language diversity is necessary.

While it may not be necessary to redesign Wikipedia to support these varying collaboration models, it is important to be aware of the processes that influence collaboration so that in the future we can better support them. From a broader perspective, the implications of this work can lead to new technical development of each individual language edition and how each collaboration model can be supported. From a more intellectual standpoint, this work provides three things: (1) There are few studies in the field of HCI that show a complete replication of a prior study; (2) I demonstrate the synthesis of two models that already exist in EN; and (3) I can show collaboration models represent what occurs in three language editions.

With a world that is increasingly globalized, the internet has become a place for sharing information across the world. As CSCW/HCI researchers and designers, it is important to recognize that the world is filled with different languages and English, especially on the internet, only represents a portion of the global speakers on the internet. As CSCW researchers, it is critical to continue to support collaboration to assure that anyone can have unlimited access to producing and consuming quality data and information in their respective languages.

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APPENDIX

Appendix A: Additional Examples to support the findings in Study 2 (Chapter 5)

Figure 1. Example of EN conversation thread with no power play. The editors state a fact and there is no response or debate.

EN Example: Thread with no power play

True Heart [edit]

The 1997 movie "True Heart" isn't mentioned in either the body of the entry or the filmography. http://en.wikipedia.org/wiki/True_Heart. [U1] (talk) 17:59, 3 July 2009 (UTC)

Figure 2. Example of ES conversation thread from the Tsunami article where both Article Scope and Power of Interpretation are at play. The editors want to merge the page Tsunami and Tidal Wave. However, they cannot agree because they have their own opinions of the definitions of Tsunami and Tidal Wave.

ES Example: Editors use both Article Scope and Power of Interpretation power plays

Fusión de Tsunami y Maremoto [editar]

Pienso particularmente que este art/ículo está demás. Podría ser fusionado conTsunami o entodo caso se renombraría a Tsunami o maremoto, para evitar el miniesbozo. Un abrazo.–Ari 18:31 13 mar, 2005 (CET)

Totalmente de acuerdo, ver tsunami, además la definicion de maremoto contienen multitud de errores.

si tiene tantos errores arreglalos tù. para eso es esta enciclopedia...no solo para atacarla De acuerdo, debe ser redirigido a Tsunami. Esta definición es errónea y por último innecesaria. El término maremoto es por demás confuso. –Miguel Vera 09:15 15 oct 2007 (CEST)

Es totalmente incorrecto la redirección. Un tsunami no implica obligatoriamente un maremoto, y un maremoto no genera obligatoriamente un Tsunami. son cosas distintas.–Dogor (discusión) 23:42 10 ene 2019 (UTC)

Figure 3. [Translated] Example of ES conversation thread from the Tsunami article where both article scope and power of interpretation are at play. The editors want to merge the page Tsunami and Tidal Wave. However, they cannot agree because they have their own opinions of the definitions of Tsunami and Tidal Wave.

[Translated] ES Example: Editors use both Article Scope and Power of Interpretation power plays

Tsunami and Tidal Wave fusion [edit]

I particularly think that this article is too much. It could be merged with Tsunami or in any case it would be renamed to Tsunami or tidal wave , to avoid the mini sketch. A hug .- Ari 18:31 Mar 13, 2005 (CET)

Totally agree, see tsunami, also the definition of tsunami contain many errors. If it has so many errors, fix them yourself. that's what this encyclopedia is for ... not just to attack it Okay, so you must be redirected to Tsunami . This definition is wrong and ultimately unnecessary. The term tidal wave is quite confusing. - Miguel Vera 09:15 Oct 15, 2007 (CEST)

Redirection is totally wrong. A tsunami does not necessarily imply a tidal wave, and a tidal wave does not necessarily generate a tsunami. they are different things .- Dogor (discussion) 23:42 Jan 10, 2019 (UTC)

Figure 4. [Translated] Example of FR from the Train article that demonstrates the use of both Article Scope and Power of Interpretation power plays. Editors are debating whether content from the Railway article is too similar to the Train article.

[Translated] FR Example:Editors use both Article Scope and Power of Interpretation power plays

Redundancy with railway? [edit]

After starting to work with the Railway article , it seems to me that a lot of the information given is very very close to the Train article . This is why I appeal to your comments on these two pages: wouldn't there be interest in differentiating them? What do you think should appear on each of these pages? How to manage the case of the common parts (story for example)? Please place your responses on this page to group the items. Vvlt March 15, 2007 at 3:31 pm (CET)

In my opinion it should be differentiated as much as possible, train should rather treat the train as rolling stock consisting of a convoy and railway as a general article (= rail transport) encompassing the different aspects, taking into account that there are also railroad. Spedona Papoter March 29, 2007 at 10:46 pm (CEST)

The differentiation and specificity of the two articles "railway" and "train" can certainly be justified in different ways, so a choice must be made. For example: "railroad" can encompass technology, economics and politics, while "train" can be more "human" in the sense of "rail convoys" + "transport" + "man around and inside". The presentation can be organized in two "chapters": - 1 Rail convoys: equipment used, use, destinations, ... (current paragraphs 1,2,3,4,5); - 2 "Culture": representations and imaginary that it produces (current paragraph: 6). It is possible to balance the two by avoiding identical developments with "chemin de fer" Whatever the choices, this page needs improvements, see corrections (the etymology paragraph is not consistent with train in the wiktionnaire), the iconography presents more motor cars than "trains", the history could "specialize" on the convoy, ... I also find that lists should be avoided, they lengthen the page without giving interest to reading, if they are essential, it is better to create a "list page" and put a link. Although (d) August 12, 2009 at 10:04 am (CEST)

For the article train, in my opinion, it should not be limited to the pure train convoy. There are now trains of a lot of things: road, of machines (example of the trains with billet, in steel industry), etc ... Otherwise, it is sure, there is job, these articles are almost in ruins. As a starting point, the English article train is not bad at all, including in its integration into railroad. Vvlt [chatting] August 12, 2009 at 12:25 (CEST)

So you have to rename the Rail Train page because "Train" existed long before the railway and continues its own life in many areas, but Train in the railway sense is indeed an article of maximum importance of the Ferrovipedia project. Sincerely Although (d) August 12, 2009 at 1:12 p.m. (CEST)

In fact, after reflection, "Train" in the railway sense seems dominant and the homonymy page is there to open the subject to other uses of the word Train having enough interest to have an article. Although (d) August 12, 2009 at 1:34 p.m. (CEST)

The rail "train" is dominant, that's right. The other trains are less common to the public, and in my opinion, there is less demand on the subject. The English article is actually not bad; to see to start, because you have to start. It is by scaffolding that the article will gain importance and that we will know where to go. Trizek bla , August 12, 2009 at 4:50 p.m. (CEST)

Figure 5. Example from FR that demonstrates the use of both Article Scope and Power of Interpretation power plays. Editors are debating whether content from the Railway article is too similar to the Train article. They are debating a merge of both articles.

FR Example: Editors use both Article Scope and Power of Interpretation power plays

Redondance avec chemin de fer ? [modifier le code]

Après avoir commencé à travailler avec l'article Chemin de fer, il me semble que beaucoup d'infos données sont très très proches de l'article Train. C'est pourquoi je fais appels à vos commentaires sur ces deux pages: n'y aurait il pas intérêt à les différencier ? Selon vous, quels éléments doivent figurer sur chacune de ces pages ? Comment gérer le cas des parties communes (histoire par exemple) ? Veuillez placer vos réponses sur cette page pour regrouper les éléments. Vvlt 15 mars 2007 à 15:31 (CET)

A mon avis il faudrait différencier autant que possible, train devrait traiter plutôt du train en tant que matériel roulant formé d'un convoi et chemin de fer comme article généraliste (=transport ferroviaire) englobant les différents aspects, en tenant compte qu'il existe aussi voie ferrée. Spedona Papoter 29 mars 2007 à 22:46 (CEST)

La différenciation et la spécificité des deux article "chemin de fer" et "train" peut certainement se justifier de différentes manières, il faut donc faire un choix. Par exemple : "chemin de fer" peut englober la technologie, l'économique et le politique, alors que "train" peut être plus "humain" au sens "convois ferroviaire" + "transport" + "homme autour et dedans". La présentation peut s'organiser en deux "chapîtres" : - 1 Convois ferroviaire : matériel utilisé, utilisation, destinations,... (paragraphes actuels 1,2,3,4,5) ; - 2 "Culture" : représentations et imaginaire qu'il produit (paragraphe actuel : 6). Il est possible d'équilibrer les deux en évitant les développement identiques avec "chemin de fer" et en développant le deuxième "chapître", il y a de la matière avec des sources. Quel que soit les choix, cette page a besoin d'améliorations, voir de corrections (le paragraphe étymologie n'est pas cohérent avec train dans le wiktionnaire), l'iconographie présente plus des motrices que des "trains", l'historique pourrait se "spécialiser" sur le convois, ... Je trouve également qu'il faut éviter les listes, elles allongent la page sans donner de l'intérêt à la lecture, si elles sont indispensables, il vaut mieux créer une "page liste" et mettre un lien. Quoique (d) 12 août 2009 à 10:04 (CEST)

Pour l'article train, à mon sens, il ne faut pas se limiter au pur convoi ferroviaire. Il y a maintenant des trains de tas de choses: routiers, de machines (exemple des trains à billettes, en sidérurgie), etc... Sinon, c'est sûr, il y a du boulot, ces articles sont quasiment en ruines. En point de départ, l'article anglais train n'est pas mal du tout, y compris dans son intégration dans chemin de fer. Vvlt [papoter] 12 août 2009 à 12:25 (CEST)

Alors il faut renommer la page Train ferroviaire car « Train » existait bien avant le chemin de fer et continue sa vie propre dans beaucoup de domaines, mais Train au sens ferroviaire est bien un article d'importance maximum du projet Ferrovipédia. Cordialement Quoique (d) 12 août 2009 à 13:12 (CEST)

En fait, après réflexion, « Train » au sens ferroviaire semble dominant et la page d'homonymie est la pour ouvrir le sujet vers les autres utilisation du mot Train ayant suffisamment d'intérêt pour avoir un article. Quoique (d) 12 août 2009 à 13:34 (CEST)

Figure 6. FR example of conversation thread with no power play. Translation is included in the findings section

FR Example: Thread with no power play

La toilette de l'ère Meiji [modifier le code]

Quelqu'un sait-il comment fonctionnent la toilette de riches japonais près de Nakatsugawa. Vraiment, j'ai aucune idée ce qu'on peut faire avec ça. - [U1] 4 décembre 2005 à 02:10 (CET)

Je suis très heureux que la curiosité des wikipédistes se porte à ces meubles tellement utiles ! [U2]

Figure 7. [Translated] FR conversation thread where editors debate neutrality of the article. In this thread, the editors do not think that the content on the David Guetta article is objective.

[Translated] FR Example: Editors uses Power of Interpretation and WP:NPOV

Manque de neutralité [modifier le code]

This pleasant-looking article is nevertheless too subjective Àmha to be encyclopedic. Choixpeau March 22, 2006 at 10:15 (CET)

Indeed, the text comes from its official site! Boxx April 21, 2006 at 10:59 pm (CEST)

The article has been deleted and recreated. You can improve it, without pumping on other sites! :) - ChtiTux May 14, 2006 at 09:18 (CEST)

The article was enriched with real information concerning its beginning - The preceding message, unsigned, was deposited by the IP 77.195.35.18 (discuss), on July 14, 2007 at 01:38 (CEST).

What Stephanie Binet forgets is that David Guetta creates hundreds of jobs a year, so his opinion of "class struggle" and such is very subjective, even anecdotal, for an encyclopedic article ... Especially since this journalist, if she is not an intern, is not a figure of authority. Unknown to the battalion ... - The above message, unsigned, was deposited by At08 (discuss), on August 26, 2010 at 7:36 pm (CEST). - You are not talking about the entire length of your article, his Spanish experience Outside his period in Ibiza was a springboard on what is David Guetta and also Cathy today It is a big gap in this article which summarizes quite bad biography of Guetta I find And the single which launched Guetta is not from 2002 but from 2001 "Just a Little More Love" with the American singer Chris Willis Also know that the novice who would read this article, will think about reading of this one, that David Guetta is a Franco-French product, having made his career in France, only in France. Except any DJ even in apprenticeship, knows that Guetta has its primordial past as a DJ in Ibiza

Figure 8. FR conversation thread where editors debate neutrality of the article. In this thread, the editors do not think that the content on the David Guetta article is objective.

FR Example: Editors uses Power of Interpretation and WP:NPOV

Manque de neutralité [modifier le code]

Cet article d'un style agréable est néanmoins trop subjectif Àmha pour être encyclopédique. Choixpeau 22 mars 2006 à 10:15 (CET)

En effet, le texte est issu de son site officiel ! Boxx 21 avril 2006 à 22:59 (CEST).

L'article a été supprimé puis recréé. Vous pouvez l'améliorer, sans pomper sur les autres sites ! :) -ChtiTux 14 mai 2006 à 09:18 (CEST)

L'article a été enrichi avec des vraies infos concernant ses début— Le message qui précède, non signé, a été déposé par l'IP 77.195.35.18 (discuter), le 14 juillet 2007 à 01:38 (CEST).

Ce que Stephanie Binet oublie, c'est que David Guetta crée des centaines d'emplois par an, alors son avis de "lutte des classes" et cie est bien subjectif, voire anecdotique, pour un article encyclopédique... Surtout que cette journaliste, si elle n'est pas stagiaire, n'est pas une figure d'autorité. Inconnue au bataillon...— Le message qui précède, non signé, a été déposé par At08 (discuter), le 26 août 2010 à 19:36 (CEST). - Vous ne parlez aucunement sur toute la longueur de votre article, de son expérience espagnole Hors sa période à Ibiza fut un tremplin sur ce qu'est David Guetta et aussi Cathy aujourd'hui C'est une grosse lacune de cet article qui résume assez mal la biographie des Guetta je trouve Et le single qui a lancé Guetta n'est pas de 2002 mais de 2001 "Just a Little More Love" avec le chanteur américain Chris Willis Sachez aussi que le novice qui lirait cet article, penserait à la lecture de celui ci, que David Guetta est un produit franco-français, ayant fait sa carrière en France, uniquement en France. Hors n'importe quel Dj même en apprentissage, sait que Guetta à son passé primordial de DJ à Ibiza

Figure 9. [Translated] Conversation thread from ES Abortion article. There is no power play. Editors state a fact, and no debate occurs.

[Translated] ES Example: Thread with no power play

Legal Aspects [edit]

The legal aspect article is repeatedly deleted. I redirect to the corresponding section on induced abortion until the topic is defined 14-06-2010 slogan (discussion) 15:19 23 Jun 2010 (UTC)

It is corrected and the article Legislation on abortion in the world has not been deleted for a long time.

Figure 10. Conversation thread from ES Abortion article. There is no power play. Editors state a fact and no debate occurs.

ES Example: Thread with no power play

Aspectos legales [editar]

El artículo aspecto legales es borrado insistentemente. Redirijo a la sección correspondiente en aborto inducido hasta que se defina el tema 14-06-2010 lema (discusión) 15:19 23 jun 2010 (UTC)

Está corregido y desde hace tiempo no se borra el artículo Legislación del aborto en el mundo

Figure 11. ES example of conversation where WP:NPOV is used. Translation is included in the findings section.

[Translated] Editor uses Power of Interpretation and WP:NPOV (ES)

Quitar la etiqueta [editar]

Es totalmente neutral. La referencia al carácter peyorativo de la palabra 'pseudociencia' no es más que una descripción y apunte de la evolución del sentido de la palabra.– 84.79.39.72 (discusión) 19:48 14 ago 2010 (UTC).

No, no es en absoluto neutral. Alguien se ha dedicado a modificar de nuevo el artículo, haciendo barrabasadas como modificar una referencia para que diga algo que originalmente no estaba allí (véase en el historial el cambio realizado a la primera referencia sobre el artículo original de Truzzi). Voy a revisarlo de nuevo. Saludos, Richy - ¿comentarios? 08:08 23 sep 2010 (UTC).

Hecho. He eliminado comentarios espúreos, sin referenciar, falseando las referencias y simples opiniones personales. Reinicio la cuenta atrás para ver si hay objeciones a la retirada de la plantilla de no neutralidad. Saludos, Richy - ¿comentarios? 08:20 23 sep 2010 (UTC).

Figure 12. EN conversational thread with no power play. The editors ask a question and no debate occur after content was removed.

EN Example: Thread with no power play

bonebed in Arizona?? [edit]

Hey, does anybody know anything about the bonebed discovery from Arizona? can't find anything on google Cas Liber 06:13, 29 May 2006 (UTC)

I've found nothing, either, so I've removed it. Firsfron of Ronchester 21:32, 15 February 2007 (UTC)

Figure 13. EN conversational thread from the article Ron Hubbard. The editors are debating the neutrality of the article, but their perspectives are validated by their own opinions

EN Example: Power of Interpretation and WP:NPOV

Early Life [edit]

I have revised a short section on "Early Life" regarding his travels in Japan in China. This is in the interest of NPOV; the section (and the whole article itself) lies too heavily on Miller and Atack, whose perspectives on Hubbard are not neutral. NestleNW911 (talk) 23:57, 7 September 2012 (UTC)

This is a common error I see from editors - an insistence that the sources have to be neutral. They do not. NPOV requires us to represent "fairly, proportionately, and as far as possible without bias, all significant views that have been published by reliable sources." It says nothing about sources being neutral, quite obviously. (And if neutrality is your goal, adding a long quote from the hagiographic publication "Ron the Philosopher" is a strange way of going about it!) Replacing the existing content with that publication also, it seems to me, misses the point being made - that Hubbard's diaries conflict with the later stories about his travels. It's not "critics of Hubbard" who are suggesting a different account - it's Hubbard's own diaries which state that. Atack and Miller are not giving their opinion of Hubbard's travel, they are describing the contents of the diaries. There's no dispute over the accuracy of their descriptions - the diaries were a central issue in the litigation over Bare-faced Messiah and the individual quotes were claimed by the CoS to be copyright violations. Prioryman (talk) 23:19, 8 September 2012 (UTC)

Phase 1: Becoming a Wikipedian, Understanding some basic collaboration moments.

(General questions about the editor and their behavior on Wikipedia)

Q1: Tell me a little about how you got involved editing Wikipedia.

Follow-up Questions:

How long have you been editing on Wikipedia?

When was the last time you edited something on Wikipedia?

What was it? Did you collaborate with someone else?

Why did you choose to contribute to Wikipedia?

Q2: How has your work in editing changed over time?

Follow-up questions:

What did you start contributing to talk pages and articles when you started?

What type of work do you do now?

How would you describe the difference between what you worked on when you started and what you are working on right now?

Why did things change?

Q3: How do you choose what to contribute to on Wikipedia?

Follow-up questions:

What type of articles do you typically edit?

Tell us about your most recent editing experience.

What do you typically use talk pages for?

What types of editing do you do on articles?

Q4: How do you interact with other Wikipedians?

Follow-up questions:

Do you communicate or interact with other Wikipedians?

How do you interact?

How do these interactions help you decide what editing you are going to do on articles?

Q5: How familiar are you with Wikipedia policy and guidelines?

Follow-up Questions:

What are some of the top policies you cite other NPOV and citing sources.
How do you use these policies and guidelines?
Have you ever edited a policy or guideline?
Are there any policies that you feel are missing?
Do you find any flaws in the policies and guidelines structure?

Phase 2: Examples and Tasks

As part of our effort to find people to interview we reviewed lots of contributions to Commons. I would like to show you some of the contributions you made and ask you some questions about them. I'm going to paste a URL into the chat that will link to the first example.

Example 1: Most Recent

https://en.wikipedia.org/wiki/Talk:1982_North_Yemen_earthquake

I'm also going to share my screen so that you can see what I see.

Q6: What is the story behind this talk page post? What were you trying to achieve?

Q7: What made you decide to contribute to this talk page conversation?

Q8: What was the result of this talk page contribution.

Follow-up questions:

Have you interacted with this editor before? How so?
Why did you decide to contribute to this Wikipedia article?

Example 2: Power play example

https://en.wikipedia.org/wiki/Talk:1838_San_Andreas_earthquake

Q6: What is the story behind this talk page? What were you trying to achieve?

Q7: What made you decide to contribute to this talk page conversation?

Q8: What was the result of this talk page contribution.

Follow-up questions:

Have you interacted with this editor before? How so?

Why did you decide to contribute to this Wikipedia article?

Example 3: Most recent experience (3 weeks ago)

https://en.wikipedia.org/wiki/Talk:Schizoid_personality_disorder#%22lack_of_close_friends%22_doesn't_technically_seem_like_it's_a_symptom_of_a_disorder_so_I_removed_this%22

Q6: What is the story behind this talk page post? What were you trying to achieve?

Q7: What made you decide to contribute to this talk page conversation?

Q8: What was the result of this talk page contribution.

Follow-up questions:

Have you interacted with this editor before? How so?

Why did you decide to contribute to this Wikipedia article?

Example 4: Power play example

[https://en.wikipedia.org/wiki/Talk:Ring_of_Fire#Rejected_changes_based_on_recent_eruption_\(June_2018\)](https://en.wikipedia.org/wiki/Talk:Ring_of_Fire#Rejected_changes_based_on_recent_eruption_(June_2018))

Q6: What is the story behind this talk page post? What were you trying to achieve?

Q7: What made you decide to contribute to this talk page conversation?

Q8: What was the result of this talk page contribution.

Follow-up questions:

Have you interacted with this editor before? How so?

Why did you decide to contribute to this Wikipedia article?

Example 5: Something from 1 year ago

Q6: What is the story behind this talk page post? What were you trying to achieve?

Q7: What made you decide to contribute to this talk page conversation?

Q8: What was the result of this talk page contribution.

Follow-up questions:

Have you interacted with this editor before? How so?

Why did you decide to contribute to this Wikipedia article?

Phase 3: Closing Script

Q9: Can you think of a memorable talk page conversation that I haven't already shown you?

Follow-up Questions:

What contributions have you made to Wikipedia that makes you most proud or happy?

How many editors were involved in this conversation?

What was the result of this conversation on the talk page and on the article talk page?

Q10: How would you describe power on Wikipedia?

Follow-up Questions:

How do you describe your influence on other people in conversations?

What do you typically do to persuade another editor?

How would you describe the politics on Wikipedia?

How do you describe power in your own work?

How do you describe politics in your own work?

Q10: If you could characterize the majority of your interactions with editors, what would it be?

Follow-up Questions:

What type of work is the majority of your contributions?

Q11: Thinking about some of the talk page conversations you have been part of, can you think of any factors that typically help the editors come to a consensus?

Follow-up Question:

How do editors typically come to a consensus in conversations that you participate in?

Do you have any advice for new editors on how they can help come to a consensus when disputing article edits on Wikipedia?

Q11: Anything else that you would like to share with me?

Do you have any questions for me? Thank you for taking the time to talk with me about Wikipedia talk pages. =