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Expanding Human Capabilities Through the Adoption and Utilization of Free, Libre, and Open Source Software

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EXPANDING HUMAN CAPABILITIES THROUGH THE ADOPTION AND UTILIZATION
OF FREE, LIBRE, AND OPEN SOURCE SOFTWARE

by

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James Daniel Simpson

DEDICATION

For my girls. I love you more than you could ever know. May your journeys take you places I could not.

"Take fast hold of instruction; let her not go; keep her; for she is thy life" *Proverbs* 4:13.

EXPANDING HUMAN CAPABILITIES THROUGH THE ADOPTION AND
UTILIZATION OF FREE, LIBRE, AND OPEN SOURCE SOFTWARE

James Daniel Simpson, Ph.D.

University of the Incarnate Word, 2014

Free, libre, and open source software (FLOSS) is software that is collaboratively developed. FLOSS provides end-users with the source code and the freedom to adapt or modify a piece of software to fit their needs (Deek & McHugh, 2008; Stallman, 2010). FLOSS has a 30 year history that dates to the open hacker community at the Massachusetts Institute of Technology (MIT) where information and knowledge was freely shared among a community of programmers and end-users (Lessig, 2006; Stallman, 2010; Sullivan, 2011). The advent of a proprietary or closed software development model in the late 1970s and early 1980s prompted FLOSS advocates like Richard Stallman to develop tools to protect end-users' rights to modify, share, and create software (Lessig, 2006, Stallman, 2010). Since then, the FLOSS and proprietary software development models have become two diametrically opposed points-of-view with advocates and detractors on both sides.

This qualitative case study sought to understand in which human spaces FLOSS helped promote sustainable human development by expanding human capabilities in accessing the world's knowledge and information in one community. It sought to answer: How has FLOSS helped to expand human capabilities by providing access to information? Amartya Sen's (1999, 2009) capability approach was used to explore Reglue, a non-profit organization in Taylor, Texas, whose mission is to close the digital divide by providing students and their families with

Linux-based computers.

Heuristic inquiry was used to analyze participants' experiences using or migrating to FLOSS to explore FLOSS' influence on human capabilities within the boundaries of the case (Moustakas, 1994). Creswell's (2008) qualitative data handling and analysis methodology was also used to identify themes. Five themes emerged from the data that included 14 sub-themes.

The study's results revealed that FLOSS does promote sustainable human development by expanding human capabilities in accessing the world's knowledge and information. The results, however, indicate that continued training and guidance were needed to ensure that the participants' success with migrating to and using FLOSS were successful. Conclusions and recommendations were made within the framework of the capability approach that serve to inform practice and policy for future FLOSS ventures or studies as well as to fill a gap that exists within the corpus of current FLOSS literature by adding a human-based case study to the body of FLOSS literature.

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Chapter 1: Introduction

Context of the Study

There have been many watershed moments in the computing world that have placed computing power and access to information into people's hands at an exponential rate (Muñoz & de Soysa, 2009). From cellular phone technologies to the Internet, these watershed moments have forever changed the world and expedited human, organizational, and governmental communication pipelines as well as aided in the rapid globalization of economies and the almost instantaneous access to the world's knowledge and information (Muñoz & de Soysa, 2009; Noonan, Baker, Seavey, & Moon, 2011). From 2000 to 2012, the percentage of the world's population who use the Internet grew 566.4% with a world average penetration rate of 34.3% (Internet World Stats, 2012). Asia was the largest contributor to this growth with over one billion Internet users (Internet World Stats, 2012). When adjusted for population, North America is first with an Internet penetration percentage of 78.6%. Following North America are Oceania/Australia (67.6%), Europe (63.2%), Latin America/Caribbean (42.9%), Middle East (40.2%), Asia (27.5%), and Africa (15.6%) (Internet World Stats, 2012). While access to and the distribution of Internet computing technologies is anything but equal, the developmental scope and sequence of computing technology around the Internet is often compared to a revolution often referenced as the digital revolution (Sharma, 2013). Sharma (2013) states that this

> digital revolution, also called the third revolution, has changed the entire landscape of the business world. After the industrial revolution, no other revolution has changed the fabric of the society as the Internet revolution has changed it. It has given rise to organizations that thrive on volunteers, peer production, and collaboration. (para. 7)

These advances in computing technology have transformed the world that we live in for either better or worse, and like a Pandora's box, these advances and the promise of future advances will only become more influential and prevalent in our daily lives affecting and transforming the

spaces and communities in which we live (Dyson, Hendricks, & Grant, 2007; Evans, 2007; Gallego, Luna, & Bueno, 2009; Muñoz & de Soysa, 2009; Salazar, 2007).

The transformative nature of computing technologies has changed the manner in which humankind works and thinks and is often cited as an innovative resource for developing solutions to solve a varying array of the world's problems ranging from human development to business operations. Sharma (2013) notes that

> mass collaboration is changing the foundational structure of businesses and reshaping the way these entities operate in our highly competitive environment. Collaboration, fueled by open methodologies and peer production, is forcing management to rethink their strategies. Organizations that have previously created walled cities are breaking the barriers and creating public spaces where all can grow and contribute to push forward the boundaries of their businesses as well as the boundaries of industries they operate in. (para. 3)

Sharma (2013) continues by stating that the surge of development in computing technologies has "made it possible for creative and thoughtful people with ideas to start businesses on the Internet that are playing a positive role in pushing forward the human race" (para. 11). To further illustrate this point, current literature is filled with examples of how computing technologies in the form of information and communication technology (ICT) projects and software or hardware development have been innovatively employed to successfully solve complex issues in a myriad of environments (Colford, 2009; Dyson et al., 2007; Salazar, 2007; Sullivan, 2011; van Reijswoud, 2009).

As with the numerous technological success stories, the literature is also filled with many examples that cite the many barriers that exist when computing technologies are employed to solve complex social, cultural, or economic issues (Nagy, Yassin, & Bhattacherjee, 2010; Rubagiza, Were, & Sutherland, 2011). These barriers range from basic computing necessities such as electricity and literacy to more complex facets of computing such as software adaptation, infrastructure and human development, language, and access to computing technologies

(Boitshwarelo; 2009; Camara & Fonseca, 2007; Nagy et al., 2010; Rubagiza et al., 2009; Vajda & Abbitt, 2011). While the navigation of these barriers may always be a determining factor for the success or the failure of a technological solution, it is the level of software that presents unique challenges to the communities, businesses, and organizations that are implementing and employing computing technologies to play "a positive role in pushing forward the human race" (Sharma, 2013, para. 11).

FLOSS and proprietary software. Within the expansive array of successful and problematic computing technology solutions, there resides an ongoing debate that is centered on the access to and the sharing of software resources to further and progress human development and freedom; to enhance human, computing, and organizational development; and to establish a public commons of knowledge sharing (May, 2006a; Sullivan, 2011; Williams van Rooij, 2007). This ongoing debate is centered on two dialectically opposed software development models–the free, libre, and open source software (FLOSS) development model and the proprietary or closed software development model. The FLOSS development model advocates for the creation, adaptation, and adoption of software that is free and open. FLOSS software is usually developed by a community of programmers often connected by the Internet. In the FLOSS development model, a program's source code is openly available to the end-user. In doing so, the end-user is given the freedom to adapt and use the software according to his or her needs (Deek & McHugh, 2008). Conversely, the proprietary software development model does not allow an end-user to adapt a piece of software to her or his needs and usually comes with a licensing fee or agreement that binds the end-user to a specific set of user tenets such as agreeing not to share the software with others who are not a part of the household, business, or organization making the software purchase (Deek & McHugh, 2008).

The debate between the FLOSS and the proprietary software development models has

many facets such as whether intellectual property rights should apply to software that is deemed necessary for computing and Internet access, whether developers or companies should open (share) their software code granting end-users access to adapt or rewrite the software's code to fit their needs, and how to free and protect the end-user from legal constraints that inhibit her freedom to use, adapt, or share a piece of software (May, 2006b; Stallman, 2010; Sullivan, 2011). Beneath the many facets of the FLOSS and proprietary software development model debate are issues that concern the access to needed software that provide access to knowledge and information and the freedom to use that access as one wishes. The implications of this debate are at the heart of how current computing technologies are shaping or could shape the world (Lessig, 2006; Lessig, 2004).

       FLOSS, the Free Software Foundation, and the Open Source Initiative. The debate between the FLOSS and the proprietary software development models is not new and has its roots in the late 1970s and early 1980s (Lessig, 2006; May, 2006a; Moore, 2002; Sullivan, 2011). At that time, a software culture existed where programmers (hackers) would freely share software code with each other promoting a community and culture that thrived on input and communal learning (Lessig, 2006; Stallman, 2010; Sullivan, 2011). This community practice of sharing code and ideas freely was soon challenged, however, by a closed or proprietary software development model where software code was no longer freely shared to protect intellectual property (Stallman 2010). With the new proprietary model many hackers realized that they could earn an income by writing code and began working with the proprietary software development model (Lessig, 2006; Stallman, 2010). Distraught by the new proprietary software development model, Richard Stallman, a programmer and advocate of the open hacker community at the Massachusetts Institute of Technology (MIT), established the Free Software Foundation (FSF) in 1985 (GNU.org, 2012a, para. 1). According to the FSF, "the word 'free' in 'free software' pertains

to freedom, not price" (GNU.org, 2012a, para. 3). The FSF (2004) believes that

> as our society grows more dependent on computers, the software we run is of critical importance to securing the future of a free society. Free software is about having control over the technology we use in our homes, schools and businesses, where computers work for our individual and communal benefit, not for proprietary software companies or governments who might seek to restrict and monitor us. (para. 1)

In tandem with the FSF, the Open Source Initiative (OSI) was established in 1998 as a means to develop a practical definition and use of free software (GNU.org, 2012b, paras. 1-3). While the OSI and FSF seem similar to many end-users, the difference between the OSI and FSF is one of philosophy, practicality, and ethics. While both are committed to an anti-proprietary software development model, both differ philosophically in their ethical application of doing so where the OSI views open and closed source software as a practical issue, for example, software that is free from cost, while the FSF interprets free and non-free software as a sociopolitical issue that either frees or restricts the end-user's freedom (GNU.org, 2012b, para. 12). While both may be placed within the same advocacy camp, the FSF views free software as a politicized issue that informs end-users of the restrictive practices of proprietary software development, while the OSI can be interpreted as more business and development orientated discussing "with executives from the public and private sectors about how Open Source technologies, licenses, and models of development can provide economic and strategic advantages" (Open Source Initiative, n.d.-a, para. 3). Both the FSF and OSI are too similar for the purposes of this study to differentiate between the two. Because both promote the open software developmental model of the early hacker development communities and as much of the literature cites both free software and open source software as FLOSS, FOSS, or simply, OSS, both the FSF and OSI will be referenced with the term FLOSS and differentiated only where one differs in application or practice from the other (May, 2006b; Sullivan, 2011).

In addition to the definition above, the meaning of FLOSS, FOSS, or OSS, in this study is

software that is openly developed in a communal manner where one is allowed to adapt a piece

of software to one's needs as long as that adaptation is kept open and is freely given back to the

community. Deek and McHugh (2008) define open source as a

> worldwide attempt to promote an open style of software development more aligned with the accepted intellectual style of science than the proprietary modes of invention that have been characteristic of modern business. The idea–or vision–is to keep the scientific advances created by software development openly available for everyone to understand and improve upon. (p. 1)

Before moving forward, a caveat should be made. The definition of FLOSS for the purposes of

this study in no way ensures that a piece of software is free (as in price), although most FLOSS is

free to use. An example of this is the Red Hat Enterprise Linux (RHEL) operating system. While

RHEL is a distribution of the free GNU/Linux operating system, Red Hat charges for its use with

the cost going to support and development. Even so, free clones of RHEL such as Scientific

Linux and CentOS are available. The existence of these free clones is possible through the nature

of how the open source community functions. In the case of Scientific Linux and CentOS,

RHEL's source code was adapted by removing trademarked material owned by Red Hat and

repackaging it under another name. The final result is an exact binary copy of RHEL that is free

to use and adapt further. This type of adaptation is called forking where developers take a piece

of source code and fork it for their purposes at the same time giving the forked software back to

the community.

It should also be noted that the issue of software price is one of the fundamental

differences between the FSF and OSI where the OSI's first criterion in its definition is "free

redistribution" (Open Source Initiative, n.d.-b, para. 1), while the FSF interprets "the word 'free'

in 'free software' . . . [as] freedom, not price" (GNU.org, 2012a, para. 3). Differences aside, the

FSF and OSI can be interpreted as different sides of the same coin. While each clings to its

philosophical, practical, or ethical difference(s) from the other, the reality is that most end-users

adopt the idea of free and open source software as software that is free to use and not the philosophical, practical, or ethical underpinnings of the FSF or OSI (Noonan et al., 2011; Sullivan, 2011).

   FLOSS' existence and adoption. The last twenty years have seen the rise of FLOSS adoption and utilization both in the number of end-users who use FLOSS and the number of organizations that have adopted some form of FLOSS in their day-to-day operations (Gallego et al., 2008; Nagy et al., 2010; Sullivan, 2011). From the GNU/Linux operating system (35% of total server operating systems usage and 4.8% of total desktop usage) to the Mozilla Firefox web browser (Firefox) (26.9% of browser end-users), FLOSS has become a casual daily and/or necessary component of computing technology for many end-users (W3schools.com, n.d., para. 1). For example, Firefox, Google, Thunderbird, and the Android operating system are all FLOSS programs or platforms that are used daily by many end-users (Gallego, et al., 2008; Nagy, et al., 2010; Noonan et al., 2011). Even so, research conveys that many end-users are unaware of FLOSS' existence, are unaware of the software options available through FLOSS, or are passive to its existence (Gallego et al., 2008; May, 2006a; Vajda & Abbitt, 2011; Nagy et al., 2010; Noonan et al., 2011). Studies also cite that many do not know of or utilize viable FLOSS options for a variety of reasons ranging from industry adoption policies to dissatisfaction with prior FLOSS solutions or use (Gallego et al., 2008; Nagy et al., 2010; Vajda & Abbitt, 2011).

   While FLOSS' market share is minimal, facets of FLOSS are touted as reason enough for end-users and organizations to adopt FLOSS. These reasons include "lower initial and recurrent costs, less dependence on . . . software vendors, and increased local capacity development and growth potential for a local ICT industry" (van Reijswoud, 2009, p. 40). These reasons have been iterated in much of the literature, yet end-users and organizations are still wary of adopting FLOSS into their daily operations (Ayala, Cruzes, Hauge, & Conradi, 2011; Colford, 2009; Deek

& McHugh, 2008; May, 2006a; May, 2006b; Sullivan, 2011, van Reijswoud, 2009). Nagy et al.

(2010) found that many organizations are hesitant to adopt FLOSS for many reasons such as

knowledge barriers, legacy integrations, forking, sunk costs, and technological immaturity (p.

149, Table 2). As for individual end-users, much of the literature states that many end-users

simply use what they know, hence the aggressive marketing by software companies to build their

brand via student, government, or organizational discounts and donations. These discounts are

seemingly innocent; however, they are given as a means to create more end-users who depend on

their products (May 2006a; Sullivan, 2011). Because of the tactics employed by software

companies, FLOSS advocacy has entered another domain belonging to the larger social justice or

free culture movements where FLOSS is interpreted as an extension of human creation and a

means to alleviate human suffering and ignorance through the free exchange of information and

tools (Lessig, 2006; Lessig, 2004; Stallman, 2010; Sullivan, 2011).

      FLOSS, social justice, and free culture. A current trend within the FLOSS community

is a human-based advocacy movement that seeks to align itself with the larger social justice and

free culture movements. This movement interprets FLOSS advocacy and adoption as not only an

economically viable and practical alternative to using proprietary software, but also as an

imperatively ethical step to provide modern tools and information to the whole of humankind

(Lessig, 2004; Sullivan, 2011). This new trajectory is a radical departure from simply developing

FLOSS as the focus becomes human-beings. This advocacy movement is unique in that the ends

of FLOSS development is humankind and not simply pieces of software. This escalates the

debate between the FLOSS and the proprietary software development models as the tools that are

interpreted as vital to compete in our modern society are now incorporated into the center of a

larger human development debate (Sullivan, 2011).

      Social justice as interpreted within the FLOSS community is based on the works of

Rawls (as cited in Sullivan, 2011, p. 232), Bradley (as cited in Sullivan, 2011, p. 232), and Sen

(1999, 2009). According to Rawls, justice is twofold and meets the following conditions:

> First, each person participating in a practice . . . has an equal right to the most extensive
> liberty compatible with a like liberty for all; and second, inequalities are arbitrary unless
> it is reasonable to expect that they will work out for everyone's advantage, and provided
> the positions and offices to which they attach, or from which they be gained, are open to
> all. (as cited in Sullivan, 2011, p. 232)

Bradley furthers this by stating that social justice is

> the directing and shaping of society's laws and institutions . . . to achieve an equal level
> of fairness and just treatment for all members of society; a system in which just conduct
> within a society toward all members of that society is guided by moral principles of truth,
> reason, justice, and fairness. (as cited in Sullivan, 2011, p. 232)

While both definitions of justice and social justice above are sound, Sen (2009) goes further in

his analysis and acknowledges that the idea of social justice is frustrated by the reality of

inequalities that exist between nations, people, and cultures. Sen (2009) redirects the definitions

of justice and social justice of Rawls (as cited in Sullivan, 2011) and Bradley (as cited in

Sullivan, 2011) and "argues that we can begin to achieve a broader justice by first focusing on

those injustices on which everyone can agree" (Sullivan, 2011, p. 233). For Sen (2009), justice is

only attainable if one recognizes the all too real reality in which many live. As such, Rawls (as

cited in Sullivan, 2011), Bradley (as cited in Sullivan, 2011), and Sen's (2009) definitions of

justice and social justice have been used to develop the free culture movement whose roots are

based on the FSF's concept of the free exchange of information and ideas that echo the early

hacker culture of MIT (Lessig, 2004; Sullivan, 2011).

   Free culture. The free culture movement was developed by Lawrence Lessig of Harvard

University and others in 2001 (Sullivan, 2011). Using Stallman and the FSF's advocacy of free

software as his theoretical base, Lessig (2004) writes that "the opposite of a free culture is a

'permission culture' – a culture in which creators get to create only with the permission of the

powerful, or of creators from the past" (p. xiv). Echoing Stallman's (2010) sentiment in regard to

the idea of proprietary ownership, Lessig (2004) observes:

> So uncritically do we accept the idea of property in ideas that we don't even notice how
> monstrous it is to deny ideas to a people who are dying without them. So uncritically do
> we accept the idea of property in culture that we don't even question when the control of
> that property removes our ability, as a people, to develop our culture democratically. (p.
> 261)

This belief led Lessig and others to develop the Creative Commons based on the GNU[1] General

Public License (GPL) as a public commons of knowledge and repository of cultural materials

(Sullivan, 2011).

  The GNU GPL. The GPL is the foundation upon which the FSF, the free culture

movement, and the Creative Commons base their argument for a free and open exchange of

information, cultural artifacts, or any endeavor that promotes human creativity and human

creation–art, code, literature, scientific discovery, or music (Creativecommons.org, n.d., para. 2;

May, 2006a; Sullivan, 2011). The GPL uses what Stallman coined as copyleft to indicate the

GPL stands in opposition to the tenets of copyright law (Deek & McHugh, 2008; May, 2006b;

Moore, 2002). The GPL also stands as Stallman's greatest *hack* in that the GPL uses copyright

law to thwart copyright law (Moore, 2002). The most current version of the GPL (GPLv3) was

released by the FSF in 2007. GPLv3 begins with a "Preamble" that architects the foundation of

the GPL and its use (GNU.org, 2007). Simply, the GPL ensures copyright for a piece of software

and offers a license. This license grants permission to the end-user to copy, distribute, and

modify that piece of software under specified conditions. These conditions are: (a) the source

code must be provided with each distribution of the copied, modified, or distributed software; (b)

any modifications to the original software must be included in subsequent distributions and must

include a copy of the software's original state; (c) any modifications made to a piece of software

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1 GNU is an acronym for GNU's not Unix.

covered by the GPL cannot be added to or added with proprietary software or code (GNU.org, 2007). Adding proprietary software or code to a piece of software licensed under the GPL voids the end-user's software license under the GPL, returning the software to the "ownership" of the GPL. In short, when a piece of software is licensed under the GPL, the software is always within the copyright of the GPL. This allows the GPL to ensure that proprietary code is never added to the software. The GPL license is the vehicle that allows others to modify, copy, and distribute the software as needed as long as the modified and unmodified code are re-distributed with each new version of the software (GNU.org, 2007).

FLOSS and social movements. Whether Stallman and the FSF foresaw the free software movement developing into a social movement is unclear. The philosophy of GNU and the FSF do allude to this as Stallman (1986) states that GNU, the GPL, and the FSF were created as "a technical means to a social end" (para. 131). What is clear, however, is that the free software movement and the larger idea of FLOSS advocacy for protecting and ensuring end-user freedom have been adopted by other groups and have ignited a global social movement through the activism or *hacktivism* of the FSF and the Creative Commons (CC) (Sullivan, 2011). At the heart of this social movement is the idea that software development, creation, distribution, modification, and use should not be governed by a single entity that seeks to include or exclude according to monetary, political, or social gain and that any human creation should be fully accessible and usable by any facet of society for the promotion of human creativity, the access to knowledge, and the lessening of human suffering and ignorance (May, 2006b; Stallman, 2010; Sullivan, 2011).

Statement of the Problem

The current literature focusing on FLOSS comprises a conglomerate of case-studies; policy debates; developmental and implementation models; and deployment or adoption

logistics. Each of these studies provide an understanding of FLOSS advocacy and adoption; however, there is a deeper meaning to FLOSS' existence and purpose other than as an alternative to proprietary software use and adoption. As Sullivan (2011) observes, FLOSS now comprises not only a social movement, but also a social justice cause that has found a place within the ideals of the free culture movement. Taking Sullivan's (2011) idea further, FLOSS advocacy is not only a movement that tends toward social justice or free culture, but also to a humanist ethical treatment of humankind where the developmental practices of proprietary software companies can be interpreted as a barrier to human communication, human knowledge, and, ultimately, human development (Evans, 2002; Sullivan, 2011).

While there are many studies that cite the positive attributes and the negative barriers of FLOSS policy, development, advocacy, or adoption, much of the literature falls easily into the following categories: (a) the cost benefits of FLOSS; (b) FLOSS' freedom from vendor lock-in; (c) FLOSS' high adaptability and scalability; (d) the hidden costs associated with FLOSS such as adaptation with legacy software integration, portability, or migration; (e) training costs; (f) and the possible hiring of new technical employees for training and system administration (Ayala et al., 2011; Colford, 2009; Deek & McHugh, 2008; Dyson et al., 2007; Gallego et al., 2008; Nagy et al., 2010). While these reasons are highly documented within the corpus of FLOSS literature, what is missing from the literature is FLOSS' direct influence on human development, in particular, FLOSS' influence on the expansion of human capabilities or choices and what those capabilities are, by providing an alternative platform for accessing the world's knowledge and information. If one were to take Stallman's (2010) idea of freedom as adopted by the FSF, then the adoption and utilization of FLOSS could lead to human development through the expansion of human capabilities by providing a freedom in choice to use a FLOSS-based platform instead of a proprietary-based platform to access the world's knowledge and information. In addition,

this freedom in choice would come with the added value of FLOSS' strengths that are referenced within the literature by providing access to software that is highly adaptable to the end-user's needs, is economically viable, and promotes open access to knowledge and information. This, however, is often lost in the literature as many studies focus on large regional statistics or on ICT projects developed for a specific region or population. While many sources cite the use of ICTs in developmental studies as well as the viable option of FLOSS to promote freedom from vendor lock-in and price, what is unclear is whether the actual application, adoption, and use of FLOSS leads to the end-user's development through her freedom of choice in software platforms to access the world's knowledge and information. This piece is needed as one could argue that human development and access to the world's knowledge and information is just as easily attainable with a proprietary software.

The idea of development leading to freedom is not a new one (Sen, 1999). Within the FLOSS community, many FLOSS organizations and FLOSS developers already interpret FLOSS as a means to freedom as well as a freedom itself (Sullivan, 2011). Even this idea is not a new one as Stallman (2010) has professed as much throughout most of his career dating back to the early days of the MIT hacker community. Even so, many FLOSS advocates and organizations directly or indirectly misinterpret the ethical and philosophical issues presented by Lessig, Stallman, and others who interpret the idea of FLOSS as a right as natural as the right to live a life one values. This is not to say, however, that this misinterpretation is a negative one. There are many organizations who use FLOSS for purposes that focus on facets of FLOSS advocacy and adoption that lay outside of the philosophical and ethical issues addressed by the FSF and CC. An example of this misinterpretation is the Humanitarian FOSS Project. The Humanitarian FOSS Project (2013) develops FLOSS solutions to better humanity for reasons other than placing the end-user's freedom as its ends such so as to "stimulate interest in the computer

science major" (para. 2) by participating in the FLOSS community. In the example of the

Humanitarian FOSS Project (2013), the end-user's development and freedom, while touted as an

ends, are reduced to a by-product of the group's larger focus of "contributing to our

communities . . . [to] generate more interest in, and counteract misperceptions of, academic

computer science as a field of study" (para. 3). While the ends of the Humanitarian FOSS Project

(2013) are sound for generating an "interest in the computer science major," the end-user's

freedom is secondary to the its larger goal–"[to] generate more interest in . . . academic computer

science as a field of study" (paras. 2-3). A second example of this misinterpretation comes from

groups that advocate for FLOSS and freedom from an economic point-of-view that precludes

humankind (Sullivan, 2011). These groups focus on the *idea* of software that is free by invoking

labor theory and consumer sovereignty leaving the end-user's freedom in software by the

wayside in favor of economics and philosophy that do little to promote human development

through the adoption and utilization of FLOSS outside of an academic environment (Sullivan,

2011).

What separates this study's focus from Stallman's life's work and that of organizations

like the Humanitarian FOSS Project is its focus on FLOSS' influence on human development by

expanding human capabilities. This expansion provides more choice in choosing software to

access the world's knowledge and information. In this sense, FLOSS is a means, a tool, and not

an ends for promoting human development. Stallman (2010) alludes to this; however, his

message gets lost in the image that he has created for himself. While a highly respected member

of the free software community (Stallman would eschew the term FLOSS as he sees the open

source movement distinctly different from the FSF's), Stallman's legacy has established him as

the philosopher-king of the free software and larger FLOSS communities. This has placed

Stallman in the ontologically removed position of a philosopher. This in no way detracts from

Stallman's influence; however, as the philosopher-king of the FLOSS movement, the documentation of the groundwork needed to effectively promote, adapt, train others, and utilize FLOSS in life's real world operations is missing in the broad brushstrokes that Stallman is actively creating for FLOSS advocacy, policy, and adoption. These real world operations (the micro-vision) are alluded to but are often only minutely discussed in Stallman's work (the macro-vision). It is here that this study took Stallman's (2010) idea of software freedom as well as Amartya Sen's (1999) capability approach of human development (a freedom-based approach) to explore a real world application of FLOSS adoption and use to understand FLOSS' place in human development.

Purpose of the Study

The purpose of this qualitative case study was to understand in which human spaces free, libre, and open source software (FLOSS) helped to promote sustainable human development by expanding human capabilities (choices) in accessing the world's knowledge and information in one community.

Research Question

This study was guided by the following research question: Has FLOSS helped to expand human capabilities by providing access to information?

Theoretical Framework

The theoretical framework utilized in this qualitative case study is modeled on Amartya Sen's capability approach as discussed in *Development as Freedom* (1999) and *The Idea of Justice* (2009). The capability approach is a two-fold approach comprised of a person's functionings and capabilities. In this model, functionings reflect "the various things a person may value doing or being," and capabilities are "the alternative combinations [or choices] of functionings that are feasible for her to achieve" (Sen, 1999, p. 75). According to Sen (1999),

"the combination of a person's functionings reflects her actual *achievements,* the capability set represents the *freedom* to achieve: the alternative functioning combinations from which this person can choose" (p. 75). For Sen (1999), "capability is . . . a kind of freedom: the substantive freedom to achieve alternative functioning combinations (or, less formally put, the freedom to achieve various lifestyles)" (p. 75). Sen (1999) uses the term substantive freedoms to include "elementary capabilities like being able to avoid such deprivations as starvation, undernourishment, escapable morbidity and premature mortality, as well as the freedoms that are associated with being literate and numerate, enjoying political participation and uncensored speech" (p. 36). It is important that Sen (1999) includes capabilities as a substantive freedom in that he defines and understands development as the "expansion of freedom" (p. 36).

      On development and freedom. In his explanation of development, Sen (1999) states that freedom is both the primary end and principal means of development or what he calls the "'constitutive role' and the 'instrumental role' of freedom in development, " respectively (p. 36). The constitutive role "relates to the importance of substantive freedom in enriching human life" and the instrumental role to "the way different kinds of rights, opportunities, and entitlements contribute to the expansion of human freedom in general and . . . to promoting development" (pp. 36-37). While the constitutive role (the primary ends of development) acknowledges the importance of human substantive freedoms in "enriching human life," it is within the instrumental role (the primary means of development) that Sen (1999) states that "different kinds of freedom interrelate with one another, and freedom of one type may greatly help in advancing freedom of other types" (pp. 36-37). The constitutive and instrumental roles are "thus linked by empirical connections, relating freedom of one kind to freedom of other kinds" (Sen, 1999, p. 37). Therefore, the expansion of one's substantive freedoms (the primary end of development) not only "enriches human life," but it is also instrumental (the primary means of development) to

"advancing freedom of other types" (pp. 36-37). In Sen's (1999) theory of development, the expansion of freedoms and the removal of deprivation leads to development. Therefore, the expansion of substantive freedoms and the removal of barriers to substantive freedoms constitute development. Sen's (1999) development model is a circular or reflexive theory where substantive freedoms enrich human life and at the same time advance "freedoms of other types" (p. 36).

Sen's (1999) theories of freedom and development are quite vast but are, at the same time, vital to understanding the capability approach. On freedom, Sen (1999) states that "freedom is central to the process of development for two distinct reasons" (p. 4). These "two distinct reasons" are: the "evaluative reason" and the "effectiveness reason" where the evaluative reason means that the "assessment of progress has to be done primarily in terms of whether the freedoms that people have are enhanced" and the effectiveness reason that "the achievement of development is thoroughly dependent on the free agency of people" (p. 4). Of importance here is the focus on the implied emphasis of the substantive freedoms of individuals. On individual freedom, Sen (1999) writes that

> individual freedom is quintessentially a social product, and there is a two-way relation between (1) social arrangements to expand individual freedoms and (2) the use of individual freedoms not only to improve the respective lives but also to make the social arrangements more appropriate and effective. (p. 31)

In Sen's (1999) model, the individual expansion of substantive freedoms leads to the expansion of other and others' substantive freedoms, thereby creating a larger community where substantive freedoms enrich human life both individually and communally as well as develop other freedoms or avenues to other freedoms. In many ways, Sen's (1999) model is highly organic in its growth and resembles a tree where each branch is unique and spurs other branches to grow by and through its own growth, and yet, the entire system is a part of the same substantive trunk.

The capability approach. The capability approach is only one approach within Sen's

vast theories of development, freedom, and justice (1999, 2009). Within Sen's (1999) extensive

theory of development, "freedom is central to the process of development for two distinct

reasons"–the evaluative reason and the effectiveness reason (p. 4). Sen's (1999) capability

approach falls within the evaluative reason where the "assessment of progress has to be done

primarily in terms of whether the freedoms that people have are enhanced" (p. 4).

The capability approach has two modes. The first mode is centered on realized

functionings (Sen, 1999). This can be interpreted as "what a person is actually able to do" (Sen,

1999, p. 75). The second mode, focuses on the capability set of alternatives, or, one's "real

opportunities" (Sen, 1999, p. 75). Sen (2009) expands on this by stating that the

> capability approach focuses on human life, and not just on some detached objects of
> convenience, such as incomes or commodities that a person may possess, which are often
> taken, especially in economic analysis, to be the main criteria of human success. (p. 233)

Sen (2009) goes on to write that "the capability approach is a general approach, focusing on

information on individual advantages, judged in terms of opportunity rather than a specific

'design' for how a society should be organized" (p. 232). This is in alignment with the organic

and reflexive nature of substantive freedoms advancing other types of freedoms. Therefore, in a

circular pattern, substantive freedoms enrich human life, then advance other freedoms. Those

other freedoms then advance human life, thereby advancing other freedoms. This circular pattern

is true of the individual as it is of the community.

Through this circular reflexivity, individual capabilities or choices–a type of substantive

freedom–are created and/or expanded adding to one's functionings–the various things a person

may value doing or being–where one has more opportunity to live the kind of life she values to

live (Sen, 1999, 2009). Even so, Sen (1999) writes that to "counter the problems that we face, we

have to see individual freedom as a social commitment" (p. xii). Substantive freedoms,

functionings, and capabilities depend on "social and economic arrangements . . . as well as

political and civil rights" (Sen, 1999, p. 3). Such an approach, Sen (1999) reasons, "allows us to acknowledge the role of social values and prevailing mores, which can influence the freedoms that people enjoy and value (p. 9).

The capability approach, while quite simple on the surface, is highly complex below the surface in that it is quite high-context where individual freedoms not only benefit the individual, but also the community. Sen (2009) states that

> the focus of the capability approach is . . . not just on what a person actually ends up doing, but also on what she is in fact able to do, whether or not she chooses to make use of that opportunity. (p. 235)

Be that as it may, Sen (2009) acknowledges that "the capability perspective does point to the central relevance of the inequality of capabilities in the assessment of social disparities" (p. 232). Sen's (2009) acknowledgement is important in that he recognizes that humankind does not have an equal capability set to live by or to fulfill the kind of life both the individual and society value. The inequality of capabilities can be inter- or intra-communal or personal. This becomes apparent, for example, when one thinks of whether a woman in the United States has the same capability set in the form of equal access to education, clean water, or health care as a woman from a developing region. In the Senian approach, one would have to access numerous variables including culture, gender relations, the sociopolitical environment, and the socioeconomic environment to begin this type of analysis. Even so, under Sen's model, if the answer is no (of course, this is dependent on the women being compared), then one would have to begin such an analysis by assessing what unfreedoms could be removed to expand one's capabilities that would then lead to more variability in one's functionings.

Because of Sen's (1999, 2009) organic theoretical approach, it is sometimes difficult to separate the pieces of the reflexive circular motion of expanding one's substantive freedoms to enrich human life that then lead to advancement of more freedoms and so on. The important

piece in this analysis is that in Sen's (1999, 2009) theoretical approach, development is the removal of unfreedoms and the expansion of substantive freedoms. Capabilities (choices) are a type substantive freedom that an individual or the community have that add to the functionings of that person or community. The capability approach assesses one's capabilities in an attempt to find a manner in which to expand one's capability set by removing unfreedom, thereby expanding one's functionings or the ability to live the kind of life that one has reason to value, live, and cherish.

FLOSS and the capability approach. The capability approach was utilized within this study to help the researcher understand in which human spaces FLOSS helped to promote sustainable human development by expanding human capabilities (choices) in accessing the world's knowledge and information, thereby expanding individual and community-based functionings. Whereas, much of the literature on FLOSS focuses on the varying software platforms and economic advantages of adopting or utilizing FLOSS, this study's intent was to examine a very human level where FLOSS was introduced to families to help them expand their capabilities in accessing the world's knowledge and information. In accordance with the literature, this initial FLOSS introduction was an economically viable and community supported solution for providing access to the world's knowledge and information; however, for this study's participants, a choice in accessing the world's knowledge and information was already denied socioeconomically. In this sense, FLOSS became a means and not an ends. The ends was human development through the means of FLOSS.

Definition of Terms

Application Programming Interface (API): An API is a programming component that specifies how software components interact with each other.

Fork: A fork is a software development project whose source code was taken from

another project. The act of creating a forked project is forking.

Free, Libre, and Open Source Software (FLOSS): Free, libre, and open source software (FLOSS) is software that is openly developed allowing developers and end-users to see the source code and then adapt that source code according to need. FLOSS is often free as in price; however, this is not always the case. Synonyms include open source software (OSS), free and open source software (FOSS), open source, or free software.

GNU: A reflexive acronym for GNU's not Unix. GNU is also a collection of rewritten Unix programs created and maintained by the Free Software Foundation (FSF). In rewriting Unix programs, Richard Stallman and the FSF were able to circumnavigate the proprietary constraints of Unix and still benefit from Unix's functionality.

GNU/Linux Operating System: The GNU/Linux operating system is a Unix-like operating system that is comprised of GNU's application layer and the Linux kernel effectively creating a fully functional Unix-like operating system.

Hacker: Hacker refers to one who works on solving complex problems and is separate from its more recent adopted definition that refers to one who knowingly performs malicious acts using computing technology.

Internet Service Provider (ISP): An Internet Service Provider is an entity that provides access to the Internet.

Kernel: The kernel is a piece of software that facilitates computing resources and communication between software applications and computing hardware. Without a kernel, a computer has no way to communicate between the commands issued by an application and the hardware that is to carry out that command. The Linux kernel, when added to the GNU system, creates the complete GNU/Linux operating system.

Linux: Linux is an open source software kernel that has popularized the GNU/Linux

operating system. Linux is also a synonym for the GNU/Linux operating system. The FSF views

the use of the term Linux without GNU preceding it as technically wrong as a kernel without

applications does not yield a fully operational operating system.

Linux Unified Key Setup (LUKS): Linux Unified Key Setup (LUKS) is a form of hard

disk encryption native to the Linux operating system.

Local Area Network (LAN): A Local Area Network (LAN) is a group of networked

computers in close proximity to each other such as can be found in a school or office building.

Computers connected by LAN are able to exchange information with each other. A LAN may or

may not have access outside of its local area.

Logical Volume Management (LVM): Logical Volume Management (LVM) is a type of

storage partitioning scheme where the physical hardware is abstracted to form logical volumes

that can be combined with other logical volumes across many physical devices.

Proprietary Software: Proprietary software is software whose code is not open to outside

developers and end-users. Proprietary software usually comes with a cost and an end-user

agreement not to use the software in a manner other than its original intent. Proprietary software

also prohibits open sharing of software effectively rendering it "closed." Proprietary software can

be free in price or come with a cost.

Master Boot Record (MBR): A MBR is the first sector of a hard disk that begins an

operating system's boot process. Without an MBR, an operating system cannot start.

Router: A router is a piece of computing hardware that provides an access point from an

Internet Service Provider (ISP) to a computer via a physical Ethernet (wired) or Wi-Fi (wireless)

connection. A router provides access to the Internet.

Source Code: Source code are human-readable computer commands that allow computer

programmers to write commands for a computer program. Source code is written in one of the

many computer languages such as Ruby, Python, C, and Perl.

Unix-like: Unix-like is a term to signify operating systems that are descendants of the Unix operating system but are not Unix. Because Unix is a proprietary operating system, the term Unix-like was adopted to signify any operating system that behaves like Unix. The term Unix-like is also written as UN*X or *nix and has been in use since 1979. The GNU/Linux operating system is an example of a Unix-like operating system as is Apple's OSX. Unix-like operating systems can be either open source or proprietary.

Wide Area Network (WAN): A Wide Area Network (WAN) is a group of networked computers whose geographical footprint is much larger than a LAN's. A WAN may span across a state, province, or country. WANs also connect smaller groups of LANs.

Wireless Fidelity (Wi-Fi): Wireless fidelity (Wi-Fi) is a computing technology that allows computers to access the Internet or Wireless Local Area Networks (WLAN) using radio waves to exchange data.

Wireless Local Area Network (WLAN): A Wireless Local Area Network (WLAN) is a computing technology that allows computers to connect via radio waves to each other and the Internet via a central access point such as a router. WLAN is what is meant when one connects wirelessly via Wi-Fi to the Internet or a database.

Methodology Overview

A case study approach was chosen as the research design for this study. According to Stake, a "case study is less of a methodological choice than 'a choice of what is to be studied'" (as cited in Merriam, 2002, p. 178). The "case," itself, is a bounded system, a single entity, that can comprise time, space, or components such as location or participants (Merriam, 2002).

A case study can be either quantitative or qualitative; however, for this case study, the focus was a qualitative one. Merriam (2002) states that "qualitative case studies share with other

forms of qualitative research the search for meaning and understanding, the researcher [as] . . .

the primary instrument of data collection and analysis, an inductive investigative strategy, and

[an] . . . end product [that is] . . . richly descriptive" (pp. 178-179). As a case study is a bounded

system, it can also be combined with other qualitative approaches and techniques allowing the

strength of those other qualitative approaches to add to the case study proper (Merriam, 2002).

For this qualitative case study, participants' experiences were used to strengthen the case study's

findings. The focus will remain the bounded system (the case); however, experiential data will be

used to interlace the human-centered focus of this study.

Setting

This study's primary setting was in Taylor, Texas, a small city located east of Round

Rock, Texas. Taylor has approximately 16,000 residents with approximately 5,738 households

within the city (U.S. Census Bureau, 2013). Taylor's demographics comprise 45% White, 42.8%

Hispanic or Latino, 10.2% African American, 1.2% Native American, 0.7% Asian American,

0.1% Pacific Islander (U.S. Census Bureau, 2013). Taylor's per-capita income is $20,296 with a

median household income of $43,484 (U.S. Census Bureau, 2013). The percentage of citizens

living below the poverty level is approximately 17.3% (U.S. Census Bureau, 2013).

Educationally, students in Taylor are served by Taylor Independent School District with a high

school completion rate of 81.3% (Texas Education Agency, 2013).

Reglue. Recycled Electronics and GNU/Linux Used for Education (Reglue) is a non-

profit organization based in Taylor, Texas, that is committed to providing children and their

families Linux-based computers to bridge the digital divide (Reglue, n.d.-b). As with many

FLOSS-based organizations, Reglue is a communal effort among FLOSS advocates and

volunteers to provide FLOSS-based solutions to those who need computing technology to access

the world's knowledge and information as well as to perform computing tasks that would not be

possible otherwise.

Reglue has a three-part mission that emphasizes technology, giving, and education.

Reglue's three-part mission statement reads:

> Technology – The child destined to invent the next version of the Internet could be without a computer right now. We need to change that.
>> Giving – We furnish eligible children with Linux computers in an effort to ensure no one is left on the wrong side of the digital divide.
>> Education – We not only give these children computers, we teach them how to use them to build their futures. (Reglue, n.d.-b, paras. 1-3)

Since 2005, Reglue has provided "1102 disadvantaged Austin-area kids and their families a computer" (Reglue, n.d.-b, para. 5). Reglue also provides free computing classes at its headquarters focusing on basic computing tasks such as typing to more complex Internet-based computing tasks.

Reglue's efforts have been recognized with a front page story in the *Austin American-Statesman* as well as the by community of Austin, Texas, who awarded Reglue with the Dewey Winburne Award for Community Excellence presented at the 2010 South by Southwest (SxSW) Interactive, Film, and Music Festival (Reglue, n.d.-a). While Reglue has been recognized by the community of Austin, Texas, recent Reglue endeavors are now focused on no more than a 50-mile radius around Taylor, Texas. While this 50-mile radius easily includes sections of Austin, Texas, it is Reglue's executive director's belief that one should give back to the community in which one lives (personal communication, May 3, 2013). All data collected for this qualitative case study came from families and individuals that Reglue has given a Linux-based computer to within Reglue's 50-mile radius of influence including those who have moved from this radius of influence. As all Reglue Linux-based computers come with continued technical support, Reglue meets its families where they are. This includes traveling extensively throughout Central Texas to provide that support.

Background of the Researcher

The researcher's background is one of humble beginnings. The researcher's childhood was near the Texas/Mexico border in a region called The Rio Grande Valley. Access to information came via limited television, schools, and modest libraries. Internet penetration did not fully arrive until the researcher was in college, and FLOSS was unknown. The world was nothing more than dusty streets and a pining to learn more of the world that existed outside of the small towns of Raymondville, Sebastian, and Harlingen, Texas.

In college, the researcher learned of the Internet via an introduction to chat rooms in April 1994. Still, the researcher was not fully connected to the Internet until 1999 when he purchased his first desktop computer and quickly learned that purchasing a desktop computer was only the beginning–one also had to purchase a lot of expensive proprietary software in order to perform common tasks such as word processing. This, however, did not hinder the researcher as he simply borrowed a copy of a proprietary word processing program as well as other necessary programs and installed them onto his computer.

As Internet technologies grew, the researcher began to exchange and download proprietary software not fully knowing of the illegality of doing so as doing so was no different than copying a music CD belonging to someone else onto a cassette tape. It was not until the Napster controversy of the late 1990s that the researcher realized that proprietary goods (music, software, film, etc.) were protected under the law and one could be heavily fined or jailed for sharing one's copy of proprietary goods with others. Naturally, this did not sit well as the researcher was fully engulfed in his college studies where the exchange of knowledge and tools was a free and open exercise of the learning community. After all, if one could share a book, why not a program or music file?

In 2004, the researcher purchased his first laptop. As with his first desktop computer, it

did not come with necessary programs to provide the needed functionality. As with the desktop computer, a necessary program was needed and purchased for the researcher to type his Master's thesis. This program was proprietary and expensive. What choice did the researcher have but to purchase the program.

Also in 2004, the researcher read an article about OpenOffice.org, a FLOSS word processing program. Out of curiosity, the researcher downloaded and installed OpenOffice.org (OpenOffice) and was able to point his students who could not afford the expensive proprietary word processing program to also download and install OpenOffice. This was the researcher's first encounter with FLOSS. From this first discovery, others soon followed such as Firefox (an Internet browser), Friendster (a defunct social networking site), Thunderbird (an email client), Shockwave.com (a site for watching film), and GNU/Linux.

The researcher fully adopted FLOSS in 2011 during a 3-month international internship in Tanzania where he met other FLOSS advocates in preparation for the internship. During the internship, the researcher only used FLOSS and quickly learned that powerful computing was just as viable and available with FLOSS as it was with proprietary software. The researcher has never willingly used proprietary software since.

Significance of the Study

The significance of the study was to add a human focused qualitative case study to the corpus of FLOSS literature. In doing so, this study fills a gap between the large expansive quantitative studies on FLOSS adoption, policy, and use and the numerous studies on the advantages, practical or economic, for adopting and using FLOSS. This was accomplished by capturing the words and experiences of families who were introduced to FLOSS through Reglue's efforts and to analyze in what human spaces their capability sets were expanded.

A benefit of this study is that it could serve as a measure for other researchers studying

FLOSS and its influence on human life. The themes and lessons learned from this study could also assist organizations similar to Reglue in their endeavors providing FLOSS-based computing technology to other communities. This study also serves as a foundational study for the researcher to build upon.

Limitations of the Study

A primary limitation of the study is its duration. While the time frame suited this study's purpose, a broader study on FLOSS' ability to help expand human capabilities could only stem from a years long study that focuses on multiple regions, participants, and organizations. This type of study could only be possible with the enlisted help of other researchers, organizations, participants in the hundreds or even thousands, NGOs, and governmental organizations. It was not this study's purpose to explore all instances of how FLOSS helped to expand human capabilities as that could easily encompass one's life's work. Rather, this study's focus was one small non-profit organization and the community it serves to better understand in which human spaces FLOSS helped to promote sustainable human development by expanding human capabilities in accessing the world's knowledge and information.

A second limitation of the study is that all of the participants had positive experiences with FLOSS. While there were minor setbacks, all participants felt that FLOSS was a viable alternative to proprietary software. Therefore, all findings fall within a narrowed scope as there were no negative experiences.

Summary

This chapter served as an introduction to the study and its key concepts. A historical perspective on the FLOSS and the proprietary software development models was provided to give context to the study's purpose, significance, and the research question. The capability approach was introduced including the researcher's reasoning for choosing the capability

approach as the study's theoretical framework. This chapter ended with the significance of the

study for future researchers and provided two limitations of the study.

Chapter 2: Review of Literature

Introduction

The last twenty years have witnessed the exponential growth and influence of ICTs (Erturk, 2007). From hand-held devices that provide real-time mobile banking, to children receiving instruction via an open or closed local area network (LAN), the scope and depth of how and where ICTs shape the world are almost unfathomable in the amount of data that is transferred during any given moment in time. Internet computing technologies and general computing development continue to grow in depth and speed as do the varying aspects of ICTs such as the software and the hardware used to access the Internet and perform basic computing tasks that are increasingly deemed vital to modern work-flow and daily life. This rapid development, however, is creating a bifurcation between those who have and those who do not have access to the Internet or computing technologies in general. This bifurcation is often called the digital divide and is addressed below.

Access to the Internet and computing technologies has caught the attention of many researchers for a number of reasons. Current research illustrate several key areas for understanding how the Internet and computing technologies shape not only the world, but also individual people and communities by providing access to the world's knowledge and information. These research areas include ICT development for developing and developed regions and their people; the use of ICTs to inform practice and policy; and the continued development of ICTs including the barriers to development as well as the successes of such development. What remains key to the current body of ICT research is the focus on how to provide powerful computing technology to the world and its people as a means of providing access to the world's knowledge and information. Underneath this overarching theme are many sub-genres of ICT and computing research such as highly complex technical research on

computing and networking platforms; research on how to provide Internet access to indigenous people; and research on legal issues such as copyright law, patent law, and the implications of the massive online sharing of the world's knowledge and information.

Whether one has access to the Internet and other computing technologies has become key in our modern epoch as our daily lives continue to grow more dependent on these technologies. As such, the Internet and other computing technologies are now factored into one's Quality of Life (QOL) by some researchers (Lee, Leung, Lo, & Xiong, 2007). In doing so, a fissure or digital divide has become apparent and is one that many researchers, developers, and computing activists have or have attempted to address as how does one factor in the reality of what the digital divide means to the QOL of those who do not have access to or adequate access of ICTs and other computing technologies (Lee et al., 2007).

Toward a Definition of ICTs and Computing Technologies

The fluid nature of the term "ICT," itself, is difficult to properly define in that many would have to come to agreement as to whether there is an inherent hierarchy of ICTs or even a definition to what constitutes an ICT–for example, is a television or radio considered equal to an mp3 device or tablet computer. Another area to define would be the conditions when a certain ICT may be more valued than another ICT such as a television trumping a tablet computer or vice versa (Lee et al., 2007). Even more poignantly, many would have to examine the implications to QOL as well as to ICT and computing technology development for those who do not possess, use, or have ever been introduced to varying aspects of ICTs as one would have to assess how people or regions without access to ICTs and other computing technologies figure into a worldly future that is purportedly and ever-increasingly dependent on ICTs.

To make sense of the terminology used in this qualitative case study, ICT and computing technology must be defined as they are utilized within this study. Therefore, this study defines an

ICT as any device that provides access to the world's knowledge and information or that can be used for inter-personal communication. This definition encompasses older technology such as televisions and radios, but also more complex technologies such as the Internet and networking. A computing technology, on the other hand, is a technology that involves some form of computer such as a smartphone, a desktop computer, or a tablet computer. Therefore, a device can be an ICT and not a computing technology, and a computing technology is always an ICT.

As this study is focused on the work of Reglue (n.d.-b) and its endeavor to provide Linux-based computers to "underprivileged children and their families" (para. 1) in Taylor, Texas, ICT and computing technology can be used synonymously as Reglue's work uses both computing technology (networking devices and computers) and ICTs (technology that is used to provide access to the world's information and knowledge such as the Internet and the computers that are utilized in the actual computing). While this definition suits the needs of this qualitative case study, it is important to remember that not all ICTs are computing technologies. For instance, many studies in the current body of ICT research speak to the use of older technologies to provide access to the world's information and knowledge as well as to culturally significant information and history. Examples of the latter include the research of Lee et al. (2007) and their study on the power of televisions and radio in accessing information in three Chinese cities as well as many of the case studies presented in Dyson et al. (2007). While this distinction is small, it is important to keep in mind that with the excitement that often envelopes Internet computing development, it is easy to overlook older technologies that have been proven effective in lieu of newer computing technologies. Even so, the differences between the older and newer ICT and computing technologies does produce a digital divide that is made even more poignant when neither the older nor newer ICT or computing technologies are available to or accessible by a region or people.

The Digital Divide

Target 8.F of the United Nations' Millennium Development Goals directly address the digital divide. The UN predicted that 2.7 billion people would have access to the Internet by the end of 2013 (United Nations, 2013, p. 56). Of this 2.7 billion, 1.3 billion are women and 1.4 billion are men (United Nations, 2013, p. 57). Much of this access is from developing countries who are experiencing a significant increase in access to mobile-broadband technologies (United Nations, 2013, p. 57). Even with these encouraging numbers and the continued growth in the number of people from both developed and developing countries who have access to the Internet, many areas of the world still find themselves without access to the Internet because of cost and poor infrastructure (United Nations, 2013, p. 57). The digital divide, however, has more facets than simply having or not having access to the Internet.

The digital divide can be interpreted to mean different things. For instance, it can simply mean the difference, in a Western context, between the haves and the have-nots in regard to ICT or computing technology use or access; or, it can mean "the recognition of the importance of access to skills, social and technical support and know-how" (Selwyn & Facer, as cited in Rubagiza et al., 2011, p. 40) that is either available or unavailable for a myriad of social, economic, or cultural reasons. This latter viewpoint aligns research concerning software solutions or platforms for emerging economies and the introduction of ICTs to regions or people without previous access (Erturk, 2007; Marson, 2005; Salazar, 2007; Young 2008; Zhang, 2007). As with this study's attempt to define ICT and computing technologies, Sutherland further asks what constitutes ICT, access, or engagement while attempting to convey the need for culturally based definitions within the larger body of ICT and technological definitions (as cited in Rubagiza et al., 2011, p. 40). Sutherland is not alone in his call for culturally based ICT and computing technology definitions (as cited in Rubagiza et al., 2011). For instance, Lee et al.,

(2007) found that in urban Chinese settings, the Internet and mobile technologies outranked television and other ICTs in terms of use and perceived benefits to one's quality of life (QOL). This finding places television as an active component of ICT use; however, many end-users simply do not interpret a television as an ICT due to its technological age as well as the tendency of television end-users to view a television simply as hardware and not a computing or mobile computing device such as a laptop computer or mobile phone. Even this image of televisions is changing with the advent of smart TVs that provide Internet access and other computing capabilities further blurring the boundaries toward finding a definition of ICT and computing technologies as the names of older non-computing technologies (the signifier) are deconstructed to form and point to new ideas or new meaning of technologies (the signified) that echo their older non-computing counterparts such as a cellular phones becoming smartphones or televisions becoming smart TVs.

So, if the digital divide can be interpreted beyond simply having or not having, namely, hardware (software is a moot point without the needed hardware), then a more complicated picture rises out of the digital divide. Hardware, while not inexpensive, can be found in the remotest regions of the world due to personal acquisition, donations, or the deployment of previous ICT projects (Erturk, 2007; Hughes & Dallwitz, 2007; Momo, 2005; Rubagiza et al., 2011). For example, mobile technology in the form of handsets can be found in the remotest regions of Africa due to prepaid low-cost services such as SMS and the absence of needed credit checks (Momo, 2005). So, if hardware can be found within the far reaches of the world, then where does the digital divide reside, where does this divide begin, and what are the divide's parameters? Add to that, hardware, while available in the remotest regions of the world, is expensive and still uncommon to many regions (Erturk, 2007). To begin to get at the heart of the digital divide, one must view this divide as a complicated slippery slope or a paradox that resides

within a triangular relationship comprised of hardware, software, and infrastructure.

Hardware. As noted above, hardware, while not inexpensive, can be easily procured either through a person's own means (purchasing a mobile handset such as a cellular phone), through donation, or through collaborated ICT endeavors. Even so, hardware limitations, regardless of expense, easily lend themselves as a component of the digital divide in terms of human capital and infrastructure (Erturk, 2007; Marson, 2005). This divide becomes even more apparent when ICT projects focus on rural regions and people where hardware has never been a component to or a necessity of daily survival. In a poignant statement in the "Introduction" to their collection of studies on ICT development for indigenous people, Dyson et al. (2007) write that

> there is a growing interest in information technology (IT) by indigenous peoples around the world. Indigenous peoples see this as a means of preserving their traditional cultures for future generations as well as providing their communities with opportunities for economic and social renewal. However, in an age dominated by information technology, indigenous peoples have often found themselves separated by the digital divide. (p. x)

Even with this growing interest and desire to become *connected* by the indigenous groups studied by Dyson et al., (2007), hardware malfunctions. This, then, brings another complication as to who will be on site to make repairs. For instance, if an ICT project is deployed in a remote region, who will be there to make a repair a year or two later when that hardware fails–and it will eventually fail? Human capital becomes a component of the digital divide as it will take a significant amount of time to teach hardware repair to a group or people who may never have seen such hardware (Rubagiza et al., 2011). Sourcing parts also becomes a component of the digital divide as computing hardware and parts are not readily or easily available in remote regions. Also, if a donated piece of hardware should malfunction, then from where will the capital come to replace a component of that hardware? Add to this any cultural considerations and what arises is a milieu of seen and unforeseen variables to plan for, many of which are

unfathomable until an actual ICT deployment ensues.

Software. As software is a moot point without the proper hardware, the same is true of hardware without the proper software. Software can easily exploit any hardware limitations, thereby creating dilemmas such as broken programs that render the hardware unusable or programs that create hardware freezes by utilizing too many hardware resources. Hardware considerations aside, software deployment comes in two varieties– proprietary and FLOSS.

In an effort to decrease the cost of ICT projects, many organizations have gravitated to using FLOSS (Erturk, 2007; Weiss, 2005). As with hardware, human capital comes into focus since many FLOSS programs are not what could be viewed as mainstream programs and are sometimes developed for a niche market (Erturk, 2007). In a statement on the irrelevance of FLOSS in emerging countries, Gerald Ilukwe, the general manager of Microsoft Nigeria, stated "that cost is not important" (Marson, 2005). Ilukwe goes on to say that "'it's easy to focus on cost and say how much is a product, but at the end of the day it's the total impact that's important. You can give people free software or computers, but they won't have the expertise to use it'" (Marson, 2005). Erturk (2007) also states that human capital is a real issue when deploying an ICT project. Erturk's (2007) study finds that most users of FLOSS are from core or semi-peripheral nations such as Brazil, Mexico, and The United States. This is not to say, however, that FLOSS is not of interest to developing regions since many FLOSS organizations are providing technical support in Nigeria, South Africa, Afghanistan, Kenya, and Namibia (FabFi, 2011; Weiss, 2005). Even since Weiss' (2005) writing, FLOSS has and is still becoming more user-friendly as this has been a primary concern for many researchers and end-users (Deek & McHugh, 2008; Gallego et al., 2008; Hughes & Dallwitz, 2007; Rubagiza et al, 2011).

A few benefits of utilizing FLOSS in ICT projects include the availability of multi-lingual programs as well as FLOSS' capacity to be physically manipulated, added with other non-

proprietary software, or newly developed to address the needs of end-users (Ayala et al., 2011;

Colford, 2009; Deek & McHugh, 2008; Dyson et al., 2007; Gallego et al., 2008; Nagy et al.,

2010). Also within the world's FLOSS communities are those dedicated to developing FLOSS

that runs on older or legacy (discontinued) hardware. Therefore, FLOSS is a viable option or

solution for a variety of reasons if properly approached in regard to hardware, training, and

culture (Elen et al., 2007; Primo, 2010; Young, 2008).

      Infrastructure. Infrastructure presents an interesting dilemma. As with hardware and

software, the infrastructure of not only the target region, but also that of the ICT project itself

must be at the forefront of all planning and development (Dyson et al., 2007; Elen et al., 2007;

Primo, 2010; Young, 2008). A primary infrastructure consideration is power. For instance, if

deploying an ICT project in a remote area that does not have electrical power, how will the ICT

project account for that? Also, if an ICT project relies on access to the Internet, then how is

access possible when deployment is in a remote region? While many infrastructure dilemmas

could be easily answered in an urban environment, remote environments present interesting

dilemmas (Rubagiza et al., 2011). For instance, if an Internet access solution is found for an ICT

project deployment in a remote region, then what are the financial expenditures expected of the

target group or region to continue this access? With infrastructure solutions there could come an

array of unforeseen capital expenditures on the part of the target region or people. Therefore,

infrastructure could also add to the digital divide in that once the support and training for a

certain ICT project is complete, how will the capital needed for the maintenance of the ICT

project be procured? This is particularly true if this training and support are coming from outside

sources. In short, one must ask whether a particular ICT project is needed or sustainable. This

then leads to questions on the longevity of certain ICT projects as well as the cycle of

deployment including the time expenditure needed to address not only issues of infrastructure,

but also those of hardware and software.

The digital divide is not a simple dilemma that focuses only on the Western idea of having or not having; rather, it is a complex web that interlaces culture, people, hardware, software, infrastructure, and even government. What is certain is that simply giving an ICT project to a people is not a solution for closing this divide (Rubagiza et al., 2011). Purpose is a primary concern since there are many ICT projects that proceed without regard to culture or the targeted people (Rubagiza et al., 2011; Salazar, 2007; Young, 2008). Sustainability is a second concern. To simply think that providing a targeted culture or people an ICT project for their own betterment so as to *connect* the targeted culture or people is to remove the historical and 'person-plus' aspects of that culture or people (Selwyn & Facer, as cited in Rubagiza et al., 2011; Salazar, 2007). This all too common practice negates the human aspect of ICT and FLOSS development by replacing humankind as the ends of technological development with the technology itself.

Cultural Considerations

Culture should be at the forefront of all phases of ICT development and deployment whether it be the planning stage, the development stage, the training stage, or the actual deployment stage. Salazar (2007) states "that the indigenising of digital information and communication technologies is a clear example of what might be called the cultural construction of information technology. Culture is not only shaped by technology, but also determines its use and value" (p. 16). Therefore, prior to introducing an ICT to a village, town, city, region, or country, one should understand how that particular ICT will not only function within a specific culture, but also how that ICT may be perceived by that culture (Elen, et al., 2010; Hughes & Dallwitz, 2007; Rubagiza, et al., 2011; Young, 2008). Of use in all phases of ICT development would be the utilization of some sort of cultural theory such as Geert Hofstede's Six Cultural Dimensions or Francis Kluckholn and Fred Strodtbeck's own six dimensions of culture to assist

in a beginning or continuing understanding of the nuances of the target culture (Gannon, 2004;

Hofstede, n.d.). This is particularly true if those involved with ICT development are outsiders. If

possible, an ICT group could also include someone from the target culture or someone who has a

working knowledge of that culture into the ICT construction and deployment. While this strategy

could never fully anticipate the dynamic environment of any target culture, this strategy could

provide key insight into the target culture's emic environment by way of an insider or an outsider

with who is accepted within the target culture (Dyson et al., 2007; Leclair & Warren, 2007). For

example, Hughes and Dallwitz (2007) helped to create a digital database for the Anangu of

Central Australia. Through the entire planning and implementation process of this particular ICT

project, Anangu participation was at the forefront to ensure all facets of the ICT project were

culturally appropriate. Likewise, Salazar (2007) stresses

> that the appropriation of a new technology is ultimately a process of negotiation between
> different constituencies and the creation of content is ultimately a social process. Thus,
> indigenous media production in general and the appropriation of new technology in
> particular shouldn't be seen as isolated phenomena, but as inserted in historical
> conditions and placed in intertextual and intercultural frames of reference. (p. 20)

In both instances, ICT planning and development is viewed as a social process that does not

isolate the very people, groups, or communities involved. According to Salazar (2007), all too

often, ICTs are interpreted as belonging to a finite space, an addition, rather than an extension of

an already thriving culture or what he calls *poetics*–the way "media comes into being and

functions in a given community, group or culture through its practice" (p. 19).

In tandem with cultural considerations are the many nuances of ICTs themselves. Using

Salazar's (2007) cultural construction of ICTs, these nuances can include language, the type of

icons used, the functionality of the graphical user interface (GUI) design, and the physical

construction of the ICT. Dyson et al. (2007) also observe that "there are . . . many cultural

concerns, particularly related to the management of indigenous knowledge, language issues and

questions of cultural appropriateness" (p. x). These concerns include symbols or icons that may

be offensive or conducive to a particular culture (Elen et al., 2010; Young, 2008); how ICTs are

perceived by the target culture (Elen et al., 2010; Erturk, 2007; Young 2008); how a specific ICT

will benefit the QOL of the target culture (Dyson et al., 2007; Lee et al., 2007); and the role does

gender plays in ICT construction and/or implementation (Primo, 2010). For example, Hughes

and Dallwitz (2007) observed during their development of an ICT database for the Anangu of

Central Australia that

> the primary issue has been designing and implementing an appropriate user interface.
> From the outset, the design of the user interface had the overall brief that "it can't look
> like something Microsoft would make." By this, it is meant having a Eurocentric,
> business-styled interface. Instead, the user interface had to be designed to support and
> communicate the system's primary purpose: that it was for and by Anangu. Without this,
> the system would never achieve the necessary acceptance. (p. 150)

Hughes and Dallwitz (2007) go on to observe that

> the demands on interface design have been much more than aesthetic. The people most
> likely to hold the necessary information about the archived material are older Anangu
> who have had no previous experience with computers. This meant that the user interface
> had to be user-friendly in the extreme. In addition, desert conditions make poor eyesight
> endemic to older residents. Consequently, the user interface had to use large print, bright,
> clear colours and large, easily recognisable icons. The current version includes all these
> features and is far from the generic business-styled interface usually adopted by large
> software manufacturers. (p. 150)

Within their design construction, Hughes and Dallwitz (2007) had to ensure that gender

specific information were not stored together or accessible by the opposite gender according to

Anangu cultural practice. Hughes and Dallwitz (2007) navigated around this emic by creating a

gender specific log-in screen thereby allowing access only to gender specific areas of the

database. So, gender specific information could sit side-by-side separated by log-in privileges,

thereby alleviating the need for two databases or physical machines. Avoiding this potential

cultural faux pas where offense could have easily been made by outsiders was possible with the

assistance of the Anangu during the varying development and design phases of this particular

ICT project.

Purposeful ICT development. Many groups and organizations tout ICT as a great equalizer that can, if effectively implemented, increase human capital and human economic statuses as well as decrease the gender and digital divides (Dyson et al., 2007; Primo, 2010; Salazar 2007). Sutherland, however, stresses that "when considering the potential of ICTs to enhancing learning there is still a tendency to take an optimistic view, predicated on the view that ICTs are in themselves a positional good and will somehow automatically extend young people's capabilities" (as cited in Rubagiza et al., 2011, p. 37). This is what Rubagiza et al. (2011) call a techno-centric view where it is believed that "the technology itself has the power to change practice, that technology 'causes' change in a deterministic way" (p. 39). Sutherland goes on to write that when this techno-centric point-of-view is the lens through which ICT or FLOSS developers interpret the world,

> this relates to an uncritical interpretation of the "person-plus" idea which does not take into account the fact that the ways in which technology is taken up relates to both the social and cultural context of use as well as to the design of the particular technology. (as cited in Rubagiza et al., 2011, p. 37)

Therefore, purpose, or intent, should be at the foreground of all facets of ICT development. Simply introducing an ICT to a group or people does not guarantee it will or can be interpreted by the target culture as useful or wanted. One must incorporate the target culture or population within the design, the purpose, and the construction of the ICT (Rubagiza et al., 2011; Salazar, 2007; Young, 2008). To do so ensures that one is using ICT as the means for access to the world's knowledge and information while keeping end-users as the ends.

The Case for Free, Libre, and Open Source Software (FLOSS)

The adoption, advocacy, and use of FLOSS was introduced in Chapter 1 with a brief background and a brief analysis both historical and contemporary. In that analysis, a history of

FLOSS under the definitions of the FSF and the OSI was presented with the understanding that while both organizations interpret and use the many terms that also reference FLOSS (OSS, free software, FOSS), the general term FLOSS would be used in this study. While there are many internal organizational white-papers as well as studies on the differences between both organizations, the philosophical differences between both organizations, while interesting, are moot for the purposes of this study (Deek & McHugh, 2008; Stallman, 2010; Sullivan, 2011).

FLOSS' influence is felt in most Western lives without much thought given to its existence (Gallego et al., 2008; May, 2006a; Vajda & Abbitt, 2011; Nagy et al., 2010; Noonan et al., 2011). Even so, FLOSS is very much a part of the modern technological landscape of Western existence whether it be through the use of FLOSS software such as Google Chrome or Mozilla Firefox to browse the Internet; using a cellular phone with the Android operating system; or social networking using sites like Facebook or LinkedIn. For many in the West as well as a growing number of regions in the Middle East, Africa, and Asia, FLOSS has quickly become a major component of daily existence that can keep one informed of world occurrences or help to ignite a revolution like that witnessed during the Arab Spring by not only providing access to the world's knowledge and information, but also a voice to those whose voice may have otherwise been silenced (Dewey, 2012; Sullivan, 2011). What remains true in whatever capacity FLOSS is utilized is that FLOSS is a viable option to access the world's knowledge and information as well as to provide a voice to the otherwise voiceless (Dewey, 2012; Primo, 2010).

While there are many facets to FLOSS advocacy, adoption, and use, FLOSS remains an interesting point of contention to many for a variety of reasons (Deek & McHugh, 2008; Lessig, 2004; Stallman, 2010). Some of these reasons include the fear of losing business by what is seen as the giving away of labor and the fear of losing one's right to intellectual property (Aho & Puttonen, 2001; Deek & McHugh; May, 2006a; Stallman, 2010; Sullivan, 2011). While the *idea*

of FLOSS is somewhat foreign to a Western audience conditioned to the tenets of late Capitalism (in particular the notion of private property) an analogy used by Stallman in the documentary *The Code* (Aho & Puttonen, 2001) will help to illustrate the driving idea behind FLOSS development, advocacy, adoption.

Stallman's analogy. The documentary, *The Code* (Aho & Puttonen, 2001), begins with Richard Stallman providing an analogy to illustrate how the fears of FLOSS' detractors are actually unfounded. In his analogy, Stallman also highlights the limits to which software companies and governments brand and punish those who believe that software should be free. Stallman tells his analogy as such:

> Let me make an analogy. An analogy between programs and recipes. A program is a lot like a recipe. Each one is a list of steps to be carried out–with rules to tell how you are done or when to go back. At the end, there's a certain result. If you cook, you probably exchange recipes with your friends. And you probably changed recipes, too. And if you made changes, and you liked the results and your friends like eating it, then you might give them the changed version of the recipe. So imagine a world where you can't change a recipe because somebody has gone out of his way to set it up so that it's impossible to change. And imagine that if you share the recipe with your friends, they will call you a pirate and try to put you in prison for years. (Aho & Puttonen, 2001)

For many, Stallman's analogy seems quite extreme; however, it is quite valid in light of the 2013 suicide of free culture advocate Aaron Swartz, who was set to stand trial for downloading information that was freely accessible to him from university libraries with the intent to make public the knowledge and information found in those documents (Lessig, 2013). While the tragic outcome of this case is extreme, it does highlight the pressures and extreme measures that companies, with the assistance of government, are willing to go in order to protect proprietary software and intellectual property rights (May, 2006a; Lessig, 2013).

Free software. The tragedy of Aaron Swartz is as ironic as it is tragic. On his blog, Lawrence Lessig (2013), Roy L. Furman Professor of Law at Harvard Law School and the Director of the Edmond J. Safra Center for Ethics at Harvard University, writes that because of

this tragedy:

> Here is where we need a better sense of justice, and shame. For the outrageousness in this story is not just Aaron. It is also the absurdity of the prosecutor's behavior. From the beginning, the government worked as hard as it could to characterize what Aaron did in the most extreme and absurd way. The "property" Aaron had "stolen," we were told, was worth "millions of dollars"—with the hint, and then the suggestion, that his aim must have been to profit from his crime. But anyone who says that there is money to be made in a stash of ***ACADEMIC ARTICLES*** is either an idiot or a liar. It was clear what this was not, yet our government continued to push as if it had caught the 9/11 terrorists red-handed. (para. 5)

Aaron Swartz, like Lessig and Stallman, believed that the world's knowledge and information should be free. The degree to which this freedom extends transcends the individualistic tendencies of most Westerners as the boundaries of intellectual property law, property law, and copyright law are often blurred (Lessig, 2004). As with any debate, there are sound arguments on both sides of free access to the world's knowledge and information. For this qualitative case study, however, the focus will remain on FLOSS as a means to access the world's knowledge and information. To do that, one must look at what is meant when one speaks of FLOSS.

 Free as in free. Stallman's (2010) famous words "'free' as in 'free speech,' not as in 'free beer'" (p. 3) begin a long journey of more than 30 years to our present time with the intent of setting not only software code free, but also human creativity, thought, and endeavor. While Stallman's (2010) words are often misinterpreted or misrepresented, what Stallman is calling for is freedom, as it is set forth by the First Amendment of the Constitution of the United States, for the artistic endeavor of code writing and software programming. This freedom of code and programs would then allow code writers, hackers, and end-users to collaborate, share, critique, adapt, and better each other's code or programs.

 At the time that Stallman (2010) wrote "The Free Software Definition," the free and open hacker community of the MIT Artificial Intelligence Lab was beginning to crumble under the newly adopted proprietary model of software development that prevented developers, hackers,

and end-users from using software in a manner that was open, communal, or adaptable to one's

needs. Thirty years later, Stallman's famous definition is often misrepresented to mean that

software should be free as in price. This, however, is not Stallman's (2010) intent as he and the

FSF caution against interpreting freedom as meaning free in price. On this, Stallman (2010)

writes that "when talking about free software, it is best to avoid using terms like 'give away' or

'for free,' because those terms imply that the issue is about price, not freedom" (p. 6). Stallman

(2010) goes on to write that "'free software' is a matter of liberty, not price" (p. 3). Therefore,

arguments against the practicality of building a business model on free software are

misinterpretations as Stallman (2010) does not condemn charging for software and states that

free software "must be available for commercial use, commercial development, and commercial

distribution" (p. 4). In Stallman's (2010) definition is the idea that software, when it is not free,

can restrict an end-user's freedom in much the same manner as restricting one's right to vote or

right to an attorney.

   The free software definition. "The Free Software Definition" was written by Stallman to

clearly define the tenets of a free program. The definition identifies four freedoms that a piece of

software must possess in order to be considered free. The definition, itself, is prefaced with the

right to "revise this definition to clarify it" (Stallman, 2010, p. 3). The four freedoms that qualify

a piece of software as free are:

> The freedom to run the program, for any purpose (freedom 0).
> The freedom to study how the program works, and change it to make it do what you wish (freedom 1). Access to the source code is a precondition for this.
> The freedom to redistribute copies so you can help your neighbor (freedom 2).
> The freedom to distribute copies of your modified versions to others (freedom 3). By doing this you can give the whole community a chance to benefit from your changes. Access to the source code is a precondition for this. (Stallman, 2010, p. 3)

"The Free Software Definition" preempted arguments about piracy and intellectual property

rights 30 years ago by explaining how free software is not piracy, illegal, or unethical. On this,

Stallman (2010) writes that the GNU Project (the original project created by Stallman in the early 1980s that is now coupled with the FSF) uses "copyleft to protect these freedoms legally for everyone" (p. 5). Stallman (2010) goes on to write that

> sometimes government export control regulations and trade sanctions can constrain your freedom to distribute copies of programs internationally. Software developers do not have the power to eliminate or override these restrictions, but what they can and must do is refuse to impose them as conditions of use of the program. (p. 5)

With foresight, Stallman authored what he calls copyleft to ensure that a program is legally protected from not only proprietary software developers, but is also protected under copyright law. Copyleft uses copyright law to protect a program from other legal restrictions or bindings. By protecting a program through copyleft, one is ensuring that a piece of software will always remain free.

Copyleft. The GNU Project created copyleft to protect an end-user's freedom by using copyright law "to serve the opposite of its usual purpose" (Stallman, 2013). As Stallman (2013) notes, "instead of a means for restricting a program, . . . [copyleft] becomes a means for keeping the program free" (para. 48). Stallman (2013) goes on to write that

> the central idea of copyleft is that we give everyone permission to run the program, copy the program, modify the program, and distribute modified versions—but not permission to add restrictions of their own. Thus, the crucial freedoms that define "free software" are guaranteed to everyone who has a copy; they become inalienable rights.
> For an effective copyleft, modified versions must also be free. This ensures that work based on ours becomes available to our community if it is published. When programmers who have jobs as programmers volunteer to improve GNU software, it is copyleft that prevents their employers from saying, "You can't share those changes, because we are going to use them to make our proprietary version of the program . . . ."
> The specific implementation of copyleft that we use for most GNU software is the GNU General Public License, or GNU GPL for short. (paras. 49-50, 52)

In a great play on words and play on copyright law, it is copyleft that allows a program to remain free by using the very law that tries to restrict end-user's freedoms. Under copyleft or the GNU GPL (the actual license that invokes copyleft) a software program is free and will always remain

so. This includes freedom from being added to or added with non-free software. Therefore, the practice of sharing free software is not piracy as it is within the bounds of copyleft that is protected under copyright law.

Free Software, Free Culture, Free Society

Free software has copyleft to protect it not only from proprietary software developers, proprietary companies, and piracy, but also from the tenets of copyright law. While this is good for FLOSS development, adoption, advocacy, and use, there are other areas of culture and society that have taken the free software movement's examination of freedom in software to examine other area's of human life that could also benefit from the ethical, legal, and epistemological points-of-view of the free software movement. These areas extend into culture and society and seek to understand or examine the nature of freedom in human development, technological use, human creativity, and information in a world that increasingly grows dependent upon ICTs to access the world's knowledge and information.

An open letter. In 1976, Bill Gates, then a General Partner with Micro-Soft in Albuquerque, New Mexico, wrote an open letter that was published in *Computer Notes*. In his letter, Gates (1976) explains his philosophy on software creation and code writing that would later be used to build upon the then new proprietary software development model. In his open letter, Gates (1976) writes that for almost a year, he and others at Micro-Soft had been developing the program BASIC accounting for near $40,000 USD worth of work. The feedback received on BASIC was good; however, Gates (1976) notices two trends:

> 1) Most of these "users" never bought BASIC (less than 10% of all Altair owners have bought BASIC), and 2) The amount of royalties we have received from sales to hobbyists makes the time spent on Altair BASIC worth less that $2 an hour. (para. 2)

Gates (1976) goes on to ask

> Why is this? As the majority of hobbyists must be aware, most of you steal your software.

Hardware must be paid for, but software is something to share. Who cares if the people who worked on it get paid?

Is this fair? One thing you don't do by stealing software is get back at MITS for some problem you may have had. MITS doesn't make money selling software. The royalty paid to us, the manual, the tape, and the overhead make it a break-even operation. One thing you do do is prevent good software from being written. Who can afford to do professional work for nothing? What hobbyist can put 3-man years into programming, finding all bugs, documenting his product and distribute for free? The fact is, no one besides us has invested a lot of money in hobby software. We have written 6800 BASIC, and are writing 8080 APL and 6800 APL, but there is very little incentive to make this software available to hobbyists. Most directly, the thing you do is theft.

What about the guys who resell Altair BASIC, aren't they making money on hobby software? Yes, but those who have been reported to us may lose in the end. They are the ones who give hobbyists a bad name, and should be kicked out of any club meetings they show up at. (paras. 3-5)

In many ways, this open letter is the beginning of the proprietary software development model.

For the first time, those who were accustomed to sharing software resources were called thieves

eventually adding the idea and term piracy to the proprietary software development model's

nomenclature.

An analogy and an open letter. There is a rupture in how culture, society, business,

education, and people interpret FLOSS. On one side of this rupture is Stallman's analogy (Aho &

Puttonen, 2001), and on the other side of this rupture is Gates' (1976) open letter. The gap that

exists because of this rupture is where end-users find themselves caught up in the milieu of legal

ramifications, lack of resources and tools due to high costs, and access to or access from the

world's knowledge and information. For some, FLOSS is a *cancer* in the computing world

(Slashdot, 2001). To others, FLOSS is access to education and information that could better one's

life, community, and society (Hill, 2013).

Decentralization. With the advent of the Internet, the computing world is becoming

more decentralized (Hill, 2013; Rogers, 2013). Because of the Internet, it is easier for

programmers to work from home or from other remote locations and submit their work using

software repositories, email, file transfer, or cloud file sharing. The Internet has also contributed

to decentralizing the locus of power from large corporate computing giants and placing some of

that power into the hands of individuals and smaller computing ventures (Rogers, 2013). While

this movement is building momentum, the place for the corporate computing giants is still

needed; however, with decentralization there arises more emphasis on the individual and the

needs of individuals rather than on corporations and their needs (Rogers, 2013). This shift, as

slight as it may seem, has fostered a boom in human creativity and endeavor. Many of these

endeavors are in FLOSS. An example of this is GitHub, an open source collaboration platform

used by many of the current and rising leaders in FLOSS development.

   GitHub. GitHub launched in 2008 as a repository for open source software and code. In

2012, GitHub had "more than 1.3 million users, and over 2 million source code repositories"

(McMillan, 2012). GitHub developed as a means to decentralize not only the developing power

held by software companies, but also that of many open source endeavors (McMillan, 2012;

Rogers, 2013). It is no secret that many open source endeavors have gatekeepers for quality

control purposes. Even so, these gatekeepers are prone to missing useful or valuable project

submissions or commits due to the sheer volume of submissions to any one project. GitHub's

launch helped to alleviate this problem by providing a commons for open source software

development where a centralized location was used to decentralize the power of gatekeepers

(McMillan, 2012). In this way, open source software development could remain as it once was–

open–with the continued growth of, participation in, and development of open source software

(McMillan, 2012; Rogers, 2013). This openness includes working along side proprietary

companies who also use GitHub, thereby conveying the openness of the FLOSS community

(McMillan, 2012). Even so, the capability of openness does not guarantee that developers will

use this openness. For instance, Hill (2013) conducted a study of other collaborative software

repositories including GitHub and learned that the average FLOSS endeavor has an average of

one contributor.

Freedom in other human spaces. GitHub is just one example of many where the FLOSS community checks its own locus of power in order to keep FLOSS principles and values open, free, and accessible to and by all. Organizations like GitHub, however, could not exist if the proprietary system of development within the computing world still had its stronghold on end-users and developers. This freedom from proprietary software companies has also spawned other freedom movements that seem unrelated but are inspired by the endeavors of the FLOSS community. Perhaps the largest of these is the free culture movement led by Lessig. The free culture movement, in turn, has also inspired other freedom movements such as the free art and free music movements. While there are many *free* movements, there does exist a central definition that acts as the central theoretical framework for the varying free movements of any interest.

The definition of free cultural works. The definition of free cultural works was established in 2006 with the assistance of Richard Stallman, Lawrence Lessig, and Angela Beesley. The definition was first put forth by Erik Möller, Deputy Director of the Wikimedia Foundation. Much like the FSF's definition of free software, the definition of free cultural works takes those ideas and extends them to all endeavors of human creativity and thought (Freedomdefined.org, 2008). According to the summary section of the definition of free cultural works, the "document defines 'Free Cultural Works' as works or expressions which can be freely studied, applied, copied and/or modified, by anyone, for any purpose" (Freedomdefined.org, 2008, para. 1).

Similar to the FSF's definition of free software, Freedomdefined.org (2008) defines four essential freedoms:

The freedom to use and perform the work: The licensee must be allowed to make any use,

private or public, of the work. For kinds of works where it is relevant, this freedom
should include all derived uses ("related rights") such as performing or interpreting the
work. There must be no exception regarding, for example, political or religious
considerations.

   The freedom to study the work and apply the information: The licensee must be
allowed to examine the work and to use the knowledge gained from the work in any way.
The license may not, for example, restrict "reverse engineering".

   The freedom to redistribute copies: Copies may be sold, swapped or given away
for free, as part of a larger work, a collection, or independently. There must be no limit on
the amount of information that can be copied. There must also not be any limit on who
can copy the information or on where the information can be copied.

   The freedom to distribute derivative works: In order to give everyone the ability to
improve upon a work, the license must not limit the freedom to distribute a modified
version (or, for physical works, a work somehow derived from the original), regardless of
the intent and purpose of such modifications. However, some restrictions may be applied
to protect these essential freedoms or the attribution of authors. (paras. 2-5)

While the definition of free cultural works may seem much like a free for all, there are

restrictions within the definition toward licenses that restrict non-derivative, non-commercial,

political, 3rd world only, and advertising (Freedomdefined.org, 2013). Of interest is the

definition's mention of copyleft as a impermissible restriction. Feedomdefined.org feels that

copyleft restricts commercial access to cultural works. This, however, is not the case as

highlighted by Stallman (2010) where he clearly states "'free software' does not mean

'noncommercial'" (p. 4). Stallman (2010) goes on to say that a "free program must be available

for commercial use, commercial development, and commercial distribution" (p. 4). While

Stallman was involved in laying down the groundwork for the definition of free cultural works, it

is clear that Möller understands that copyleft could restrict freedom by allowing for only non-

commercial use. This, however, is not the intent of copyleft as delineated by Stallman (2010).

   Free culture. In the last decade, Lawrence Lessig has become the figurehead of the free

culture movement. While there are many facets of what constitutes a free culture, Lessig (2004)

states that "tradition is the way our culture gets made" (p. xiv). By this, Lessig (2004)

understands that culture is not something that is purchased or immutable; however, our desire to

hold onto tradition(s) is what often stifles human creativity by placing our culture in the hands of

those who have the power to create, shape, or influence those traditions. It is important to

understand that the traditions that Lessig (2004) speaks of are not the traditions of family, group,

or regional value; rather, they are the traditions imposed on humankind by law.

Lessig (2004) develops a unique thesis where the bipartisan mindset of his audience

(Americans) is asked to put political and economic leanings aside and evaluate how culture and

tradition were originally created. Lessig (2004) juxtaposes that idea with how culture and

tradition are created today. Lessig (2004) sees that humankind's creativity and endeavors are not

driving culture and traditions; rather, it is self-interest, money, and power. Lessig (2004)

acknowledges that tradition is how our culture gets made; however, there is a shift occurring

with the advent of the Internet that Lessig believes is shaping our culture by holding onto

traditions that serve the interests of those in power or the financial fortitude to influence those in

power.

In defining free culture, Lessig (2004) writes that

a free culture supports and protects creators and inventors. It does this directly by
granting intellectual property rights. But it does so indirectly by limiting the reach of
those rights, to guarantee that follow-on creators and innovators remain *as free as
possible* from the control of the past. A free culture is not a culture without property . . . .
The opposite of a free culture is a "permission culture"–a culture in which creators get to
create only with the permission of the powerful, or of creators from the past. (p. xiv)

Lessig (2004) goes on to write that the

law is changing; that change is altering the way our culture gets made . . . . Like
Stallman's arguments for free software, an argument for free culture stumbles on a
confusion that is hard to avoid, and even harder to understand. A free culture is not a
culture without property, or a culture in which artists don't get paid. A culture without
property, or in which creators can't get paid, is anarchy, not freedom . . . . Free culture . . .
is a balance between anarchy and control. A free culture, like a free market, is filled with
property. It is filled with rules of property and contract that get enforced by the state. But
just as a free market is perverted if its property becomes feudal, so too can a free culture
be queered by extremism in the property rights that define it. That is what I fear about our
culture today. (pp. xv-xvi)

What Lessig (2004) envisions is a culture where reason and logic prevail. Lessig (2004)

illustrates this with the invention of the airplane and private property law where private property

was once interpreted to mean not only the physical ground that one owned, but also the airspace

above the ground. This brought up an interesting court case with the invention of the airplane as

would not an airplane be trespassing on others' private property by flying through owned

airspace (Lessig, 2004). What Lessig (2004) presents with this illustration is that with new

invention comes the need for new interpretations of the law. Those who wish to cling onto

tradition and not change with the invention of new technologies are often the ones who have

capitalized and monopolized many of the industries that are now incorporated into our culture

(Lessig, 2004; Lessig, 2006).

      Lessig's (2004) premise for free culture stems from numerous ideas that all focus on the

control of once free human spaces by the government or by corporations and how to free those

human spaces once again. Ironically, it was the Internet that helped to introduce such control.

With the Internet, humankind could vastly extend its creative and industrious endeavors to forge

new communities built upon sharing and collaboration. The new human spaces fostered by the

Internet broke down the barriers that bolstered many older industry strongholds such as print

media. In an effort to protect their profitable traditions, many corporate strongholds within

varying aspects of media began their anti-piracy campaigns that are prevalent today (Lessig,

2004; Lessig, 2006). As Lessig (2004) notes, in our permission culture,

> protectionism is . . . its motivation. This is not a protectionism to protect artists. It is
> instead a protectionism to protect certain forms of business. Corporations threatened by
> the potential of the Internet to change the way both commercial and noncommercial
> culture are made and shared have united to induce lawmakers to use the law to protect
> them. (p. 8)

Therefore, the free culture movement seeks to free human creativity and endeavor from this

protectionism. This idea, however, is hotly contested by those whose interests are threatened by the free culture movement leading many anti-free culture proponents to label anything within the boundaries of free culture as piracy.

Free ≠ piracy. Free culture transcends the concept that all ideas and their derivatives should be protected under the law. Much like Stallman's analogy, if this were true, then we would all be thieves and pirates as everything that we have come to know, understand, and believe are fruits grown from the trees and vines of others (Aho & Puttonen, 2001). Still, this has not stopped the law from prosecuting those who understand this to be true.

Both Stallman and Lessig see piracy as wrong (Lessig, 2004; Stallman, 2010). Unlike the popular counter argument that is often given in litigation, free culture and free software do not seek to destroy the lives of artists or programmers; rather, they seek to restore the once unfettered boundaries of human creativity and endeavor. Intellectual property is needed, however, as Lessig (2004) writes,

> intellectual property is an instrument. It sets the groundwork for a richly creative society but remains subservient to the value of creativity. The current debate has this turned around. We have become so concerned with protecting the instrument that we are losing sight of the value. (p. 19)

The implications of this turned around thinking could have harrowing consequences when extended into the areas of poverty, education, medicine, human development, human rights, and social justice (May, 2006; Sullivan, 2011). As illustrated with Aaron Swartz' case, there are no limits to the lengths that government can be used to protect the interests of the purveyors of proprietary knowledge that is built upon the labor of others.

FLOSS | Capability Approach > Free and Open Development

FLOSS development, advocacy, adoption, and use easily lend themselves to Amartya Sen's capability approach (Sullivan, 2011). In seeking to free software from the constraints of the

proprietary model of software development, the FLOSS community has helped to expand human capabilities by providing software that is not only free in the sense of Stallman and the FSF, but also free as in price (May, 2006a; May, 2006b; Sullivan, 2011; van Reijswoud, 2009). This has placed computing power in people's hands, and it is FLOSS' price that often motivates people, communities, businesses, and governments to adopt FLOSS as a viable alternative (Ayala et al., 2011; Hemphill, 2005; May, 2006b).

FLOSS and the proprietary Goliaths. To understand how FLOSS advocacy, development, use, and adoption could help expand human capabilities, one must understand the forces at work to safeguard proprietary software and development. May (2006a, 2006b) and Hemphill (2005) provide a sound introduction to intellectual property (IP) and the World Trade Organization's Agreement on Trade-Related Aspects of Intellectual Property Rights (TRIPS). May (2006a) and Hemphill (2005) make an argument similar to Lessig's (2004) where the instrument of intellectual property is what is protected to the point where human creativity and endeavor are no longer the ends; rather, the means (IP) is protected abusing the ends of human creativity–humankind.

Elias writes that IP law is comprised of the "statutes, government regulations, and court decisions that together determine who owns IP and the rights that go along with that ownership" (as cited in Hemphill, 2005, p. 484). Hemphill (2005) goes on to write that "under IP law, the owner of the intellectual asset may file suit for property right infringement and ask a court to enforce whatever collection of rights are being transgressed" (p. 485). Hemphill (2005) states that while copyright law protects "only the literal form . . . [that a creative] expression takes" (p. 485), it does not protect the underlying ideas and concepts. Because of this, FLOSS has been able to develop software that is similar to popular proprietary software. For example, The Document Foundation developed LibreOffice. LibreOffice bears a similar resemblance to

Microsoft's Office Suite, yet it is completely free and a viable alternative to Microsoft's product.

While both are similar in look and feel, the idea and philosophy behind each is different down to

the source code.

Patent law has become another popular tool utilized by proprietary software developers

and organizations, as a patent law "gives the inventor of a new and nonobvious invention the

right of exclusive use of that invention for a limited term" (Hemphill, 2005, p. 485). This limited

term is 20 years. While 20 years is much shorter than the lifecycle of a copyrighted work (the life

of the author plus 50 years or 70 years), when viewed through the lens of software development,

a patented technology becomes almost useless to the FLOSS community as that particular

technology is all but moot due to the rapid developmental nature of things technological.

Tradition and modernity. Like Lessig, Sen (1999) believes that the conflict between

tradition and modernity "calls for a participatory resolution, not for a unilateral rejection of

modernity in favor of tradition by political rulers" (p. 32). As Lessig (2004) interprets the

purveyors of tradition as those who hold onto profitable traditions, Sen (1999), too, believes that

> an attempt to choke off participatory freedom on grounds of traditional values . . . simply misses the issue of legitimacy and the need for the people affected to participate in deciding what they want and what they have reason to accept. (p. 32)

Using Lessig (2004) and Sen's (1999) interpretation of the conflict between tradition and

modernity, the use of copyright law and patent law to protect the traditional modes of software

development hinder human development, creativity, and endeavor. It is here that Sen's (1999,

2006) capability approach can be utilized to theoretically bolster FLOSS development, advocacy,

adoption, and use as the mode of the FLOSS community and the FLOSS developmental model

are highly dependent on participatory involvement. In this manner, FLOSS can be utilized as a

means to provide access to the world's knowledge and information while keeping the expansion

of human capabilities as its ends.

Summary

This chapter provided an overview of the study's key concepts within the context of current literature. An overview of the digital divide was provided with a discussion of the cultural aspects of ICT adaptation and deployment. A discussion of free software and free culture followed as well as a historical perspective of the philosophical tension between the FLOSS and proprietary development communities. This chapter also highlighted other facets of FLOSS that help decentralize the locus of power in the software industry by exploring the manner in which humankind interprets business, community, culture, and law.

Chapter 3: Methodology

The purpose of this qualitative case study was to understand in which human spaces FLOSS helped to promote sustainable human development by expanding human capabilities in accessing the world's knowledge and information in one community. This study was guided by the following research question: How has FLOSS helped to expand human capabilities by providing access to information?

Research Design

Qualitative case study was used as this study's research design. The rationale for choosing the qualitative case study from the corpus of qualitative research methodologies stemmed from the researcher seeking to understand in which human spaces FLOSS helped to promote sustainable human development by expanding human capabilities in accessing the world's knowledge and information. To do so, the researcher interviewed participants whose responses on their experiences using FLOSS yielded a better picture or scenario through their anecdotes and words. The participants' experiential anecdotes and words served as the study's primary data. The study's design was therefore qualitative in nature by virtue of the type of data collected. Taken together, all of the participants' lived, spoken data are strands that were interlaced into this study's case. In doing so, phenomenology in the form of heuristic inquiry was used to better understand the participants' shared experiences using FLOSS as provided by Reglue (Brown, 2008; Moustakas, 1994). Combining the use of heuristic inquiry with case study is in accordance with the tenets of the case study methodology as "defining a case study in terms of the unit of analysis, the bounded system, allows for any number of qualitative strategies to be combined with the case" (Merriam, 2002, p. 179). Merriam (1998) also states that heuristics is a special feature of the case study methodology that illuminates "the reader's understanding of the phenomenon under study" (p. 30). The case proper in this study was Reglue and the experiences

of a small group of community members that Reglue serves.

Qualitative research. As the purpose of this study was to understand in which human spaces FLOSS helped to promote sustainable human development by expanding human capabilities or choices in accessing the world's knowledge and information, it was important to capture the participants' experiences when they spoke of their experiences using FLOSS. Therefore, a qualitative approach was needed as the data collected was in the forms of words that conveyed emotion, affirmation, disappointment, joy, or frustration in terms of the participants' experiences using FLOSS (Merriam, 2002).

Qualitative research is unique among the varying research approaches in that it encompasses numerous methodologies (Merriam, 2002). According to Merriam (2002), "the key to understanding qualitative research lies with the idea that meaning is socially constructed by individuals in interaction with their world" (p. 3). Merriam (2002) goes on to write that unlike the positivist world point-of-view, the world point-of-view in the qualitative mode is not fixed because the world is dynamic and ever-changing just as people are dynamic and ever-changing.

While it would been valid to simply collect quantitative data in the form of websites visited or data downloaded by participants who used FLOSS in their daily lives, this type of quantitative data would do little to serve this study's purpose as human capabilities are best expressed by the participants themselves (Sen, 1999). As such, one does not know what a person thinks about certain capabilities without the use of words be they written or spoken. Therefore, a qualitative approach suited this study's purpose best as human capabilities are best understood with words that illustrate the participants' experiences as those experiences are not only a social phenomena, but also a very personal one (Sen, 1999).

As this study utilized a qualitative approach, there are four key characteristics of the qualitative research methodology that were useful to this study (Merriam, 2002). The first

characteristic is in the very nature of this study's purpose. Merriam (2002) writes that qualitative research attempts "to understand the meaning people have constructed about their world and their experiences" (p. 4). This is in alignment with this study's purpose as the purpose is to understand in which human spaces FLOSS helped to promote sustainable human development by expanding human capabilities in accessing the world's knowledge and information.

The second characteristic is that the researcher is the primary instrument for data collection (Merriam, 2002). All interviews, data collection, and data analysis for this study were conducted by the researcher. Outside help came in the form of member checking to ensure that the researcher correctly conveyed the participants' meaning and intent through transcripts of their spoken data.

On the third characteristic, Merriam (2002) writes that "often . . . [in a qualitative study] there is a lack of theory or an existing theory fails to adequately explain a phenomenon" (p. 5). Therefore, . . . qualitative research is . . . inductive (Merriam, 2002, p. 5). As this study's purpose was rooted in understanding, each participant's individual data set (their experiences vis-à-vis spoken words) helped the researcher to develop themes that emerged from the data both individually and collectively. The specific (each participant's data set) led to the general (an inductive understanding of the study's purpose).

The fourth characteristic, is that the final product is richly descriptive to convey a full picture of the data collected and the phenomena studied (Merriam, 2002). This rich description is vital in that the data collected in qualitative research can be in the form of not only words, but also pictures, field notes, music, song, or video. A rich description is needed to place the data within a context that the consumer of research can understand as well as to provide credibility or validity to the study as qualitative data is considered "soft" data unlike the "hard" data of quantitative research (Creswell, 2008; Merriam, 2002).

Case study. The case study methodology was chosen as it provided a better framework for collecting and then assessing participants' spoken data within the framework of a bounded system (Creswell, 2008; Merriam, 2002; Marshall & Rossman, 2011). As case studies can be comprised of individuals, groups, a phenomena, or events, this study's case was Reglue and the community it serves (Merriam, 2002). While a daunting task, the selection of research participants assisted in honing such a large case as it provided a means to identify those who have had meaningful interaction with FLOSS as provided by Reglue.

Merriam (2002) writes that the "process of conducting a case study begins with the selection of the 'case'" (p. 179). Merriam (2002) continues by writing that a

> bounded system is selected because it exhibits characteristics of interest to the researcher. The case might be unique or typical, representative of a common practice, or never before encountered. The selection depends upon what you want to learn and the significance that knowledge might have for extending theory or improving practice. (p. 179)

According to Merriam (2002), "by concentrating upon a single phenomenon or entity (the case), this approach seeks to describe the phenomenon in depth. The unit of analysis, not the topic of investigation, characterizes a case study" (p. 8). Merriam (1998) also states that "unlike experimental, survey, or historical research, case study does not claim any particular methods for data collection" (p. 28). Therefore, "the case study focuses on holistic description and explanation" (Merriam, 1998, p. 29). For this qualitative case study, the case or unit of analysis was Reglue and the community members it has provided Linux-based computers to. What the researcher inquired to understand was in which human spaces FLOSS helped to promote sustainable human development by expanding human capabilities in accessing the world's knowledge and information in one community.

In using participants' experiential data vis-à-vis their anecdotes and words as this study's primary data, a slight clarification is needed as to why a focus on participants' anecdotes and

experiences were needed. The reason for this focus is that people's anecdotes and experiences are not isolated events; rather, they are pieces of larger events (Merriam, 2002). In the case of Reglue and the community members it has provided Linux-based computers to, the case was comprised of not only smaller, individual experiences, but also a larger, shared experience. This study's focus was not on a single individual's experience as it was on the case comprised of the community members that Reglue has provided Linux-based computers to. While participants' anecdotes are shared, this study's primary focus was the collective community experience. Therefore, by documenting community members' anecdotes, a larger understanding of the human spaces in which FLOSS helped to promote sustainable human development by expanding human capabilities in accessing the world's knowledge and information developed. By sharing the participants' individual anecdotes, their words performed the function of synecdoche for the larger global community to inform policy and practice when working on FLOSS-based initiatives. In the spirit of FLOSS, it is not only the individual, but also the community that embraces the open communal sharing of resources and knowledge.

Merriam (1998) states that there are many types of case studies such as historical, ethnographic, descriptive, interpretive, and evaluative. Yin (2011), however, identifies two types of cases studies, intrinsic and instrumental (p. 18). Intrinsic case studies are those that "produce unusual insights warranting its study" (Stake, as cited in Yin, 2011, p. 18). Instrumental case studies are those that "not only . . . [present] a particular situation but . . . [are] intended to inform other situations or cases" (Stake, as cited in Yin, 2011, p. 18). This study used the instrumental approach as the information and knowledge gained from the data could assist and inform practice for similar projects not only nationally, but also internationally.

The rationale for choosing a qualitative case study research project rested in the researcher's own interest in FLOSS' influence on human development. By studying this

particular case, the researcher sought to understand in which human spaces FLOSS helped to promote sustainable human development by expanding human capabilities in accessing the world's knowledge and information by examining the anecdotal and experiential data shared on the successes and setbacks experienced within the case. The shared data was then developed into themes that could inform practice, guide future research, and enlighten educators and educational policy makers. What set this study apart from other FLOSS studies is its human-based focus where FLOSS serves humankind as its ends.

Heuristic inquiry. Heuristic inquiry is a part of the larger phenomenological qualitative methodology (Moustakas, 1994). According to Merriam (1998), heuristics is one of three special features that comprise the case study methodology. As such, Merriam (1998) states that a case study's heuristic quality can "explain the reason for a problem, the background of a situation, what happened, and why. Explain why an innovation worked or failed to work. Discuss and evaluate alternatives not chosen. Evaluate, summarize, and conclude, thus increasing its potential applicability" (p. 31).

Moustakas (1994) writes that heuristic inquiry "is a process that begins with a question or problem which the researcher seeks to illuminate or answer" (p. 17). This question or problem, in turn, "is one that has been a personal challenge and puzzlement in the search to understand . . . the world in which one lives" (p. 17). While heuristic inquiry is highly autobiographical, Moustakas (1994) writes that "with virtually every question that matters there is also a social— and perhaps universal—significance" (p. 17).

This study used heuristic inquiry as a means to better understand the participants' experiences using FLOSS. According to Merriam (2002), phenomenology is "a school of philosophical thought . . . [that] underpins all qualitative research" (p. 7). While there are many approaches and facets to phenomenology, phenomenology's primary inquiry is to "attempt to

deal with inner experiences unprobed in everyday life" (Merriam, 2002, p. 7). This type of

inquiry is "based on 'the assumption that *there is an essence or essences to shared experience . . .*

. The experiences of different people are bracketed, analyzed, and compared to identify the

essences of the phenomenon'" (Patton, as cited in Merriam, 2002, p. 7). Brown (2008) adds that a

"heuristic case study is able to shed light on the phenomenon, allowing the reader to extend their

experience, discover new meaning, or confirm what is known" (p. 3).

To better understand the participants' essences or experiences, Merriam (2002) writes that

"the researcher temporarily has to put aside, or 'bracket,' personal attitudes or beliefs about the

phenomenon. With belief temporarily suspended, consciousness itself becomes heightened,

allowing the researcher to intuit or see the essences of the phenomenon" (p. 7). While documents

can serve as a type of data in heuristic inquiry, "the phenomenological interview is the primary

method of data collection wherein one attempts to uncover the essence, the invariant structure, of

the meaning of the experience" (Merriam, 2002, p. 93).

As the experiences of the participants are bracketed, so, too, are the researcher's

experiences (Merriam, 2002). According to Merriam (2002),

> phenomenological researchers usually explore their own experiences, in part to examine
> dimensions of the experience and in part to become aware of their own prejudices,
> viewpoint, and assumptions. These prejudices and assumptions are then *bracketed, . . .* so
> as not to influence the process. (Merriam, 2002, p. 94)

The process of bracketing "allows the experience of the phenomenon to be explained in terms of

its own intrinsic system of meaning, not one imposed on it from without" (Merriam, 2002, p.

94). In addition to bracketing, the processes of phenomenological reduction, horizontalization,

and imaginative variance are also components of heuristic inquiry.

Phenomenological reduction is the "process of continually returning to the essence of the

experience to derive the inner structure or meaning in and of itself" (Merriam, 2002, p. 94).

Horizontalization is "the process of laying out all the data and treating the data as having equal weight. Data are then clustered into themes, and repetitious statements are removed" (Merriam, 2002, p. 94). Imaginative variation "involves examining the data from divergent perspectives and varying frames of reference (Moustakas, as cited in Merriam, 2002, p. 94).

While the overlying qualitative methodology for this study was case study, heuristic inquiry was also tantamount to understanding the participants' individual and shared experiences using FLOSS. Bracketing was important to this study as the researcher is highly vested in the FLOSS community. Prior to interviewing the study's participants, the researcher worked on bracketing all pretense and personal experiences with FLOSS. To properly do so, the researcher ensured that there were at least 30 minutes of solitude prior to each interview. During this moment of solitude, the researcher reflected on his experiences using FLOSS and tried to remember what it was like to be new to FLOSS. These reflections allowed the researcher to better understand the participants' feelings during the interview.

Setting of the Study

The study's setting was in Taylor, Texas, a small city located east of Round Rock, Texas, where Reglue is headquartered. Taylor, Texas, has approximately 16,000 residents (U.S. Census Bureau, 2013). Demographically, 98% of Taylor, Texas', population is comprised of White (45%), Hispanic (42.8%), and African American (10.2%) residents (U.S. Census Bureau, 2013). The other 2% of Taylor, Texas', population is comprised of Native American (1.2%), Asian American (.7%), and Pacific Islander (0.1%) (U.S. Census Bureau, 2013). Agriculture, manufacturing, and retail services are Taylor, Texas', primary industries and employers (City of Taylor, n.d.).

Selection of Participants

The selection of participants was facilitated with the guidance of Reglue's executive

director and gatekeeper. The researcher is currently a volunteer at Reglue and has built a rapport

with Reglue's executive director through email, volunteering, and performing Reglue computer

installations. As this research project used a qualitative research design, participant selection was

purposeful (Creswell, 2008). According to Creswell (2008), purposeful sampling is where

"researchers intentionally select individuals and sites to learn or understand the central

phenomena" (p. 214). Before sampling began, the researcher concentrated on building trust with

Reglue's executive director and gatekeeper (Creswell, 2008). Building trust added to the

researcher's transparency and ensured Reglue's executive director that there was no malicious

intent intended upon those who participated.

Participant selection was in the forms of opportunistic and snowball sampling, both forms

of purposeful sampling. Opportunistic sampling "is purposeful sampling undertaken after the

research begins, to take advantage of unfolding events that will help answer research questions"

(Creswell, 2008, p. 216). Opportunistic sampling was beneficial in that once the project started,

there were instances when a participant who did not initially want to participate decided to.

Because of this, snowball sampling was also utilized. Like opportunistic sampling, snowball

sampling "is a form of purposeful sampling that typically proceeds after a study begins and

occurs when the researcher asks participants to recommend other individuals to study"

(Creswell, 2008, p. 217). As the community that Reglue works with is small, it was the

researcher's hope that participants would want to relate their experiences using FLOSS and

would openly participate once news of the study spread. Even so, Reglue's executive director and

gatekeeper was instrumental in locating participants who were willing to participate in the study.

During the participant selection process, the researcher learned how precious time was for

all potential participants as only nine of the 15 potential participants participated in the study. Of

the seven that did not participate, time, moving, travel, or work schedules contributed to their not

participating. In one case, the researcher exchanged email messages with a potential participant for over one month without setting an interview date.

Protection of Human Subjects

The researcher followed strict and specific guidelines established by the University of the Incarnate Word (UIW) concerning the protection of human subjects. The researcher completed a CITI training course on the protection of human subjects and conducting research in the social sciences, earning a certificate from CITI as proof of participation and completion of the training. The researcher also submitted his full research plan for IRB approval along with all of the necessary paperwork required of the IRB process at the University of the Incarnate Word. The researcher also used pseudonyms to further protect participants' privacy. A letter of formal consent was presented and explained to Reglue's executive director and gatekeeper prior to data collection. This letter was also formally presented to all potential participants.

All data was kept on the researcher's Linux-based laptop on a LUKS encrypted disk partition that was destroyed by reformatting the disk at the end of the research project. The reformatted disk was then returned to the LVM pool. The researcher also backed up the study's research data to an open source cloud server running Debian GNU/Linux. As with the laptop partition, the open source cloud server was destroyed at the study's conclusion. Only the researcher and his dissertation committee had the ssh key to log onto the server.

Role of the Researcher

As this study was a qualitative case study, the researcher was the primary research instrument for the collection and analysis of data (Creswell, 2008; Merriam, 2002, Yin, 2011). As such, the researcher kept a field journal for recording observations and notes when analyzing written transcripts, photos of the research site, and visual or audio data. This data was member-checked for accuracy and clarification with post-interview email messages.

Volunteering. The researcher is fortunate to work for an employer who encourages volunteering. As such, prior to, during, and after the data collection time period, the researcher continued to travel 115 miles each way to volunteer at Reglue's shop every two weeks. Volunteering included many facets that ranged from general cleaning such as sweeping and throwing away rubbish to recycling computer components at a recycling center in neighboring Thrall, Texas. See Figure 1. Reglue's executive director, Hal, was never short on providing a list of items that needed to be accomplished. This included leaving the door key underneath a coffee can by the front entryway so that the researcher could get to work straight away. By volunteering often and keeping in constant communication with Hal, the researcher built a relationship with Hal that has continued outside of Reglue.

Figure 1: The researcher's vehicle loaded with recycling.

Data Collection and Procedures

Data collection was through qualitative interviews. It was the researcher's initial goal to also engage participants in a manner that asked them to utilize the FLOSS technology introduced

to them by Reglue by constructing a WordPress research site hosted on a private cloud server; however, after the first two interviews, the researcher realized that the participants' time, work schedules, and familial responsibilities did not lend themselves well to this. The WordPress site was only visited by one person, the researcher. Even so, using FLOSS to engage participants could have involved some discomfort for participants, particularly those who are not proficient in their computer literacy; however, doing so could have assisted in making the case that FLOSS helped provide access not only to knowledge and information, but also to people and places outside of the participants' communities.

Data collection was an interesting endeavor as the researcher's own experiences had helped to build an understanding of the realities that exist in the participants' lives where ICT and FLOSS are not a priority for daily survival. The interviews, themselves, were in the form of heuristic inquiry as the researcher was trying to understand in which human spaces FLOSS helped to promote sustainable human development by expanding human capabilities in accessing the world's knowledge and information. These human spaces revealed themselves through the questions asked and the experiential data that the participants shared with the researcher. The interviews were conducted on a one-to-one basis allowing each participant to be him or herself. The interviews' location was determined by the participants as it was the researcher's intent not to be a hindrance to the participants' daily lives.

All data for this qualitative case study was collected between September 2013 and January 2014. There were nine interviews comprised of six women and three men. Five interviews were face-to-face, and four interviews were conducted using Google Voice to call the participant's home or cellular phone. Using Google Voice for four of the interviews was a necessity as those participants' lives necessitated a phone interview rather than a face-to-face interview due to time constraints and their daily personal schedules.

The researcher only used FLOSS to conduct this study. This included Debian GNU/Linux as the operating system on the researcher's research laptop. All data was recorded using Audacity. Transcription was performed using Google Transcribe and LibreOffice Writer. Thematic coding was performed using Google Docs, FreeMind and Freeplane mind-mapping software, and Gedit text editor. All data was saved on a LUKS encrypted partition on the researcher's laptop and backed up to a private Debian GNU/Linux cloud server. Only the researcher and his dissertation committee had administrative privileges to the cloud server's ssh key.

Data Analysis Overview

Data analysis underwent several forms that accounted for the study's internal validity, reliability, external validity, and ethical procedure (Merriam, 2002). For the study's internal validity, all data for this qualitative case study was member checked where the researcher asked "the participants to comment on . . . [the researcher's] interpretation of the data" (Merriam, 2002, p. 26). As for the study's reliability, a transparent audit trail was used as "a way to show how data were collected and managed—to account for all data and for all design decisions made in the field so that anyone could trace the logic" (Marshall & Rossman, 2011, p. 221). The study's external validity was addressed by selecting a small sample. According to Merriam (2002),

> since small, non-random samples are selected purposefully in qualitative research, it is not possible to generalize statistically. A small sample is selected precisely because the researcher wishes to understand the particular in depth, not to find out what is generally true of the many. (p. 28)

 All ethical issues were addressed under the guidelines established by University of the Incarnate Word's IRB board and the researcher's dissertation committee. The researcher also practiced his Kantian belief that in all things, humankind should be treated as an ends and not a means (Rowan & Zinaich, 2003).

Data analysis for this qualitative case study was conducted through transcription of the

interview recordings followed by an analysis of those transcriptions through coding and the identification of themes within the data. The researcher used Google Transcribe to carefully listen to each interview and simply write out what was said before any coding ensued. The researcher was weary of using Google Transcribe after October 3, 2013, when Google Transcribe became a paid service; however, in the spirit of open source, the researcher wrote to Google Transcribe's developers. After a brief email exchange, Google Transcribe's developers gave the researcher a free one year subscription to complete this study. The field journal assisted in transcribing what was not said during the interview. The field journal, however, did not play a significant role other than to serve as a place to quickly write observations. After each interview was transcribed, the arduous task of coding and identifying themes within the data commenced. Creswell's (2008) methodology for handling and analyzing qualitative data was used for coding and identifying themes that emerged from the data. Creswell's (2008) six-step approach begins as soon as the data has been collected. The six steps are organizing, analyzing, transcribing, exploring the general sense of, coding, and describing the data.

According to Creswell (2008), organizing the data "is critical in qualitative research because of the large amount of information gathered during the study" (p. 245). Transcribing the data involves converting the data into computer files for analysis (Creswell, 2008). Analyzing the data can be done either by hand or with computers. If done by hand, then the "researchers read the data, mark it by hand, and divide it into parts" (Creswell, 2008, p. 246). If data analysis is done with the use of a computer, then "researchers [can] use a qualitative computer program to facilitate the process of storing, analyzing, and sorting the data" (Creswell, 2008, p. 247). As the researcher does not know of any FLOSS qualitative research software, data analysis was performed with a computer using spreadsheets and mind-maps.

The fourth step in Creswell's methodology for handling and analyzing qualitative data is

exploring the general sense of the data. Exploring the general sense of the data "consists of exploring the data to obtain a general sense of the data, memoing ideas, thinking about the organization of the data, and considering whether you need more data" (Creswell, 2008, p. 250). After a general exploration of the data is complete, coding the data becomes the next process in handling and analyzing the data.

Coding qualitative data "is the process of segmenting and labeling text to form descriptions and broad themes in the data" (Creswell, 2008, p. 251). The coding process "is to make sense out of text data, divide it into text or image segments, label the segments with codes, examine codes for overlap and redundancy, and collapse these codes into broad themes" (Creswell, 2008, p. 251). This is part of the inductive characteristic of qualitative research as the research data is "narrowed into a few themes" (Creswell, 2008, p. 251). Themes are "similar codes aggregated together to form a major idea in the database" (Creswell, 2008, p. 252).

The final step in Creswell's (2008) qualitative data handling and analysis methodology is to describe the data. In describing the data, the researcher is "answering the major research questions and forming an in-depth understanding of the central phenomenon through description and thematic development" (Creswell, 2008, p. 254) with the data collected. According to Creswell (2008), "description is a detailed rendering of people, places, or events in a setting in qualitative research . . . . In providing detailed information, description can transport the reader to a research site or help the reader visualize a person" (p. 254-255).

Data Analysis Procedures

Creswell's (2008) methodology for handling and analyzing qualitative data was utilized and began immediately after each interview when the researcher converted the recorded data from the Audacity file format (.aup) into both the MPEG-2 Audio Layer III (MP3) and the Waveform Audio File Format (WAV) formats. While the FLOSS community may not consider

the MP3 and WAV formats FLOSS, the researcher decided upon these audio formats in the event he had to share an interview file with a participant. Doing so would ensure that a participant could easily listen to his or her interview.

After an interview was converted into the MP3 and the WAV file formats, the researcher would spend the days following the interview transcribing the interview into the OpenDocument Format (.odt) using LibreOffice Writer. Once an interview was transcribed into the OpenDocument Format, the transcription was emailed to the participant as a way to member check the transcription. The transcription data was then copied into a Google Docs spreadsheet that was shared between the researcher and his dissertation committee. The Google Docs spreadsheet was utilized for the study's initial pattern coding and the first data pass that included generalizing ideas and searching for specific phrasing within the transcription data.

The initial pattern coding was comprised of two passes through all of the data. Initial pattern coding consisted of relistening to each interview and rereading each interview transcription to capture the nuances of each interview including information that may have been passed over, the participants' tone, and initial patterns that each interview possessed both commonly and uniquely (Creswell, 2008). Once the general sense of the data was explored, coding the data ensued using the Google Docs spreadsheet. Participants were given a number based on their interview order that was then used to reference the participants during the coding process. See Table 1.

Coding. The third through fifth data passes allowed for coding the data and discovering themes that emerged from the data. The sixth through ninth data passes concentrated on making sense of the data and aggregating sub-themes into major themes. During this process, the researcher communicated often with his dissertation chair for feedback as the researcher struggled with bracketing his experiences. Mind-maps were created and used to physically see

the themes that were emerging from the data. During this phase, the researcher struggled to "make sense out of the text data, examine codes for overlap and redundancy, and collapse these codes into broad themes" (Creswell, 2008, p. 251).

Mind-maps. Mind-maps assisted in visually seeing themes emerge from the data. Creating mind-maps allowed the researcher to bracket his emotions and experiences as well as to assist in removing bias as the researcher is now involved in Reglue's endeavors. During this phase, the researcher objectively weighed emerging themes with what the data transcriptions read and with how the participants' responses sounded during the interview. At the end of coding, five themes emerged from the data. These themes were born of "similar codes aggregated together to form a major idea" (Creswell, 2008, p. 252). 14 sub-themes also emerged from the data. The researcher felt it important to use the 14 sub-themes within the study as they represented nuances to the five major themes that emerged from the data. In many instances, the sub-themes were also major themes at varying points within the coding process. The data's sub-themes are discussed in further detail in Chapter 5.

Summary

This chapter presented the research methodology utilized in this study. The qualitative case study methodology was chosen and was coupled with heuristic inquiry to better understand the study's purpose and to explore the research question. An overview of the study's setting, the researcher's methodology for the selection of participants, and the researcher's data collection and analysis procedures were presented with relevant literature. The analysis and presentation of the participants' responses follows in Chapter 4.

Chapter 4: Analysis and Presentation of the Findings

The purpose of this qualitative case study was to understand in which human spaces FLOSS helped to promote sustainable human development by expanding human capabilities in accessing the world's knowledge and information in one community. This study used Amartya Sen's (1999, 2009) capability approach as its theoretical framework to understand how using FLOSS helped participants from one community expand their capability sets by providing a free and open means to access the world's knowledge and information. This chapter presents an overview of the setting, a demographics overview of the participants, the researcher's experience during data collection, the presentation of the major themes, and the participants' responses. A discussion of the research question and the capability approach utilizing the data's major themes is addressed in Chapter 5.

Overview of the Settings

This study was comprised of four settings all connected to Reglue. Two interviews were conducted at the participants' homes, four interviews were conducted using Google Voice, and three interviews were held at Reglue's shop in Taylor, Texas. While this qualitative case study had four settings, all participants received a computer from Reglue and live within the 50-mile radius that Reglue focuses its endeavors on. See Figure 2.
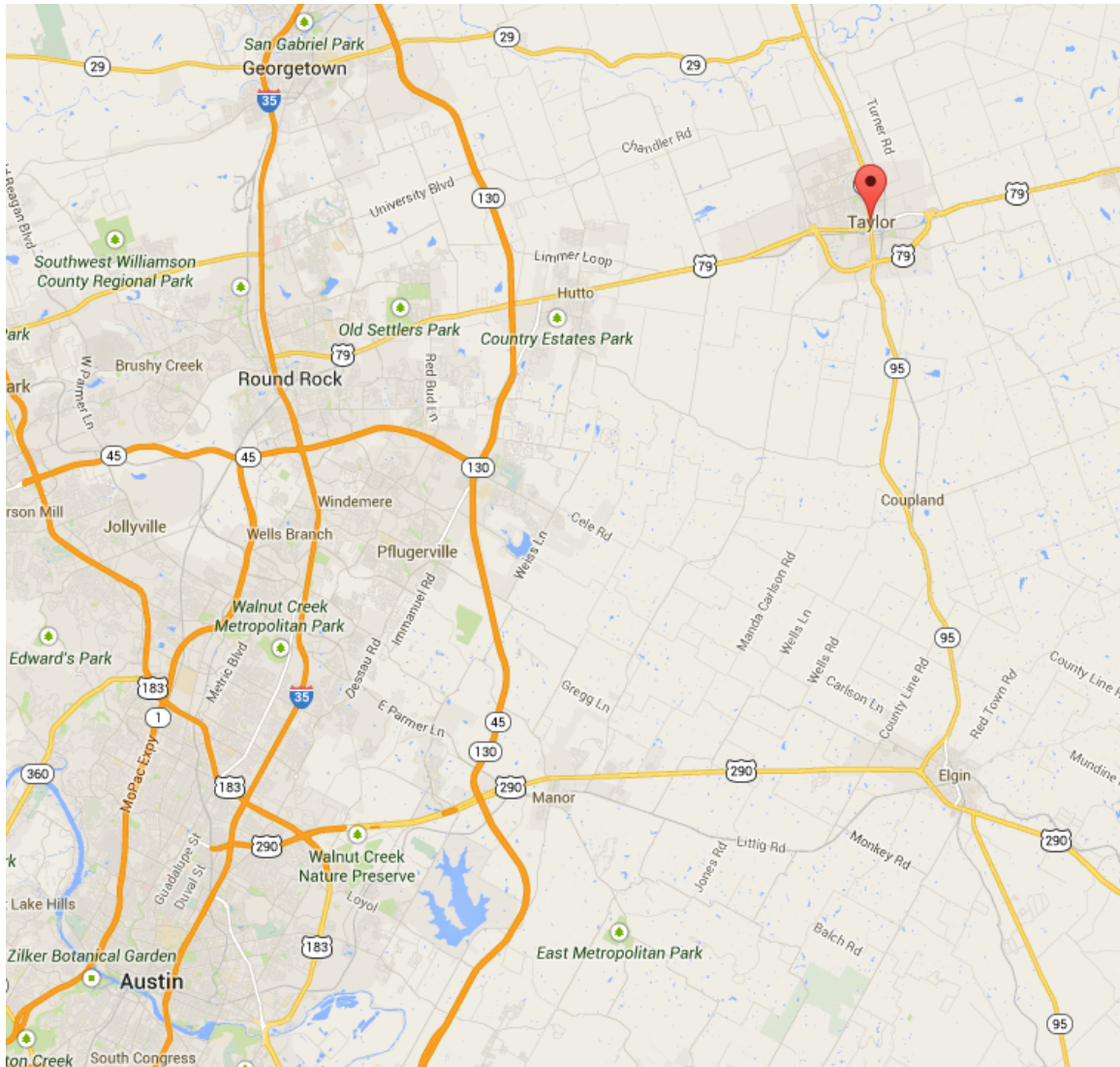
Figure 2. Reglue's area of influence. Source: Google Maps. (2014). [Taylor, Texas] [Street Map]. Retrieved from https://www.google.com/maps/place/Taylor,+TX/@30.4806962,-97.5938138,11z/data=!4m2!3m1!1s0x8644dedf9a1e17cb:0x3f957928784e0983

Reglue. Reglue is a non-profit organization located in Taylor, Texas. Reglue's executive

director, Hal, has lived a storied life. The researcher first learned of Hal through Hal's profuse

blogging and writing. After reading much of Hal's writing, the researcher contacted Hal using

Google+ (G+) in April 2013. After a few email exchanges, the researcher was invited to visit

Reglue's shop in Taylor, Texas.

Hal claims that Reglue's mission is simple–give "free Linux computers to under

privileged children and their families" (Reglue, n.d.-b, para. 5). Even so, Reglue's simple mission

is comprised of three parts–technology, giving, and education–that address three areas–bridging

the digital divide, community involvement, and social and environmental responsibility (Reglue,

n.d.-b). In the last nine years, Reglue has provided 1600 Linux-based computers to 1102

disadvantaged kids and their families (personal communication, December 6, 2013).

Reglue's shop is situated at the corner of a large city block adjacent to Taylor Head Start

and an old, abandoned schoolhouse. The neighborhood is old, and the roadway infrastructure is

in need of repair. Reglue is not on an affluent side of Taylor, Texas, which bespeaks to its

mission in serving underprivileged kids and their families. Reglue's shop is an old army barrack

that has also served as a Meals on Wheels kitchen. The shop's upkeep is financed by the City of

Taylor in appreciation of Reglue's effort in assuring that "a child's exposure to technology should

never be predicated on the ability to afford it" (Davis, 2009; Reglue, n.d.-b).

Demographics Overview

Data was collected from nine participants between September 2013 and January 2014.

The hope was to interview 15 participants, but due to circumstances outside of the researcher's

control, only nine participants provided data. The study's participants were comprised of three

men and six women. During data collection, the researcher did not ask the participants their age;

however, context clues within the interview data assisted with surmising an approximate age for

each participant. Pseudonyms were used to protect the participants' privacy. Table 1 provides key

participant demographic data including the relationship that the participants have with Reglue

and the primary and secondary user(s) of the donated computer.

Table 1

Participant Demographic Information

Participant	Interview order	Gender	Age range	Relationship with Reglue	Primary user	Secondary user
Catarino	7	Male	50-60	Volunteer	Adult	Child
Eve	1	Female	30-40	Recipient	Children	Adult
Hal	5	Male	50-60	Executive director	Adult	Child
Josephine	4	Female	20-30	Recipient	Children	Adult
Mike	6	Male	30-40	Volunteer/ Recipient	Children	Adult
Morgan	9	Female	50-60	Recipient	Adult	
Sasha	3	Female	30-40	Recipient	Children	Adult
Sophia	2	Female	30-40	Recipient	Adult	Children
Tove	8	Female	50-60	Recipient/ Former director	Adult	

Description of the participants. The final step of Creswell's (2008) qualitative data handling and analysis methodology is to describe the data. Doing so, however, would be incomplete without providing a description of the participants. Creswell (2008) states that "in providing detailed information, description can transport the reader to a research site or help the reader visualize a person" (pp. 254-255). The participant descriptions that follow serve this purpose.

Eve is a mother of three boys who are dyslexic. The relationship between Eve and Reglue is a strong one with Eve referring to Hal has her "great friend" (personal communication, September 11, 2013). The evening of Eve's interview, the researcher met Hal in the parking lot of a sporting goods store. From there, the researcher followed Hal to Eve's apartment. Eve's computer needed replacing, so Hal had conveniently arranged not only the interview with Eve,

but also the installation of the new computer. To show her appreciation, Eve cooked a spaghetti dinner and insisted that Hal and the researcher eat with her family before the installation or interview.

Sophia is a mother of three children who was preparing to graduate from Texas State University–San Marcos with a degree in Education. Sophia not only received a computer from Reglue, but is also a liaison between Reglue and the school where she works. Sophia's interview was conducted using Google Voice.

Sasha is a mother of two boys. Sasha is politically active with the Keep Austin Affordable campaign (http://keepatxaffordable.org/). Sasha learned about Reglue at a political rally as she was interviewed by a friend of Hal's. Sasha is also a voracious writer who is completing her fifth book. Sasha's interview was conducted using Google Voice.

Josephine facilitates a non-profit learning center in Austin, Texas. The learning center is located on the east side of Austin, Texas, known locally as East Austin. She learned about Reglue when she researched how to open a computer lab at the learning center. Josephine's interview was conducted using Google Voice. It was unclear during our interview if Josephine owns the learning center or simply facilitates it.

Hal is Reglue's executive director. Hal has become synonymous with Reglue making it hard for participants to distinguish between Reglue and Hal. Hal is recovering from throat cancer, yet his passion and drive to provide disadvantaged kids and their families with computing technology has not slowed him down. Hal is a personality that is larger than life. His life's story has taken him all around the globe, yet Hal's focus has always been the welfare of others. Hal's interview took place on a cold December afternoon at Reglue's shop. Hal's interview was interrupted twice by community members that conveyed the literal open-door policy that Hal professes.

Mike is a Reglue volunteer who was introduced to FLOSS by Hal. Mike is a self-employed computer technician. Mike's passion for computing keeps him returning daily to assist with hardware repair at Reglue's shop. Mike's depth of knowledge and understanding of computing hardware makes him an invaluable Reglue volunteer. Mike's interview was at Reglue's shop among piles of computer components.

Catarino is a programmer and former Reglue volunteer. Catarino states that he is now retired technically (personal communication, December 19, 2013). Catarino found out about Reglue by attending an Austin-area Linux geek installation fest to benefit Reglue's mission. While no longer volunteering at Reglue, Catarino keeps in contact with Hal. Catarino's interview was at Reglue's shop among the same piles of computer parts as Mike's.

Tove is Hal's wife. She is also Reglue's former director; however, Hal introduced her to FLOSS prior to her involvement with Reglue. Tove is also recovering from a stroke. Tove uses her computer as a part of her recovery process by exercising her cognitive acumen (personal communication, January 10, 2014). Tove's interview was at her home on a cold, wet January morning. Hal was in attendance along with two very wet dogs. A game show and then a soap opera blared in the background during her interview.

Morgan's interview was conducted using Google Voice. Morgan is an old friend of Hal's. Like all other participants, Morgan felt a deep connection with Hal and is appreciative of not only Hal's assistance with providing computing technology, but also their friendship. The researcher admits that he knows little about Morgan in that her interview was quite matter-of-fact.

Reglue volunteers. Catarino, Hal, Mike, and Tove are unique to the participant data set because of their involvement with Reglue. All four participants became involved with Reglue after learning about Reglue's mission or receiving a computer from Reglue. For instance,

Catarino is a programmer who at one time was heavily involved with Reglue. Catarino began

volunteering at Reglue after attending a Reglue sponsored community Linux installation fest

(personal communication, December 19, 2013). Hal is Reglue's executive director who became

involved with FLOSS after his daughter asked him to show her how a computer worked

(personal communication, December 6, 2013). Mike's involvement with Reglue began after his

son began volunteering at Reglue to earn a laptop computer (personal communication, December

19, 2013). Tove was introduced to FLOSS by Hal (personal communication, January 10, 2014).

The researcher felt that all four of the Reglue volunteers' stories were important to the

study as their stories were similar to other participants' stories. While different because of their

insider relationship with Reglue, all four Reglue volunteer participants were introduced to

FLOSS either by Reglue or Hal.

Researcher's Experience During Data Collection

The Reglue community is a very high context community where relationship is important

(Gannon, 2004). Entry into the Reglue community began with the researcher's initial visit on

May 3, 2013, and continued for three months. After IRB approval was granted in August 2013,

Hal acted as the liaison and gatekeeper to potential participants. Without Hal's assistance, the

researcher would not have been able to find participants easily as the Reglue community is quite

mobile. Hal was instrumental in locating potential participants and providing their contact

information. Many times this contact information proved futile as a telephone number had

changed, email addresses were bumped as undeliverable, or the potential participant did not

answer either telephone calls or email messages. There were several instances when the

researcher questioned whether this qualitative case study was viable.

Data collection. The researcher's experiences during data collection were as varied as his

volunteer duties. The face-to-face interviews were conducted at either the participant's home or

at Reglue's shop. These interviews were semi-structured as many simply began as a conversation and ended as the conversation continued outside of the interview's parameters. Eve and Tove's interviews were conducted at their homes. Hal was present at both in-home interviews. Eve was so excited about the opportunity to see her "great friend" (personal communication, September 11, 2013) Hal and participate that she prepared a massive spaghetti dinner for Hal and the researcher. Tove's interview involved wet dogs and a loud television tuned to a game show and then a soap opera.

Four interviews were conducted using Google Voice. Sophia's interview was conducted using a computer at the researcher's home. Sasha, Josephine, and Morgan's interviews were conducted in meeting rooms that the researcher reserved at his workplace. The researcher's removed online position during the Google Voice interviews allowed for structured interviews.

Themes

Five major themes emerged from the coding process. Together, these themes represent 23 themes that emerged from the data. Nine passes through the data allowed for the aggregation of the 23 themes into five major themes possessing 14 sub-themes. See Table 2. Only one of the five major themes does not have a sub-theme. The five themes identified were:

1. Gratitude

2. FLOSS requires assimilation

3. FLOSS provides needed tools

4. The FLOSS community is open source

5. Technology is a necessity

Table 2

Five Major Themes with Sub-Themes

Theme	Sub-Themes
Gratitude	
FLOSS requires assimilation	FLOSS is inherently safe
FLOSS provides needed tools	FLOSS closes the digital divide
	FLOSS is a viable economic option
	FLOSS supports marginalized groups
	FLOSS fosters learning
	FLOSS provides access to information
	FLOSS is an unknown technological alternative
	FLOSS fosters new opportunity
The FLOSS community is open source	FLOSS fosters communication
	Advocacy
	Voluntarism
Technology is a necessity	Technology must serve a purpose
	People use the software that they know
	FLOSS is similar to proprietary software

Sub-Themes. It was a difficult process for the researcher to ascertain which themes should be aggregated into major themes. After nine passes through the data, numerous email exchanges with the researcher's dissertation chair, and re-analysis of the data, the data was synthesized in a manner that logically led to the smaller sub-themes. Because of this, not all of the participants are coded with a major theme, but they may be coded with a major theme's sub-theme. In this sense, many of the sub-themes are synonymous with their major theme, yet there was enough nuance within the data to warrant a sub-theme. It is important to note that a few of the sub-themes were major themes at one point during the coding process. For instance, Mike is not coded for the major theme "FLOSS provides needed tools," yet he is for this theme's sub-theme "FLOSS fosters learning." The rationale for this is that Mike's interview yielded an indirect agreement with the theme "FLOSS provides needed tools" in that he witnessed this

aspect of FLOSS through his children and how he uses FLOSS for learning purposes as a

computer technician. Even so, Mike never specifically said that FLOSS provided the tools that

he or his children needed to learn. Mike does say, however, that FLOSS has enhanced his and his

children's learning. For example, when Mike was asked about his first impressions when first

introduced to FLOSS, Mike stated:

> I always wanted a computer. I never had one. The only thing I knew how to do with a
> computer was to turn it on. From there, everything was just a learning experience. When I
> came across Linux, I'm like, well, you can get all this stuff for free you know, and it
> works just as good, even better than Windows or Mac. (personal communication,
> December 19, 2013)

Another example is when Mike told the story of how his son learned about FLOSS and Reglue.

Mike said:

> Well, actually my son was asking me if he could volunteer here [at Reglue] because a
> friend of his told him about it. [His friend] told him if he volunteered and worked so
> many hours that . . . [he] would eventually end up getting a laptop for his personal use.
> He likes to work on computers right now. He already knows what college he wants to go
> to because he wants to be a programmer. (personal communication, December 19, 2013)

In both examples, Mike alludes to FLOSS providing both he and his son the needed tools for

their learning needs; however, in the data, Mike never says so.

The five major themes are the primary focus of this study. When warranted, sub-themes

are presented but only as a sub-theme that complements the major theme. The sub-themes are

discussed in more detail in Chapter 5.

Participants' Responses

The presentation of the participants' responses is verbatim. The researcher chose to use

verbatim quotes within the study to accurately present the participants' voices as well as to

present the data as evidence and to offer the reader a deeper understanding of the participants'

responses by providing their words as accurately as possible (Corden & Sainsbury, 2006). Time

fillers and extraneous words were edited with careful detail so that there was a balance "between

not excluding . . . [participants'] words and not doing the . . . [participants] a disservice" (Corden & Sainsbury, 2006, p. 19). What follows are the study's participants' responses within the paradigm of each major theme.

  Gratitude. During the data collection process, the researcher was taken aback with the sincere gratitude conveyed by the participants and the acts of gratitude shown them by the community. It was understood that Reglue provides technology to kids and their families; however, the researcher was not prepared for the warm, heartfelt gratitude that five participants felt for Reglue and for Hal. Hal had become more than just an executive director; he had become a friend. Eve, Sophia, Sasha, Josephine, and Tove all expressed their sincere gratitude for the acts of kindness shown by Hal and Reglue.

  When asked about her experience when Hal delivered her sons' computer, Eve said:

> It was actually one of the greatest times for the boys because they were younger, and, at the time, they used to like to get onto the computer. [They] always heard at school, "you need to get onto your computer and do this." They didn't have one. So, when they finally had one, and they were able to do what everybody else did, as a parent, it felt wonderful to actually have someone provide them that. (personal communication, September 11, 2013)

Eve's gratitude was thought provoking because her sons could now complete school work that their teachers assumed they could with tools that they did not have. Prior to Eve and her sons receiving the computer, school work that required the use of a computer was not possible. During her interview, Eve stated that this was their first computer for which she was grateful. When asked about additional thoughts that she would like to share, Eve answered:

> I just think it's a great opportunity for my kids to have someone as special as [Hal] to help them do stuff or people that are actually around like him [Hal] that have these things because without him, I would have never known about this [Reglue] and my kids would have never had the opportunity to brighten their horizons. I'm pretty grateful there's people out there that can care for others. [People] who want to do . . . instead of get something in return. He [Hal] doesn't expect anything in return. (personal communication, September 11, 2013)

Echoing Eve, Sophia also shared her feelings of gratitude for the computer and kindness that Reglue and Hal had shown her. Expressing her feelings and expounding on Reglue's continued efforts, Sophia said:

> I'm just really grateful for the opportunity. Going out and finding those kinds of resources can be hard sometimes for families who are in true need. You almost have to have technology and a computer in your home to get by with anything nowadays. It's just so great how easily available it is [technology provided by Reglue] and how it's so open to whoever needs it. I went in there [Reglue's shop] the other day and [Hal] said, "I got a stack of computers ready. You just send them my way." And they're [Reglue] always glad to help and always just ready to be helpful. Anyone who needs it [Reglue's services] should certainly take advantage of the program because it's too good not to. I'm just personally grateful for the opportunity and hope that I can share it with others as much as I can. (personal communication, September 20, 2013)

Sasha felt a similar gratitude when Reglue delivered her sons' computer. Sasha stated:

> [I felt] overwhelming joy. I mean, my kids, they have a balance, but they are just like any normal teenager. They want to be on the computer watching videos and doing silly stuff. So now, they have an avenue that they can call their own and that they can kind of tap into things with it. It was thrilling. (personal communication, September 30, 2013)

Josephine facilitates a learning center in Austin, Texas. Josephine's gratitude extended beyond her own experiences with Reglue and into the experiences of the learning center's students and their families. In 2009, Josephine was tasked to open a computer lab at the learning center. Much to her surprise, Reglue was able to provide the 25 computers that Josephine asked for. When asked about this experience, Josephine said:

> I emailed [Hal] through his website, . . . and he got back to me right away. I said that we were looking to see if maybe you all would be willing to donate some computers. He [Hal] said, "Absolutely. I think we can partner up. What were you thinking"? I cringed when I asked, but I asked anyway. I think I asked for 25 computers expecting him to say no. He [Hal] said, "Oh yeah, absolutely. Is that it, or were you thinking of something more"? I thought, "You're kidding me." It was probably the easiest ask and easiest donation I've ever gotten in the five years that we've done this. (personal communication, November 7, 2013)

Josephine continued to speak of her gratitude for Reglue's services and shared how Reglue's endeavors have helped numerous families. Of this, she said:

What I will say is this: I always tell people that we're an organization that runs on fumes. I don't know a lot [about others], but I think most non-profits have really tight budgets, ours especially. If this [Reglue] did not exist, there is absolutely no way that we would have been able to offer access to computers, computer classes, and the Internet. [For our students] to get online and practice their ESL content or opportunities for the little ones to get online and play games either one-on-one with their parents or one-on-one with a volunteer, none of those things would have existed without this [Reglue]. There's no way that our little non-profit could have made it without it. So we are very thankful for it, and we hope that more people learn about it moving forward than currently know about it. We are fans of it, and we promote it as much as we can. (personal communication, November 7, 2013)

Tove was introduced to FLOSS by Reglue and then became heavily involved by volunteering. At one point, Tove served as Reglue's director. During her interview, Tove spoke about the gratitude that she continues to receive from community members and the investment she believes Reglue makes for the future. Tove recalled:

I believe we're put on this earth for a reason. It's to not only take all of the time, but also to give back. The enjoyment of giving back is unequivocal to anything else I've ever known. You feel like you're doing something worth while to help somebody else. The kids are where our future is. It's not their fault that they don't have any money or that the economy is [poor]. I've met a couple of people that we've given [computers] to. It's not just about feeling good. It's an investment in the future. (personal communication, January 10, 2014)

Tove continued to speak about a reporter from the *Austin American Statesman* who shadowed Hal for an article on Reglue's efforts. Of the article, Tove said that it was good that "for a moment people know or are at least aware of your endeavors" (personal communication, January 10, 2014).

Gratitude also extended beyond the participants. There were numerous examples of the community's gratitude for Reglue and the services provided. During Tove's interview, she was asked if she had ever been thanked for her part in Reglue's endeavors. Hal, who was in attendance during the interview, immediately interrupted the interview and said:

It's all over our walls. She [Tove] got some mail from the kids and their parents thanking us. She also got a nice card and note from the superintendent of schools in Austin, Texas. She opened it, and then she framed it. (personal communication, January 10, 2014)

The broader community's gratitude coalesced in 2010 when Hal was awarded the Dewey

Winburne Community Service Award at the annual South by Southwest Interactive Festival. Of

this experience, Hal said:

> [Tove] mentioned earlier about the Dewey Winburne thing. I was asked to come attend.
> There were actually ten recipients with one outstanding. So as this guy is up there on
> stage with two or three hundred people in the room, I'm listening to him talk about all
> these people in the room and what they've done. They did amazing things. I mean you
> know they're all community givers. So I'm thinking this is nice, and I know there's a lady
> who did what ever she's doing. When they called me up front to receive the special thing
> [award] I just stuttered because I was with all of these amazing people in the room doing
> amazing things. I got picked for [the award]. In the scheme of things, it really means
> nothing right, but just for that moment, you know it does. (personal communication,
> January 10, 2014)

FLOSS requires assimilation. During data collection, the researcher wanted to explore

the participants' experiences either using FLOSS for the first time or in making the transition to

FLOSS from other software platforms. This theme was originally titled "FLOSS has a learning

curve," but it was soon realized that there was more to this theme than the process of learning

new software. There were also software compatibility issues that many of the participants

experienced as they transitioned to FLOSS. Sophia, Sasha, Josephine, Hal, Mike, Tove, and

Morgan all shared their experiences with their assimilation to FLOSS.

> When asked for her thoughts on a computer running FLOSS Sophia said:

> [I was] a little skeptical. From my experience with free programs for cell phones, I get
> apps and there is always some kind of ad like thing. Initially, it sounds amazing. What's
> the catch? It is definitely intriguing because what is better than free compared to all these
> super expensive programs. (personal communication, September 20, 2013)

> Sasha's assimilation to FLOSS has been positive; however, she did speak about an

experience with incompatibility after she purchased a game for her sons to play with their uncle.

Sasha said:

> I bought a computer game that you can link with other people and play. My big brother is
> a huge Warcraft player and wanted to play with his nephews. Because [the game] wasn't
> compatible, there was some conflict, but, again, Hal emailed me and listed an alternative

way. We should be able to load up the game with no problem now. (personal communication, September 30, 2013)

Sasha also added:

> I think it's important to get it [FLOSS] out there. There are some things wrong with it because it is not as compatible. It's going to take some time to get all the kinks worked out, but everybody has to go through growing pains in order to evolve. (personal communication, September 30, 2013)

Josephine spoke about the small adjustment experienced by students and parents at the learning center when assimilating to FLOSS. When asked about the drawbacks or the disadvantages of using FLOSS, Josephine said:

> I never heard anything. I think the only things you hear is initially everyone is like, "this isn't what I'm used to." Besides that, no one has said anything. There's a little bit of a learning curve, but it was so minimal that it is worth it. It is completely worth it. (personal communication, November 7, 2013)

Josephine also shared her own experience learning to use FLOSS. She said:

> At first, it was a little intimidating when you start using something new. This is especially true when computers in general are not the friendliest for everyone. So when you get used to a software you're using or an operating system that you're using and someone introduces a new operating system and a new software option, you're intimidated. I mean to use a Word document but it's an open document, it took me a second to realize that they were virtually compatible. What I could actually do was more. OpenOffice had a lot of other cool features that didn't exist with Microsoft. (personal communication, November 7, 2013)

Hal spoke about FLOSS' assimilation from a different point-of-view as he was the person that introduced FLOSS to children and their families. Because of the small market share that FLOSS has, Hal felt it important that a child's computer be aesthetically pleasing in order to not only convince the child that the computer being given to her or him is a legitimate machine, but also to soften the blow that some adjustment is needed. Hal provided an installation example to illustrate his point. Hal said:

> We sit the child down. Now let's say we have an 11 year-old girl. She's our model here. I set the computer up, and I tell her, "it's your computer. Just push play." So she turns it on. The computer buzzes. It clicks. It pops. The first thing I hear is a deep inhalation of

breath, and a "wow that's pretty." We make sure that every computer that we go out with captivates them from the first time they see the screen because, truth be told, we've got an uphill battle. Most of these kids have been using Mac or Windows computers. So if we go in there with a drab machine and then give them drab news that they have to learn something all over again, we don't do as well. When we go in with all bells ringing and whistles blowing it's wonderful. (personal communication, December 6, 2013)

Mike's experience with assimilation, like Hal's, comes from a different point-of-view.

Mike spoke about his daughter's college insisting that its students use proprietary software. Mike could not understand why the college insisted that their students use proprietary software. Mike reflected:

Well my daughter is going to college. She needs Microsoft Office because that's what they use at [her] school. I don't see why they don't get OpenOffice since it's free. They don't have to worry about paying for a license every year. (personal communication, December 19, 2013)

Mike also spoke about his frustration with game developers not developing games for the Linux platform. Mike said:

I like to play a lot of games. Developers mainly make Windows-based games. I wish that they would make it so that you could use it on Linux, too, instead of having to go to VirtualBox and trying to run the game out of [a virtual machine]. (personal communication, December 19, 2013)

Tove shared only a small piece of her assimilation to FLOSS. Unlike Sophia, Sasha, Josephine, and Mike, Tove had some prior knowledge of Linux as well as a 30 year career working with complex aviation software and machines. Even so, Tove said:

I had some knowledge of Linux before I met Hal. It scared me. It really did. I was going, "oh no." My first experience with it I thought, "boy, you really got to know what you are doing or you are really going to [mess] this up." (personal communication, January 10, 2014)

During Tove's interview, she also spoke of an online gaming site called Pogo where she likes to play games. Every now and then, the gaming site would update their site causing a compatibility issue with Tove's computer and web browser. Speaking to this point, Hal added:

What would happen is Adobe stopped supporting flash in Linux, and Pogo messes with

their APIs all of the time. So, what worked this morning, doesn't anymore. Your [browser] is telling you that your flash doesn't work anymore because they [Pogo] messed with their APIs [application programming interface] and altered them. [Google] Chrome now bakes the latest [flash] into their browser. So, if you're running Chrome, it doesn't matter if you are running flash on your system or not. (personal communication, January 10, 2013)

Morgan, like Sasha, also experienced compatibility problems when she purchased

hardware that was incompatible with FLOSS. On this, Morgan said:

Getting back to the question you [the researcher] asked about things that I miss or wish that I could have with Linux, [Linux] is kind of limited.. You have to use only certain printers. I think HP is the only printer that you can use with it. Hal gave me a computer last year, and I was using a different computer at the time until it quit working. The printer that I had was an HP, and it worked just fine. I loved that printer. When Hal gave me this new computer last year, the computer would not match up with the printer. So Hal had to help me out with another printer that would match up with Linux. With Linux, there are certain things and programs that I cannot use. You know those cassette players that you can hook up to your computer to turn your music into MP3s? I got one of those, and I can't use it on the computer. It won't let me. It won't do anything. It's like the computer is not even reading the device. So, I do know that there are certain limitations with Linux. It doesn't capture certain things. I'm sure maybe some buy Microsoft because a lot of these things [peripherals] you can attach to a [Windows] computer. It's specified Microsoft or Apple. Linux does not like Apple or Microsoft. There are certain things that you can't or certain equipment that will not work. So, there are certain limitations with Linux. (personal communication, January 18, 2014)

FLOSS is inherently safe. During data collection, the researcher realized that a part of

the assimilation process was the participants learning that their software was virus proof and

secure. Eve, Hal, Mike, Catarino, Tove, and Morgan all spoke about how different it is to have a

computer that is free of viral threat. During her interview, Eve stated that "it was amazing to

know you could do that [run a computer on the Internet] without having to worry about all the

other stuff [viruses]" (personal communication, September 11, 2013). Hal added to this and

stated:

Microsoft is still paying for [their] lack of vision because their computers are nothing but a virus trap. I don't care how well they patch it [Windows] next week. They have to patch it again and again. Google recognized that and wrote their own operating system based on Linux. They build it on the Linux kernel which is considered Scotch Guard for your computer system. You might get a virus, but I'd pay money to see it. (personal

communication, December 6, 2013)

Mike's experience working on computers justified Hal's perspicacity. When Mike fixes

his clients' computers, he makes it a point to inform his clients of FLOSS options. On this Mike

said:

> It's like Windows compared to Linux. I tell [clients] to use Linux. They will not have to worry about viruses. They will not have to worry about hackers, and it will run more smoothly and lighter on their computer's hardware. (personal communication, December 19, 2013)

Catarino spoke about FLOSS from an alternative point-of-view. Catarino indirectly

referenced Linus' Law. Linus' Law, named after the programmer who created the Linux kernel,

Linus Torvalds, states that "given enough eyeballs, all bugs are shallow" (Raymond, 2000). This

means that by making the source code available, the FLOSS community is able to provide open,

communal quality assurance. This translates to safety. When speaking about proprietary and

FLOSS software quality assurance, Catarino stated:

> Quality assurance issues. We used to use that argument. I'm sure it's just stuff that we picked up in the media. There this safety in a system, in an open source system, because there's a thousand geeks that will look at that code. Within three days they will begin babbling about anything that is suspicious in it. (personal communication, December 19, 2013)

Tove echoed Catarino's point-of-view and spoke about feeling safe when using FLOSS

for online banking because of past issues with online banking systems that used proprietary

software. Tove said that she preferred FLOSS "for the security" (personal communication,

January 10, 2014). To this, Hal added, "she's much more comfortable with banking [online]. She

doesn't mind banking on Linux for the security because she is no longer worrying about viruses

and malware" (personal communication, January 10, 2014).

Morgan speaks with others when on online forums about FLOSS' security. On those

forums, she informs others about avoiding viruses by using FLOSS. She said:

I've been on some websites that have forums and things to discuss. People just sit there and talk about all of the problems they are having with Microsoft crashing and viruses. Thank goodness I have Linux. I don't have to worry about anything. People [on the forums] will ask me about Linux, and I tell them. (personal communication, January 10, 2014)

FLOSS provides needed tools. This theme was the most complex in that there were numerous sub-themes that complemented the major theme. All participants expressed that FLOSS provided the tools that they needed to one degree or another. Eve, Sophia, Sasha, Josephine, Hal, and Tove directly stated that FLOSS provides needed tools; however, all participants supported this theme indirectly through the sub-themes. The sub-themes were: (a) FLOSS closes the digital divide, (b) FLOSS is a viable economic option, (c) FLOSS supports marginalized groups, (d) FLOSS fosters learning, (e) FLOSS provides access to information, (f) FLOSS is an unknown technical alternative, and (g) FLOSS fosters new opportunity. The researcher judiciously decided to include what were once major themes as sub-themes to the major theme. In doing so, the study would not lose important aspects or nuances of the participants' experiences by absorbing all of the sub-themes into one major theme. In this section, the sub-themes are addressed within the context of the major theme.

Almost immediately after her interview began, Eve offered how FLOSS had assisted her three sons who have dyslexia, how FLOSS had fostered learning in her sons, and how FLOSS had fostered new opportunity for her family. Eve shared:

It [Linux] had games and teaching tools. All three of my children have dyslexia. So Hal [loaded] games with math and other typing [programs] to assist them with that. One of the things that we did as a family was look up recipes so we could cook something for supper. They [Eve's sons] used Firefox. They would actually get on the Internet to look up stuff. (personal communication, September 11, 2013)

When asked about the type of information her sons looked up, Eve said:

They were looking for information that they needed for class. With our past experiences, they really didn't have any . . . because we were not able to afford it. When my kids [are using their computer], there are no drawbacks. They know how to get to everything. It

was actually awesome to know that my kids had the world at their hands. It was kind of scary, too, but it was actually good because I knew that there was a lot that they would be able to learn. My kids were able to find stuff to read on their own. Because of their dyslexia, they had a problem asking people questions. So it [the computer] helped them a lot because they didn't feel comfortable asking people questions. With the computer, they were able to Google or actually go through Firefox and figure out their own answer to their question. [FLOSS] widened their reading. They've received programs from Hal that have helped with their typing and reading skills. The boys mainly use it [the computer] for videos and learning something from their homework by researching a topic. They had to look up something about Indians one time, and they were able to do that [with the computer]. Before this, they never had the opportunity. It opened doors. (personal communication, September 11, 2013)

Eve continued by speaking of the opportunity that FLOSS has provided her sons and why she would encourage others to use FLOSS:

I would definitely encourage it [using FLOSS] because it gives your child more opportunity to learn. It also shows them that you do not have to pay high prices for something that is available to you for free. (personal communication, September 11, 2013)

Sophia is the primary end-user of the computer in her home. As a college student, Sophia was busy with research during her interview. Reglue donated a computer to Sophia so that she could use it for her studies. When asked about the tasks that she performs with her computer, Sophia said:

I do lots of Word documents using the computer. I browse the Internet. I search for articles, lots of articles and journals. [I create] PowerPoints and lots of projects. I like staying connected. I feel like there's always a resource there available for anything. I've got a fifth grader We [look up] current events. There's always something to learn. He's big into science. So [we look up] what's happening in science right now. We're big weather people, so we constantly have the radar going. Anything that you want to know, it's just right there at the tip of your fingers. Want to know something, Google it. (personal communication, September 20, 2013)

When Sophia was asked about what she would like to accomplish in her future now that she has access to a computer at home, Sophia replied:

I actually considered pursuing a Masters degree after I get my Bachelors. That may be in a couple of years, but I've heard of lots of really good online programs. I'm interested in pursuing a Masters degree online for sure. (personal communication, September 20, 2013)

During her interview, Sophia also stated that she encourages others to use FLOSS and Reglue's

services, particularly the families that she works with. She said:

> I have five families at the top of my head that I've told about the program [Reglue]. I tell them that this is a really great program, and it's free. If this is what you are looking for, you can't go wrong. All of them [the families] have taken advantage of it, and are pleased with Linux and LibreOffice products. It's just really a great thing. (personal communication, September 20, 2013)

When speaking about one of her son's experiences with FLOSS, Sophia said:

> I have a fifth grader. With the convenience of this laptop that Hal provided us, my son can go into his room to look up things on science and current events. He's really big into science and current events. Before, it was like just a pain to him to go get on the computer, and he didn't even know where to start. He couldn't even get to Google. With a little guide, a little training with Hal, he's now constantly looking up information. It's something fun for him. It's a really good resource. (personal communication, September 20, 2013)

Now that she has access to information via the Internet, Sophia ended her interview by stating:

> There's not better resource. You can learn anything with access to the Internet. Even if you don't have it at home, there are Wi-Fi hotspots that are available. They are right there and ready to connect to. It's just as easy as anything else. (personal communication, September 20, 2013)

> Sasha offered numerous examples of FLOSS providing both she and her two sons the

needed resources to learn, explore, and to create. Sasha stated:

> I think they [her sons] feel that things are limitless. They can basically communicate with people all the way in Japan seamlessly. One of my sons has an email pen-pal that he speaks with. They are the only people in our little foundation community that have a computer of their own. I think that they feel very privileged. (personal communication, September 30, 2013)

Sasha continued:

> My youngest son likes to research things. He loves finding rocks and fossils. He can research what he finds on the computer, and that's his favorite thing to do. It's great that he can just come in with his box of mud and junk and use it examine his findings. He's thrilled with it. He's actually putting this huge museum piece together on the computer for his records because I won't let him hold more than 10 pounds of rocks at one time. So when he passes that, he takes pictures of them and uploads it to the computer. He has his cyber-museum. I also want to finish my fifth book. I do most of my work on the laptop, but I really want this to be their computer. We've been talking about collaborating a CD

together. A kind of time-capsule to refer back to. We are going to interview each other, and put stuff in there like who's your favorite artist right now. (personal communication, September 30, 2013)

When asked whether she encourages others to use FLOSS or Reglue's services, Sasha added:

I would encourage others to use open source because it's a growing industry and, honestly, Microsoft needs competition. I believe that the bigger the giant gets, the worse it is for the little guys. So, if there is some competitive software that is just as good or better, then I think it's important for it to get out there. The biggest thing is just making sure that there is someone available to provide technical support and training for people who aren't as adaptable to a new operating system. (personal communication, September 30, 2013)

Josephine's experience with FLOSS providing needed tools comes from her work

with establishing a computer lab in the learning center she facilitates. Josephine said:

In January 2010, we started offering free computer classes. Before, we were not using the computer lab to its full capacity. So, we started offering free classes along with Hal. The great thing about open source is that one, I didn't even know about open source. This was a concern for us, but Hal came in and told us about it. He introduced us to OpenOffice and Linux. I'd never used either of those, but I thought, "Oh, my gosh. OpenOffice is the best." Why did we not ever know about this before? So, that's what we were using to teach our families or the parents that were coming in at night for computer classes. Hal was one of the best things that ever happened to our learning center. (personal communication, November 7, 2013)

When speaking specifically about the families that the learning center serves, Josephine

elaborated:

I hear from moms speaking about their kids saying, "oh wow." They [the parents] like seeing their kids at home definitely getting around the computer. It was neat to see their expressions when they realized they could attach a photo and send it to their families in another country. It's just things like that I think we take for granted. You could physically see the excitement and their confidence building over time. (personal communication, November 7, 2013)

When speaking about the economics of FLOSS, Josephine added:

Knowing that there's an option there that doesn't cost a lot of money is good. You know, when I was in college, it's sometimes just a real bummer that you can't have access to some of the things that seem very basic. Now knowing that something like this does exist, I can tell moms that if they can't afford to buy this you don't even have to. You can do this: go online and download this. Voilà. You now have access to something, and you saved your family "x" amount of money. (personal communication, November 7, 2013)

Josephine also spoke about the empowerment that families experienced by having access to

information and technology. On this, Josephine explained:

> A lot of the parents like to look up things about their kids. I have one parent that comes to mind. She had a son that was sick. Once she worked with us, she was able to look up things about her son's illness that she never had known before. She was empowered because she could look it up rather than being at the mercy of a doctor who might not speak Spanish. A lot of the parents have enjoyed being able to look up lessons that they can do at home with their little ones. You know, educational games that they could play. They also enjoyed finding sites where they could look up activities for their kids. They liked that they could print them out. I think they enjoyed the Internet. They used email to communicate with their families without having to wait for a call. I guess international calling isn't as expensive as it used to be, but it is for our families. So now they can communicate with them [their family] a little more regularly and a little more freely. (personal communication, November 7, 2013)

When asked if she every encouraged families to adopt FLOSS, Josephine exclaimed, "absolutely.

It's free. Why wouldn't you? That's my reason. It's free, and you know, especially for people who

can't afford it, there's no reason this shouldn't be the most viable option" (personal

communication, November 7, 2013).

Hal spoke about the numerous endeavors that Reglue is involved in. When asked about

Reglue's area of influence, Hal said:

> We were going to Abilene, Texas. I had one go to Lubbock, Texas. I went as far as going down into the Rio Grande Valley, Texas. In fact, we helped set up some Internet connections after the nasty hurricane a few years ago. We set up their networking. We provided the computers for that effort through FEMA. It was a volunteer endeavor. We didn't receive a dime for it. It's what we do. We went all over the place. Now we just do it in Central Texas, but we try to stay right here in eastern Williamson County because that's where we're needed the most. (personal communication, December 6, 2013)

When asked about his motivation for providing FLOSS and computers to disadvantaged kids and

their families, Hal responded:

> That's a fair question. I don't make a dime from what I do. I did mention that at one time I made very good money. Now, I'm on disability. I live on a very short income. However, I have two choices: I can go back into my field and make that kind of money until I retire which is only like a few years away, or I can stay doing what I do. To answer your question, everyday that I get up out of bed, I know that I am going to help impact somebody's life for the better. I have the perfect job. I make kids' lives better. I enrich it

through technology, and my payback is the smiling faces and the report cards that come back. So, in a word, I'm motivated by what we actually do. (personal communication, December 6, 2013)

Before Hal's illness, Reglue had an initiative to teach programming to girls. Hal spoke briefly of this endeavor. He said:

> We we would mentor a young girl for six weeks. We would go to her home, or she would have to travel to our facility with her mother. We taught everything from Python coding to replacing a motherboard. They would get a certificate of completion. We do mentor young women. If you get in that sphere of influence at eight years old, you can change their direction. You can correct without trying to correct. You might be able to set up a more even keel for that child to look at technology as an option. Technology has a split [gender gap]. I mean there are just one or two percent of women in the tech field. So we do our very best to engage that young lady and show her that we care alright. One of our five kids that are in graduate school, one of them is Brandi. We're real proud of her. She'll graduate in a year. She is a volunteer in the Freshman Computer Science classroom. She actually works as an unpaid assistant. She writes her own software. She writes in C and in Java. I understand she was to start helping patch things into the [Linux] kernel because she's brilliant. I don't know if they accepted her patches though. She's at UC Berkley. (personal communication, December 6, 2013)

Hal also led an endeavor to convince Taylor Independent School District in Taylor, Texas, to adopt FLOSS and FLOSS-based hardware as a means to save money. On this, Hal said:

> The school district in Taylor, Texas, were buying Macintosh laptops for their high school kids. This was a huge waste of tax money. They now know it because they can get Chromebooks at 150 dollars their cost. Starting next year, those students will not be receiving Windows computers or Mac computers, they're going to be receiving Chromebooks. (personal communication, December 6, 2013)

Mike is self-employed and uses the Internet to find potential clients. Mike also uses the Internet to research his skill-set in order to become more proficient. Mike spoke about his first experience with computers. He said:

> I started out when they [not specified who] gave me a computer. Out of curiosity I took it apart and put it back together. My interest took off from there. I started looking on the Internet [to learn] how to build a computer. I built me another computer. I continued from there and started working on other people's computers. Most of it is just looking on the Internet and reading the experience of other techs or what others have written on what type of problems they have with certain computers. That is how I ended up learning how to work on computers. That's all I do now. Someone comes to me with a problem. I'll look on the Internet if I can just to make sure because sometimes I second guess myself.

Even though I know what it is, I still want to make sure. And I look at forums. I go to a lot of them and find out that other people are having the same problem with this certain computer that I am working on. I read how other techs have helped them fix it. (personal communication, December 19, 2013)

Mike also shared how FLOSS is influential to his family. On this, Mike recalled:

My kids and my wife had never used a computer before. I have a Facebook account that my wife uses. She uses it to contact her sisters and the rest of her family. Now I can't get her off it. She likes using the computer, and she doesn't know what it costs if you have to pay for a program. The rest of my kids know what you need to pay for and what costs money. They'll ask me about programs, and I tell them what program they can get that's free. (personal communication, December 19, 2013)

When asked about his experience with the Internet, Mike said:

It made me realize that the world is small. My PC has a camera on it, and I'm able to talk to a family member that's on the other side of the United States or from another country. It's like they're right next door. That's what makes it so good about having a PC. (personal communication, December 19, 2013)

Catarino's interview was much more philosophical. During his interview, Catarino inversed the conversation and explored "FLOSS provided needed tools" from the point-of-view of how FLOSS is sometimes prevented from providing needed tools. On this, Catarino explained his experience when trying install Linux along side Windows to dual boot on a Lenovo computer that was decommissioned by his employer. Catarino shared:

I was reading up the other day real quickly trying to look at [dual booting Windows and Linux] because I remember when [Windows] Vista first came out, there were some horror stories with a couple of manufacturers who were loading stuff that seemed specifically to prevent you from doing that. Compaq and Dell I think were the ones that were doing funny stuff to make it extremely difficult to put Linux on after Windows. I thought, "this borders on illegality," but nobody will win this. Apparently with Win7 [Windows 7] there's not a big hurdle. There's one extra step that you have to do to relocate the MBR [master boot record]. When they gave me this new laptop at work with Win7 on it, the IT guy said, "well we don't have a service agreement with Lenovo anymore. You can just have this thing. I'm just going to write it down that it went to the scrap bin, and you can have this laptop." So I take it home. It had [Windows] XP on it, I thought, but they have this entire disk encryption software on it that was the death of it. (personal communication, December 19, 2013)

After failing to install Linux on his laptop, Catarino decided to swap out the hard drive with a

different one. Continuing his story, Catarino said:

> I have this extra drive, and it's a 7200 rpm drive. I'm going to plug that in the laptop and boot it up. I took my old [Windows] XP disk and stuck it in. I first used GParted [Gnome partition editor] that I had on a CD. I boot that up with no problem. GParted didn't have any problem. GParted sees the hard drive and lets me make some Linux partitions and some Windows partitions. I shut down the computer and pull out the GParted CD. I throw the XP CD in. I want to install XP and dual boot like I used to. When I put the XP CD in, I get a screen that says there's no hard drive. But I just partitioned it. I know it knew that there was a hard drive. So I thought well this is funky. So, I found an Ubuntu Linux CD laying around. I threw that in, and it got to roughly the same spot as the XP CD. It doesn't see a hard drive. Our IT person said I probably need to go back and check the BIOS [Basic Input/Output System] and make sure that some how maybe something didn't get turned off in the BIOS, but he also said Lenovo is probably sticking some kind of a driver in between things to make it not see the hard drive when I wiped the drive. I put the original drive back in which had been wiped, and it did the same thing. So, it wasn't the hard drive. We think it's Lenovo trickery. (personal communication, December 19, 2013)

Catarino drove our conversation into a discussion about the economic and generational aspects

of the digital divide and why he at one time assisted Reglue. On this, Catarino shared:

> You get these things that sort of make you feel good. They call it the warm fuzzies. There's always a warm fuzzy to be found in doing this stuff. Even if it's vicariously through him [Hal]. There's those warm fuzzies out there. You know people find out about what we do [Reglue]. I had neighbors come over to me in Hutto, Texas, and say that the stuff that we are doing is real cool. They don't help much or anything, but they may call and say, "hey, I found this computer. You want it"? People think it's cool, and they give you accolades. That's encouragement to keep going. The digital divide. When we taught classes here a couple of years ago, we taught the computer 101s. I didn't realize that we were going to have a certain percentage of people that come in for this class that don't know how to keyboard. We didn't think of that. I see in this country that there's an age range where if you're under a certain age, you'll pick up computing in a minute. This age range sort of grew up with computers in school, and it's just a secondary thing. There isn't a kid alive [in The United States] that can't keyboard to some degree. My wife, who's about eight years younger than me, she's in her early 50s, is on that borderline. There's a lot of things that happen to people in life: what happened in your life at a certain age, what kind of school did you go to or not go that determines whether you ever became semi-computer literate. There millions of people that work in offices. They work on a PC everyday, and they can operate it. They're mouse clickers, but they're comfortable in their mouse clicking world. They know. I struggle with things with my wife. I struggle with things like the difference between an app and an OS. Where is that age where computer illiteracy ends? It probably varies, but it seems to be mostly gone when you get under 50. It's [computer illiteracy] going away. I don't remember all the people we had in those classes, but there were certainly people in their 40s that couldn't even mouse click because of the fear of it. This is because all they hear are all these horror stories about the computer locking up and having to buy a new one. Sometimes, they'll pay somebody to

reinstall the operating system. So, they're just afraid of doing damage to the computer. I don't know where that line is in age where computer illiteracy ends, but certainly I can't think of anybody in their 30s who are computer illiterate. I'm sure there's exceptions. I mean there's these geezers like us that, for some reason, something happened in their lives that forced us to become somewhat computer literate, but at our age you could also find a whole world that is not computer literate. Because I work in the tech industry, I know a whole lot of people that are around my age that are techies, but I don't think that's the rule at my age. Certainly all the 30 year olds and the 40 year olds, I think, are mostly computer literate. My wife has improved her keyboarding quite a bit through the combination of online things and [public] library staff. I gotta give her that much, but knowing a browser from an operating system? At least she can type it. I was probably the last of the ones that actually took typing in school. You took a class, and you did it on a typewriter. I sort of feel for those guys that are my age that didn't take that kind of stuff because some of them I know really struggled later on when all of a sudden they had to do their work on a PC where before they had paper. Hal talks to me about the struggle to try to help people even in Taylor. I think this city has probably done more to help us than than certainly Lakeway did or Austin or Round Rock or Hutto would. Still, you can't force people to move forward to learn computing. (personal communication, December 19, 2013)

Tove also shared her experiences with FLOSS providing needed tools. She first spoke

about her initial introduction to FLOSS. She said:

I had never used anything other than Microsoft prior to meeting Hal. I knew of Linux, but had never used it. Compared to Microsoft, it is so nice. I used to get so many viruses. I haven't had any now with Linux. For four years I haven't had any viruses. It's been absolutely great in that aspect. There are a few things that I would still like to figure out, but other than that it's okay. (personal communication, January 10, 2014)

Tove added:

I absolutely love it [Linux]. It's very user friendly. I think for a kid, it would be great. I think it's opened more doors for Reglue's families. With Linux, I do a lot of shopping online that I never used to do. I wish that I could shop online all the time. I wish that I could get groceries online. It's amazing how things have changed. Now my daughter does programming. (personal communication, January 10, 2014)

Tove continued and spoke about Hal's commitment to providing the community needed tools.

Reglue has a sister-project called Prometheus that provides Internet service for six months. On

this, Tove said:

Hal takes money out of his pocket to get somebody started on the Internet so that they can get a connection you know to be able to do some work. There was this one young man Hal worked with for a while. He was a was a musical prodigy and just brilliant. He

was just absolutely brilliant. So, Hal took time out of his day that he spends at the shop to work with the young man. I don't begrudge him any time he spends at the shop. It's all so worth while. (personal communication, January 10, 2014)

During her interview, Tove shared her thoughts on the names of some FLOSS programs. She

remarked:

> There are so many different [Linux] distributions out there. I find it confusing in some ways. I also have issues with some of the weird names given to programs. I know these people are intelligent. I know they're creating all this stuff, but do something that makes sense. There was one program that Hal had given to a young lady with cerebral palsy called GIMP (GNU Image Manipulation Program). I'm thinking, how can you even tell the child to go to GIMP. That one really angered me, and I remember bringing that one up at Linux-fest. That's an insult to some people. (personal communication, January 10, 2014)

Tove then spoke of the practical application of FLOSS in her daily life. She said:

> I do my grocery list. I have a master list. I check off what I need every month. It works. It's also time saving finding recipes. I like to cook, and, needless to say, I can't spend as much time doing that as I used to. I look up recipes like chicken masala. I would never have attempted to make that years ago. It was so easy with the recipe found online. (personal communication, January 10, 2014)

Tove ended her interview with her insight on the need for FLOSS. She remarked:

> Why does Microsoft nail us down to an operating system? I was also a military wife for a good number of years. The military uses Linux. I figured then why aren't the rest of us using it. Other countries' governments like Brazil are using it. What's really hard is when you buy a computer, it has Microsoft on it. Most people don't know about Linux and what they can do with it. If I'm on Facebook and somebody's complaining that their computer is not working or something, I say well go get Linux. You won't have this complaint. I try to sell it forward. It's the unknown, and people do not like to make changes. (personal communication, January 10, 2014)

> Morgan was not as forthcoming during her interview. She admitted that she only uses her

computer for photos, typing letters, social networking, and some online research. She shared:

> The only thing I use with the software is the word processing. When I want to type letters, I use OpenOffice. I use that and the Internet access. That's basically all I use. I do take pictures. I use GIMP to do the cropping of the pictures and things like that. I used Microsoft for all these years before I met Hal. He set me up with a computer with Linux on it. I never heard of it before. It was just like Microsoft. There was nothing different about it for me. I'm glad that I have my word processing. (personal communication, January 18, 2014)

Morgan also shared some insight on her ability to get free software upgrades using FLOSS. She

said:

> I don't have to worry about how Microsoft makes you pay to get their yearly upgrade.
> Their [Microsoft] software makes you go out and buy it. I don't have to do that with the
> Linux. I get little alerts saying that I have some upgrades. I just push a button, and that's
> all it takes. I have my basic little needs taken care of, and I'm fine. (personal
> communication, January 18, 2014)

Morgan added:

> I just can't believe that people are spending money on Microsoft when they can just
> download that software [FLOSS] from the Internet for free. They will get all their needs
> taken care of. I mean Microsoft probably offers a little bit more in the way of
> compatibility that Linux can't, but I'm pretty sure that over the years, they'll tweak it
> [Linux] so we won't have to deal with that anymore. (personal communication, January
> 18, 2014)

The FLOSS community is open source. Participants described their interaction with

Reglue and the larger FLOSS community as a favorable outcome of receiving a donated

computer from Reglue. Like FLOSS, all participants spoke about how open Reglue and the

FLOSS community were with providing feedback, training, and technical support. Most

participants enjoyed the collaborative nature of the FLOSS community. Like the software that

the FLOSS community develops, many participants felt that the FLOSS community is also open

source in that there were no restrictions to the type of assistance offered. This idea also translated

into the idea of open source transcending into human action where singular actions were

performed to benefit the larger community. Like "FLOSS provides needed tools," this theme also

had sub-themes. They are: (a) FLOSS fosters communication, (b) advocacy, and (c) voluntarism.

These sub-themes are addressed within the context of the major theme.

The evening of Eve's interview, the researcher assisted Hal with installing a replacement

computer in Eve's home. During her interview, the researcher asked Eve if she and her sons had

received training using the computer. Eve replied:

Hal actually went through and showed us exactly how to use the computer. Hal actually went through and showed us each individual feature – what it could do, what kind of programs it had, what kind of games, what kind of teaching stuff. All three of my children have dyslexia. So Hal installed games with math other typing tutorials that would actually assist my sons. (personal communication, September 11, 2013)

Using the computer collaboratively was important to Eve and her sons. The family would often look for recipes together online to try new dishes. During the interview, the researcher witnessed this collaborative effort as all three of Eve's sons collaboratively played a math game. The researcher witnessed all three boys assisting each other, when needed.

Sophia works at a local school. At her school, Sophia is an advocate for FLOSS and Reglue. She often refers families to Hal and Reglue's services. Sophia spoke about how she first heard of Reglue. She said:

I believe it was through the district's community outreach person. He was my go-between with families. He helped with any kind of assistance that they needed. I work with lots of underprivileged students. So, I just asked him on behalf of some students of ours if he knew of any resources for helping these students get some desktop computers because we were looking, too, for our program. He referred me to Hal. (personal communication, September 20, 2013)

Sophia then spoke about the training that she received:

This was too good to be true. The program is so compatible. Everybody is used to Windows. So, how could I not use Windows? Hal's said that everything is saved the same way. It's totally transferable. So, he explained it [Linux] to me. It is so easy. It was like you really didn't have to explain it. Of course, Hal is always available for answering questions. So any time that I had a question, Hal would say, "come on in." It was that easy. (personal communication, September 20, 2013)

When asked about the advantages that FLOSS has provided her, Sophia said:

You don't get the personal help provided with the ones [programs] you pay so much money for. There's nobody. You have to chase somebody down to get answers if you have questions for anything. You don't even know where to start. It's just like you're on your own. With this [Reglue], someone is here to guide you through it. They're so personable. It's really nice to know that there's a resource there to help. (personal communication, September 20, 2013)

Sasha was introduced to Hal through another FLOSS advocate. Sasha spoke about this

experience when she was asked how she first learned of Reglue. Sasha recalled:

> Hal was referred to me by John Voss who is in charge of a networking non-profit organization that assists people in need. I was at a campaign speech for the Affordable Housing Act, and I sat down with John for a minute. He was interviewing me, and he found out that I had two boys who needed a computer because I wasn't really able to let them use my laptop. I use my laptop professionally, and I just couldn't have them jeopardize it in any way. So, John got real excited. He took my information and coordinated a meeting with Hal. Before I knew it, Hal was setting up a brand new computer in my house for my boys. It was amazing. (personal communication, September 30, 2013)

When asked if she had received training, Sasha said:

> Well after we set it [the computer] up, Hal sat me down and provided an introduction. After sitting 10 seconds with Hal, it was very easy to adapt to the new computer. There's been a couple of things since then that I have had to ask for help. After an email from Hal, I'm good. I understand. (personal communication, September 30, 2013)

> Josephine's experience with additional training and technical support from Reglue echoes

Sasha's. Like Sasha, Josephine share her initial encounter with Hal. She recalled:

> Well before meeting Hal, I was only familiar with Microsoft. Hal started introducing me to all these other things [programs] that I had no idea existed which was great. Then my husband got into it. By the time we knew it, it was a lot easier to use. (personal communication, November 7, 2013)

Josephine then expounded on how the learning center's computer lab could not have existed

without FLOSS and the support that comes from the FLOSS community through Reglue. To this,

Josephine explained:

> Well if we hadn't had that [FLOSS and Reglue] as an option, we wouldn't have had a computer lab because there's no way I could have afforded to buy the software necessary to provide instruction. We couldn't have afforded the operating system. The computers we got were refurbished. There was no way the computer lab could have existed without it [FLOSS]. The benefit to our families was that our moms became a little more comfortable using a computer. Add to that, our kids were able to use the computer. We used very simple online computer games for them, but it taught them how to hold a mouse. It taught them how to move the cursor around. It was a really great benefit just the introduction [to FLOSS] and getting their feet wet in that area. It [FLOSS] made it possible. Without it, we wouldn't have a computer lab at all. (personal communication, November 7, 2013)

> Hal's position offers a unique perspective as Hal is an active member of the FLOSS and

Reglue communities. During his interview, Hal offered numerous examples of how the FLOSS

community assisted and continues to assist Reglue. Hal offered anecdotes of how the idea of

open source transcends computing and translates into human action. Hal began by sharing the

cautious approach that the local educational community took when first learning of and then

working with Reglue to get computers into students' hands. Hal shared:

> I started taking computers apart putting them back together. I had friends bringing them
> over to the house. A couple guys that I was in Desert Storm with would help me fix the
> computers. Before I knew it, I was on my feet, and I had a whole wall full of computers I
> didn't know what to do with. So, I went to my daughter's teacher, and she was a little
> weary at the time. She doesn't know me, and she's got a responsibility to take care of her
> kids to ensure no harm comes to them. So, at first we were doing like this drug deal in
> Dollar General's parking lot at 8 o'clock at night. The teacher would back her car up to
> my car, and we'd swap these computers. After awhile, they realized that I was who I said
> I was. They realized that I did what I'd said I'd do. So, after some time, they began to give
> me the names of kids that we could help. That's how the whole thing started. (personal
> communication, December 6, 2013)

Much of Reglue's donation base comes from local businesses who have heard of Reglue's

endeavors by word-of-mouth. When asked how the local community has given back to Reglue,

Hal offered:

> Not only do some of the people give back, but word travels. So and so works for so and
> so, and his kid just got a computer from these guys. Then the business owner says well
> put me in touch with him. The next thing you know, that business owner who either hired
> or knows somebody that heard about this [Reglue] is on our donation list giving us the
> computers that we need to drive on. So it's a multi-faceted path of up and down. The
> community also donates badly needed funds from time to time. Most of all these
> computers you see come from local businesses that were made aware of what we do by
> the people that we served. (personal communication, December 6, 2013)

When asked about how the FLOSS community has assisted Reglue, Hal stated:

> The Linux and wider open source community has funded Reglue, and it's all come in as
> PayPal donations. It's never a lot of money, but it was always enough money. I'm not
> gonna draw a salary on donated dollars even though at one time I could've. The open
> source community helps my kids everyday. My kids have a bookmark in their browser
> that sends them to what ever [Linux] distro they have. Reglue kids all have one avatar for
> their [Linux distro] forums. They use this avatar to identify themselves as Reglue kids,
> and I make sure everybody knows it. So, they go into a Linux Mint forum, if someone
> sees that Reglue avatar, they know that's a Reglue kid asking questions. I will not have

my kids talked down to or bullied or belittled because they're not asking a question correctly. I will not tolerate that. So, how has the open source community aided us financially? Not only have they helped our kids learn how to use their systems, but they're also setting up programs all across the globe, albeit not as large and organized as Reglue. We have influenced a couple dozen people. I get the emails all the time asking how to get started. Without help from the open source community and the Linux community, we never could've done what we've done so far. (personal communication, December 6, 2013)

The larger FLOSS community has also helped Hal with other efforts that he is battling.

Hal was diagnosed with throat cancer in 2012. Almost immediately after hearing of his

diagnosis, not only did the FLOSS community assist in paying Hal's medical expenses, but the

medical community also assisted. The same is true of how Reglue received its non-profit status.

The collaborative and open assistance that Hal and Reglue have received is a testament to the

idea of open source transcending computing. On this, Hal shared:

In 2012, I was diagnosed with throat cancer. A man by the name of Thomas Stratford knew. Thomas knew that I didn't have insurance, and, being a good friend, he went and started a fund for my cancer treatment. In two weeks, they had raised 50,000 dollars. Out of that publicity, one of the top ear, nose, and throat specialists in the world who practices Austin, Texas, heard. His nurse contacted me and said that the doctor would like to see me. She said, "he's going to go ahead and take care of you, and he's not going to charge you any money." So, it was through this open source organized fundraiser that a top ranked ear, nose, and throat cancer doctor came to me and offered me his services. I told him I only got X amount of dollars. The doctor said, "don't worry about it. I got you covered." So, fast-forward to 2012. In June of 2012, Jon Jarvis, who has been active in the open source community for years, knew that we were kind of in a jam to become our own non-profit or 501(c)(3). So Jon said, "look I have an organization called Reglue." Jon said, "I'm a doctoral candidate. My directors are both doctoral candidates. We don't have time to do this anymore. Come see us, and we'll hold a meeting." So we went to San Marcos, Texas. We held the meeting. Jon and his directors voted three of us myself, Catarino, and Gary Porter as the new directors of Reglue. Jon and his directors, in turn, resigned their positions and left us sitting in full control of an established non-profit organization. It's actually an amazing story because to this day, we would not be a non-profit. So we owe Jon Jarvis and his people a lot. From there on end, we took off, and we made it happen. Now we just got this place [Reglue's shop] two years ago. We now reside in Taylor, Texas. The shop is an old World War II barracks that at one time was a Meals on Wheels kitchen. At another time, it was a voting center. The use of this building has been leased to us for a dollar a year for 99 years. The City of Taylor pays all our bills. They pay all of our repairs. The city fathers came to me and told me to just do what I do. So we don't own this place, but it's ours to use as long as we're productive. (personal communication, December 6, 2013)

Hal continued and offered his goals for Reglue and how the FLOSS community is instrumental

in ensuring that disadvantaged families in Williamson County, Texas, have the tools that they

need. Of this, Hal said:

> What I want more than anything else is to be put out of a job. There are 5000 families in
> eastern Williamson County, Texas, that live at or below the poverty level and have school
> aged children. My goal, what I want more than anything else, is to make sure each one of
> these kids has equal footing. To use a worn out phrase, I want these kids to have a level
> playing field in order to compete. They're not competing for jobs yet, but what they are
> competing for are grades and SAT scores. They cannot do those things unless they have a
> computer and the tools that other kids have. Linux and open source software has given us
> those tools. The computer comes as they come. Look around this shop. There's easily 300
> machines here. What makes that possible is the fact that the software that we put on those
> machines does not cost a dime. The software is either as good or better than the software
> that comes on your Microsoft computer. (personal communication, December 6, 2013)

Hal continued alluding to his willingness, at one time, to use proprietary software to ensure that

kids had the tools that they need to be competitive. Hal continued:

> We went to Microsoft in 2005, 2008, and 2009. We said told them what we do and
> showed them our paperwork. To make a long story short, they [Microsoft] ignored us.
> They wouldn't even acknowledge us though we sent the letters certified mail. We actually
> sent letters to Steve Ballmer himself. We would receive a signature back from our
> certified letters, but we never heard anything about it. The reason that we wanted
> Windows licenses was not to put on the machines as we got them installed with Linux,
> but to run Windows in virtual machines. So, if a child really needed to use a Windows
> program, we were able to put him or her into a virtual environment that gave him or her
> the ability to use the needed Windows program. Finally, after all this time, in 2010, we
> get a letter from Redmond, Washington. They acknowledged that they read about our
> efforts on the Internet and that it sounded like a noble thing to do. They said that they
> could help by offering us Windows XP licenses SP1 at 50 dollars a copy. I'm not real
> smart, but I can do the math. We donated 209 computers that year. I could not donate 20
> of those computers if I had to pay 50 dollars per license. I framed the letter, and it's in my
> box-o-stuff somewhere. (personal communication, December 6, 2013)

Hal continued and spoke on how FLOSS' openness saves tax dollars in the long run. Hal said:

> I speak with local school districts often. We go to them and advocate that they don't have
> to use Microsoft Office. We tell them not to buy it. Don't spend my tax money on things
> you don't need. We teach them how to use Google Docs so they have got a flow of
> information between 3 or 4 different kinds of operating systems. This way they all can
> read the document because it was created by the same software. They don't have to spend
> 200,000 dollars this year for Microsoft Office updates. These school districts are learning
> that lesson. They're learning it all across the nation. They are learning it not only in our

little community, but in major cities across The United States. We're just now catching up to the rest of the world. This is good because now many of our tax dollars are not going to buy software that we don't need. Our tax dollars are going to do what they need it to do. (personal communication, December 6, 2013)

Hal ended his interview with his prophetic vision for Reglue. Hal reflected:

Well, I would like to see Reglue all across the United States. I don't care what you call it. You can call it unglued for all I care. What I would like to see, and we've already seen it on a small scale, are people setting up their own efforts using our model. What I would like to see is one of two things: either the Reglue influence at least heard of if not acted upon or a government program that does what we do on a super large scale. What I consider us doing is a large scale, but it's all relative. We gave away 1600 computers, but what I would like to see is Reglue not so much as an entity unto itself, but as an influence for others to copy. (personal communication, December 6, 2013)

Mike is a Reglue volunteer who was first introduced to Reglue through his son's

volunteering. During his interview, Mike spoke about not growing up with technology and the

drive that he now has to share his technical knowledge with younger generations. Mike said:

I have free time during the day so I volunteer at Reglue. I like to work on computers, and for me, I like to help people especially the younger generation since they're growing up with computers. I remember when I was in school, my teachers always said computers were the wave of the future. I never had a computer growing up. We couldn't afford one. Now I have the chance to help others get a computer. That's what I like to do. So, that's why I ended up volunteering at Reglue. (personal communication, December 19, 2013)

Mike is also a vocal advocate for FLOSS. During his interview, Mike struggled with

understanding why hardware companies install proprietary software on end-users' computers. On

this, Mike said, "I don't see why corporations are selling Windows to make money. I don't see

why they should charge for an operating system that is placed on your computer when you buy a

computer" (personal communication, December 19, 2013).

Catarino spoke about his initial introduction to the FLOSS community during an

installation day in Austin, Texas, and how that influenced his decision to volunteer at Reglue.

Catarino shared:

There was a thing going on back in Austin, Texas, where they had this one day a year installation day. Somebody donated space at a bar in downtown Austin. We would have a

day to try to get all the Austin Linux geeks to come down and advertise this to get people
to drop off their computers. We'd bring a truck load of the recent contributions. We'd haul
all those computers down to the installation site, and people would drive up and drop off
their old computers. The whole event was how many computers could this big group of
geeks install Linux on. We'd subdivide volunteers into intake, initial evaluation, and OS
installers. It was this big mass assembly line to see how many computers we could get
out of the door at the end of the day. There was a mailing list where I caught that the
installation day was coming up in Austin, Texas. I thought I can stick a screwdriver in
stuff. I know what a RAM chip is. I'll go down and help out with this. At the end of the
day, we had maybe just eight or ten computers that just didn't get to the end of the
assembly line. The space's owner said that his bar was opening in two hours. We packed
up the unfinished computers, and I said that I would take them home and work on them in
my spare time. You know, it started out with just fixing a couple of computers now and
then in my garage, and it just grew from there in terms of what I was doing. (personal
communication, December 19, 2013)

Catarino also shared the struggles that he experienced as a Reglue volunteer. This portion of

Catarino's interview included the fate of some of Reglue's computers. Catarino shared:

I've heard Hal have to tell parents or guardians that this is the kid's computer. Hal had to
go to a pawn shop once to recover a kid's computer. You run into parents like that, and
what you can do about it is limited. I mean we got the computer back in this case, but you
have to sometimes think about these things before you step in. How can you mitigate it?
All you do is try to mitigate it, but you don't really solve it. I mean we're not we're not
social services. (personal communication, December 19, 2013)

Tove spoke about how Dell and St. Jude's provided used equipment to assist Reglue's

efforts. Tove said:

When St. Jude's here in Taylor, Texas, a different entity than the St. Jude's Children's
Hospital, donated 75 laptops one year right at about Christmas time. Hal was really
hustling delivering the computers. He even delivered on Christmas Day. That was that
was the biggest donation of laptops we've ever had. It put a lot of smiles on faces. I
believe in what Hal does. Dell also made a big donation. They decommissioned all of
their kiosks. They donated not computers, but Belkins [power strips] and cables. It was
stuff that we wouldn't use. So we came up with a little storefront on eBay. Reglue
survived three years on the money generated from eBay. This allowed us to buy the parts
that we needed to fix our computers. (personal communication, January 10, 2014)

Morgan stated that the FLOSS community continues to support her by providing

technical assistance when needed. Morgan said that Hal is always available when needed to

ensure that her computing needs are met. Morgan said that she is able to speak with Hal over the

Internet about her computing problems (personal communication, January 18, 2014).

Technology is a necessity. Technology played an important role in the lives of Eve, Sophia, Sasha, Mike, and Catarino. Within this theme, participant responses ranged from the participant needing to use technology to provide income for his or her family to technology assisting with job hunting, resume writing, and researching one's career options. In many instances, technology was viewed as a necessary tool for either potentially earning or earning an income. This theme also had three sub-themes: (a) technology must serve a purpose, (b) people use the software that they know, and (c) FLOSS is similar to proprietary software. These sub-themes are addressed within the context of the major theme.

When the researcher asked Eve about how she and her sons view and use technology, Eve said:

> To describe daily technology, you can't really get by without these days. It is [the] communication between my children, my family, [and] my job. [Technology] would be the first thing ever because that's actually how I make a living for my children. (personal communication, September 11, 2013)

When speaking of her oldest son, a freshman in high school, Eve said:

> It [technology] opened up doors. What I would like the boys to accomplish is to be more comfortable with it. My son, who is a freshman, wants to go to school for fixing cars. He can look up and see what kind of other options he may have so it [technology] will give him an opportunity. (personal communication, September 11, 2013)

Like Eve, technology provided Sophia the opportunity to carve out time to write resumes and job hunt online. When asked about the opportunities that have opened since she received her computer from Reglue, Sophia said:

> Well, having three kids, it's hard to just find time to go out and say even job hunt. Pretty soon I'll be doing that, but I can do everything from right here at my computer. You know [I can] fill out the application, attach the resume. I can do everything from right here at 2 o'clock in the morning. With compared to having to get a babysitter and physically fill out the application and gather all of those documents, I can just create them right here and save even printing all of them. It's so much more convenient for everything. I'm constantly having to do paperwork. My first question is can I do that online. (personal

communication, September 20, 2013)

Sophia went on to say that she uses "the computer everyday a couple of hours a day" (personal

communication, September 20, 2013). Sophia also uses the computer to complete her homework

assignments and for social networking (personal communication, September 20, 2013). Sophia

also observed that both proprietary software and FLOSS "are exactly the same" (personal

communication, September 20, 2013).

Sasha and her sons also use their computer daily. Even so, Sasha is much more practical

with her outlook on technology and believes that it should serve a purpose (personal

communication, September 30, 2013). When asked on the advantages that FLOSS has provided,

Sasha replied:

> I don't know if there's any advantages. I can't see the difference yet. Once there's projects especially with school coming up, I will probably find some benefit. FLOSS just crosses over. If you ever used Microsoft Word and things like that, then this is similar. Now that Quinn, my oldest, is in AP classes and needing the computer more I'll probably see more benefit then. (personal communication, September 30, 2013)

Sasha then spoke about how she ensures balance in her sons' lives. Sasha also believes that the

opportunity that technology brings to her sons' lives in invaluable. She said:

> There are positive and slightly negative effects of using technology. We've set some guidelines. We time ourselves so that we are not on the computer indefinitely for long periods of time. I put a timer on the computer, and when they log out, I can judge how long they've been on it. I have an honor system with my sons because the computer is kind of addictive, and they can get overstimulated with it. So I say, "let's unplug. Let's go outside and get fresh air." So, that's the negative side of it. The positive side of having a computer is the confidence and and the fortitude to have the opportunity to do projects, to do research, to move forward, and to create with the computer. I mean there's very little that you do that doesn't necessitate the use of a computer these days. It's just opportunity. (personal communication, September 30, 2013)

Mike uses technology for his livelihood as well as to communicate with his family who

live across the United States and internationally. While Mike does not have formal training, he

has earned a reputation for being a computer expert. Even so, Mike reflected on how his not

having formal schooling has prevented him from applying for jobs in the computing field. Mike

shared:

> I've never looked for a job that's working with computers because most employers tell me
> that I need a certificate from school. That's what I don't have. A lot of people ask me how
> come I don't start working from my home. I am asked why I do not start my own business
> repairing computers. I tell them, "what do you think I'm doing now"? I would like to tell
> employers to give me something that's broken and let me fix it. They can then tell me if
> they want to hire me or not based on my work. That's a 50/50 chance you know. I would
> either have have a job or not. (personal communication, December 19, 2013)

When asked whether he encourages others to use FLOSS, Mike spoke to the similarity of

proprietary software and FLOSS. Mike also spoke about his client-base who are mostly

proprietary software users. Mike said:

> I would encourage it [using FLOSS]. I always do to save them money. I tell others that
> there's really no difference in using OpenOffice and Microsoft [Office]. You're able to use
> both of them equally. People start using Windows and they get stuck. That's when they
> start calling me and telling me their problems with Windows. I like those kind of clients.
> If I have to charge them, oh yeah, keep calling me. I'll be more that happy to take that
> call. (personal communication, December 19, 2013)
>
> Catarino uses technology daily in profession as a programmer. Even so, Catarino

provided some insight as to why FLOSS was needed in Reglue's computing endeavors. Catarino

shared:

> If we [Reglue] installed Windows on our computers, we couldn't have afforded the other
> things like [Microsoft] Office and virus subscriptions and all the stuff that comes along
> with Windows. Even if we gave computers with Windows, which we wouldn't, we would
> still need to use the Linux and open source stuff purely because of the economic factors
> of who we are providing these computers to. Another hurdle is providing Internet access
> because if they can't afford a computer, then they can't afford Time Warner. Using open
> source is almost a forced position. Now, it was an agreeably forced position. We don't
> mind that, but generally speaking, you don't need a virus scanner. You don't need this;
> you don't need that stuff that cost money in the Windows world. (personal
> communication, December 19, 2013)

In Catarino's estimation, the forced position of using FLOSS was a means to provide needed

technology to the community. Catarino also shared an endeavor that Reglue pursued with

providing the physically handicapped the computers and software needed to perform computing

tasks. In this endeavor, Reglue was willing to purchase the proprietary software from a large drug manufacturer; however, the cost proved too much for Reglue to sustain. On this, Catarino said:

> Hal used to work with the physically handicapped. We had to have some proprietary Windows software in order to use the software. We tried writing a grant for the funding, but we could not get a grant for it anywhere. The software is made by Pfizer using open source [software]. So, they know where the money's at. So what are you going to do about it? (personal communication, December 19, 2013)

Hal added to this and said that "the software works by placing a device in their mouth. Someone can then suck or blow codes that the computer picks up. It's a Windows only program, and it costs 8000 dollars" (personal communication, December 19, 2013). Without the needed funding, Reglue could only assist two children who needed this software to access computing technology.

Summary

This chapter included an overview of the setting, a demographics overview, and the major themes that emerged from the data. The researcher also shared his experience during data collection. All information in this chapter was presented objectively and in a manner that respected the participants' privacy. The participants' responses where framed within the study's five major themes: (a) gratitude, (b) FLOSS requires assimilation, (c) FLOSS provides needed tools, (d) the FLOSS community is open source, and (e) technology is a necessity. 14 sub-themes also emerged from the data. The sub-themes were addressed within the framework of the major themes. A discussion of the research purpose, the research question, and the study's major themes within the framework of the capability approach follow.

Chapter 5: Discussion and Recommendations

This study sought to understand in which human spaces FLOSS helped to promote

sustainable human development by expanding human capabilities in accessing the world's

knowledge and information. Using the qualitative case study research design and heuristic

inquiry, this study explored the experiences and stories of nine participants who received a

FLOSS-based computer from Reglue, a non-profit organization located in Taylor, Texas. The

participants of this study openly shared their experiences with the researcher and provided

feedback on their experiences using FLOSS either for the first time or in making the transition

from other software platforms. This chapter discusses the participants' responses within the

framework of Amartya Sen's capability approach and ends with recommendations for further

research. The sub-themes identified in Chapter 4 will also be addressed as they were instrumental

in forming the study's major themes. See Table 2.

The Capability Approach

Sen's (1999, 2009) capability approach is a two-fold approach comprised of a person's

functionings and capabilities. Functionings reflect "the various things a person may value doing

or being," and capabilities are "the alternative combinations of functionings that are feasible for .

. . [one] to achieve" (Sen, 1999, p. 75). The capability approach encompasses both individual and

community functionings and capabilities. A person's capabilities or choices enhance and

influence that person's functionings by differentiating the functionings that one may choose

from. The same is true of the functionings and the capabilities of that person's broader

community. According to Sen (1999), the choices that one has directly influences the opportunity

for one to live the kind of life that she values, lives, and cherishes. This is also true of the

functionings and capabilities of one's community as the capability set of one's community

directly influence the functionings of that community that, in turn, affect the community

members' individual functionings and capabilities.

The capability approach is a part of Sen's (1999, 2009) vast theory of development. Sen (1999) states that the

> capability approach focuses on human life, and not just on some detached objects of convenience, such as incomes or commodities that a person may possess, which are often taken, especially in economic analysis, to be the main criteria of human success. (p. 233)

The focus on human life is important as this study sought to add a human focused case study to the corpus of FLOSS literature.

For Sen (1999), development is the "expansion of freedom" through the removal of unfreedoms (p. 36). By removing unfreedoms, one's capabilities are expanded by providing access to items or tools needed to further one's development. This, in turn, expands one's functionings. The highly organic and reflexive nature of the capability approach make it a sound theoretical framework for this study as this study sought to understand in which human spaces FLOSS has helped to promote sustainable human development by expanding human capabilities in accessing the world's knowledge and information. It is important to note that expanding capabilities in no way ensures that one will act on those new capabilities. Having the opportunity to expand one's choices, however, is what is important as these newly expanded capabilities could lead to other unknown functionings that, in turn, could lend themselves to acquiring further unknown capabilities.

Further Limitations of this Study

Before moving forward, it is important to openly speak on limitations that arose post-data collection and during data analysis. Firstly, it is unclear if the participants perceived FLOSS or technology as the impetus that provided access to knowledge and information. In most instances, it seemed that the participants were pleased and grateful for the access to knowledge and information; however, Reglue and Hal seem to be the true impetus of this access. Many

participants felt that Hal was the driving force. Within this insularly bounded system, FLOSS just so happened to be the tool-set provided for access to knowledge and information. This leaves one to conjecture whether the same feelings and experiences would be similar with proprietary software. While all nine participants clearly advocated for the *freeness* of FLOSS, some participants (Eve, Josephine, Sophia, and Sasha) also stated or alluded to using whatever technological tools were readily available to perform needed tasks or that met their needs including using proprietary software. Even so, the purpose of this study was to understand in which human spaces FLOSS helped to promote sustainable human development by expanding human capabilities in accessing the world's knowledge and information. Therefore, the participants' experiences within this qualitative case study explored the instances where FLOSS helped to expand the participants' capabilities. This, however, is clearly a limitation of the study as a study that focuses on proprietary software expanding human capabilities would better assess FLOSS' influence on helping to expand human capabilities.

Secondly, the boundary or differentiation between FLOSS and technology in general was unclear. Many participants synonymously used the term *technology* and the titles of popular proprietary and FLOSS programs when speaking of their experiences using FLOSS and with Reglue. It was simple for me to ascertain the participants' meaning; however, if one where to take this research further, the need to further study this interplay of words and phrases is warranted as this interplay could have been two-way where a participant used a proprietary title for a FLOSS program and vice versa. As Reglue provides both technology (the physical computers) and FLOSS (the software on those computers) this was not an issue; however, further research should better differentiate between the two, particularly in non-insular communities. At the onset of this study, I did not take this into account as my prior experience with providing FLOSS as a means for access to the world's knowledge and information was also within the

coupled hardware and FLOSS paradigm. This, too, is a limitation of the study. Even so, within this study's bounded system, FLOSS is useless without the needed hardware to use it. While this works for the parameters of this study, a larger study on FLOSS is warranted to better explore FLOSS' influence in expanding human capabilities when the hardware is already available.

Finally, the use of Google Voice as a means to conduct interviews also introduced a limitation as I could not read body language during the interview. Be that as it may, the removed position that I had during the Google Voice interviews did force me to tune into the participants' tone and timbre of voice to properly convey and understand their meaning. In the case of the Google Voice interviews, member checks assisted in ensuring that a participants' meaning were properly documented.

Limitations aside, there was clear evidence that FLOSS as provided by Reglue did help to promote sustainable human development by expanding human capabilities. Evidence of this is presented in Chapter 4 and includes: Eve's gratitude that her sons' have an avenue for accessing information that addresses their learning needs; Sophia's desire to attend graduate school; Sasha's appreciation for her sons' new opportunity to explore the world via archeology and to academically compete with other students who have access to technology; Hal's life's work in providing kids and their families the needed tools to be academically competitive; Mike's ability to find freelance work; Catarino's better understanding of the digital divide; Tove's cognitive rehabilitation post-stroke; and Morgan's access to photographic tools and human communication. All of these are examples of the expansion of the participants' capability sets. Each could easily lend themselves to other functionings that could then be used to expand other capabilities.

While the limitations of this study are clear, the significance of this study is still important as this study sought to provide a human-based study on FLOSS' influence in human lives. The human spaces that I was invited to were personal and quite private. The high-context,

insular community that Reglue serves took me to participants' homes, into their private lives, private thoughts, ambitions, dreams, and personal well-being. The human spaces are what drive the significance of this study. It is within these human spaces that access to the world's knowledge and information conveyed its true value by adding to the participants' capability sets.

Human Spaces Within this Study

Human spaces can be defined as the places where human life or human thought dwell (Lessig, 2004). These spaces include culture, community, family, and individual thought. Human spaces can also include human endeavors such as art, music, and code Lessig, 2004). The participants' human spaces that I was invited into included home, family, personal welfare, employment, school, hopes, dreams, and ambitions.

The relationship that I built with Hal became one of deep friendship. Hal's influence has changed my focus on FLOSS' influence on the individual, the community, and myself. I grew quite close to Hal including once taking Hal to his oncologist appointment. I enjoyed and learned much from Hal during our conversations while driving down Highway 72 to Thrall, Texas, to recycle computer components. The human spaces that I entered where a joy and a learning experience.

Other human spaces that I was invited to included learning of and seeing the private struggles that Tove endures after her stroke; Eve's concern with her sons' dyslexia and their learning needs; Sasha's advocacy for affordable living in Austin, Texas, and her sons' education; Sophia's aspirations to attend graduate school; Mike's disappointment in not having the schooling and certifications to secure a job with a technology company; Josephine's struggles keeping the learning center running on a tight budget; and Hal's recovery from throat cancer. I am not sure if I fully expected to learn of these concerns at the onset of this study. The invitation into these human spaces helped me to understand my own position with FLOSS in a more mature light. I

learned that while FLOSS is an important component that brought all of the participants together, it is Reglue and the sense of community that it nurtures and fosters that is most important. The same community that provides strength to FLOSS is also the same community that ties us all together in our own humanity. I learned that FLOSS could be substituted with any other human endeavor, and it would be community that provides the strength to that endeavor. This understanding was born out of the sub-themes that emerged from the data. While this study found five major themes, it is the sub-themes that helped to better synthesize the data into the five major themes.

Sub-Themes to the Study

The presentation of the participants' responses and their synthesis into this study's major themes were presented in Chapter 4; however, I feel it important to address the 14 sub-themes that also emerged from the data and why they were not included as major themes to the study when a few were major themes, at one point, during data analysis. What follows is an overview of the sub-themes and why that particular sub-theme was deemed important yet remained a sub-theme to its major theme. The sub-themes are presented with their respective major theme.

Gratitude. Gratitude did not have a sub-theme. This theme was unique among the major themes in that it included what I felt were the most human-based data. The gratitude conveyed not only through the participants' words, but also through their tone, cadence, and timbre of voice warranted its own major theme. This gratitude transcended simply being given a Linux-based computer. It was a gratitude that expounded on the importance of human community, contact, care, and emotion. The gratitude expressed by the participants was raw in its form. It was the gratitude of being given an opportunity to expand one's capabilities both personally and for others. Indeed, the gratitude shown by the participants could easily lend itself to another study.

FLOSS requires assimilation. This theme was unique in that it was once titled "FLOSS has a learning curve." What was meant by this is that FLOSS did present some challenges for the participants. While Eve, Sophia, Sasha, Josephine, Mike, Tove, and Morgan felt that the training provided by Hal and Reglue made assimilating to FLOSS easier, there were some minor setbacks in relearning how to use their prior knowledge of computing within the paradigm of FLOSS. Even with these minor setbacks, all participants easily made the assimilation to FLOSS. As with most things technological, there is a learning curve, but this learning curve was more than just a learning curve. Again, it was having to apply a developed skill-set to a new context. This theme had one sub-theme titled "FLOSS is inherently safe." This sub-theme fits into the context of this major theme because of the participants' understanding of technology.

FLOSS is inherently safe. This sub-theme is unique in that it concerns the participants readjusting their understanding of computing technology in regard to FLOSS. Simply, many participants were quite used to the inherent shortcomings of the software that they knew and used frequently prior to adopting and utilizing FLOSS. The largest of these shortcomings were viruses and malware. Participants who were new to FLOSS had to learn that the Linux operating system is inherently safe from viruses and malware. The cautionary approach that many participants had with past software experiences took some time to abate. Participants had to learn to trust the inherent safety of FLOSS. This, however, did not mean that the participants could simply discard adopted online and computing safety practices. What it does mean is that the participants could now feel safer when they or their children were online. This safety, however, should never supersede online and computing best practices such as not opening email from senders that are unrecognized or downloading attachments that are from unfamiliar sources.

FLOSS provides needed tools. This theme provided the largest number of sub-themes. During data analysis, I often struggled with where the sub-themes should be placed as many

could be and easily were major themes. The sub-themes were addressed within the major theme in Chapter 4, but there was enough nuance to warrant a separate sub-theme. All seven sub-themes were addressed either directly or indirectly by the participants' responses.

   FLOSS closes the digital divide. The digital divide was directly addressed by Catarino; however, Eve, Sophia, and Sasha were engulfed by the digital divide in their own degree. Aspects of the digital divide surfaced in the form of economics, social status, and personal goals. For instance, Eve expressed that the computer and training that she and her sons received from Hal could not be measured as this was their first experience with technology in their home (personal communication, September 11, 2013). Prior to meeting Hal, Eve could not afford the technology that her sons' schools felt that they needed. FLOSS provided a means to complete homework assignments as well as to conduct research.

   FLOSS also helped Sophia and Sasha bridge the digital divide. For instance, Sophia is now able to apply for teaching jobs while at home and no longer needs to pay for babysitting while she fills out applications (personal communication, September 20, 2013). Like Sophia, Sasha's experience with FLOSS also affected her family's well-being as Sasha is now able to enjoy seeing her sons' social status and confidence build now that they have access to the tools that other kids have (personal communication, September 30, 2013).

   Josephine experienced the digital divide from a different point-of-view. In Josephine's case, she was trying to bridge the digital divide by providing computing technology to the parents and students who are a part of her learning center's community. With Reglue's assistance, Josephine was able to successfully open a computer lab for low-income families in East Austin. This computer lab also provided the needed access that parents needed to communicate with family members in other countries as well as to send money back to their home countries (personal communication, November 7, 2013).

FLOSS is a viable economic option. Many participants spoke or alluded to the added expense that computing technology introduced into their lives. Of interest is that no participants spoke of the price of hardware. All discussion on the economics of FLOSS was based on its free availability. As Josephine expressed, she was surprised that she had never heard of FLOSS when in college and openly advocates for FLOSS among the learning center's community (personal communication, November 7, 2013). Like Josephine, Sophia tells other families about FLOSS and its free availability. Of importance here is not simply that most FLOSS is free as in price. What is important is that because of its free availability, FLOSS provides computing technology to people who could not otherwise afford it. While this notion precludes hardware expense, hardware is not hard to procure. Chapter 2 speaks to this. It is also quite easy to find computing hardware at school warehouse sales and thrift stores; however, once the hardware is secured, one still needs software to install onto the hardware. FLOSS fills this gap in that if one can purchase the hardware, then there is a free economically viable option for the needed software that could save the end-user hundreds of dollars.

FLOSS supports marginalized groups. This sub-theme arose during data analysis. When reflecting on Reglue, its mission, and the community it serves, I realized that Reglue is supporting marginalized groups (immigrants, single mothers, the handicapped, the poor) by providing FLOSS to those groups. Josephine's experience with her learning center's computer lab is a perfect example. The cost of certain pieces of software immediately out-price the families that the computer lab serves. By using FLOSS, Josephine is able to provide access to knowledge and information via the Internet. The learning center's community now has access to training, medical research, and legal assistance through a computer lab that uses FLOSS to provide that access to needed knowledge and information. Another example is Eve.

Eve and her sons now have access to knowledge and information that addresses her sons'

learning needs. Eve expressed that prior to using FLOSS, her sons were at the mercy of a school environment that did not differentiate curriculum to address her sons' learning needs at all times (personal communication, September 11, 2013). Using a computer with FLOSS has provided the supplemental learning that Eve's sons need in order to better their reading skills and to build the confidence that they need to perform academically as her sons were once weary of asking for assistance (personal communication, September 11, 2013).

FLOSS fosters learning. FLOSS fostered learning and curiosity in all of the participants and the members of their households. FLOSS provided the access to knowledge and information needed to explore new career options, to further educational opportunities, to develop intellectually stimulating hobbies, and to become literate and numerate. All participants expressed their desire to learn, create, and to explore their personal communities as well as discover new ones. For example, Mike uses FLOSS to better his technical skill-set although he does not have the technical certification (personal communication, December 19, 2013). Tove uses FLOSS therapeutically to exercise her cognitive acumen after her stroke (personal communication, January 10, 2014). Sophia is now planning on furthering her education by enrolling in an online graduate program (personal communication, September 20, 2013). In all instances, FLOSS was at the heart of providing the tools needed for each participant to achieve the kind of life that she or he wished to live.

FLOSS provides access to information. Access to information and knowledge is at the very core of this study. While there are other avenues to access information, FLOSS provided a means that is in alignment with and similar to how our communities, our society, and our world accesses information. In doing so, FLOSS provided a means for each participant to become an active member of the broader online community of learners where information is freely exchanged and ideas fostered. In a society that becomes ever more dependent on technology, it is

important to ensure that access to information is available to all facets and members of society.

FLOSS provided this access by giving the participants not only access to knowledge and

information, but also a voice, participation in, and membership of the larger, global online

community.

   FLOSS is an unknown technological alternative. In many instances, FLOSS is simply

an unknown technological alternative. While many end-users utilize FLOSS technologies in their

daily lives, many times this is unknown. For instance, using the Firefox web browser does not

connote the idea that one is using FLOSS to access online information. Rather, one is simply

using a tool, a web browser. Android-based cellular phones are also FLOSS, however, what does

this actually mean? Does one use an Android-based cellular phone thinking that she or he is

using FLOSS? To answer these questions, one must consider that because FLOSS is often

community-based, the economic expense of advertising is not always an option. Add to that

Tove's observation that many FLOSS programs are strangely named and the sheer number of

FLOSS programs available (over 30,000), then it is no wonder that many have not heard of

FLOSS (personal communication, January 10, 2014).

   In Josephine's case, she wished that she would have known about FLOSS when in college

(personal communication, November 7, 2013). Other participants expressed their surprise when

learning that OpenOffice and LibreOffice were fully compatible with Microsoft Office. Some

participants also indirectly expressed that they did not know of FLOSS alternatives because

people simply use what they know. If one is conditioned to use a certain set of tools at school or

at work, then why would not one expect to use that same set of tools for personal at home. This

last concept is addressed below in greater detail as it was a sub-theme to *Technology is a*

necessity.

   FLOSS fosters new opportunity. Most participants expressed the new opportunities that

have presented themselves since using FLOSS. These opportunities ranged from education to

community support. In all instances, FLOSS provided a new set of capabilities for the

participants to expand their functionings and live the kind of life she or he wished to live. One

does not know what one does not have access to. Therefore, the access to knowledge and

information provided by FLOSS expanded the participants' capabilities that provided additional

variability to their functionings.

       The FLOSS community is open source. A major component of FLOSS is the

community that comprises it. Catarino spoke to this during his interview when he addressed

quality assurance in software where code is freely commented on and bettered by members of

the open source community (personal communication, December 19, 2013). Hal also addressed

the open source nature of the FLOSS community when he spoke about Reglue kids and the

avatar that identifies them as such (personal communication, December 6, 2013). In both

instances, Catarino and Hal were speaking about the larger open source community that acts not

only as a source for member checking, but also as a vast repository of knowledge and experience

to learn from. The FLOSS community is, itself, open source as all information and knowledge is

freely available and open to any one who is willing to participate.

       The spirit of the FLOSS community transcends borders, language, and government. The

spirit of the FLOSS community exists in most places humankind exists including our own notion

of community and the Golden Rule (Rowan & Zinaich, 2003). The driving philosophy of the

FLOSS community is in every facet of human life where human contact, communication, and

community trump, in this case, the software developed by the community. This is also true of the

Reglue community and its relationship with the broader FLOSS community. Examples of this are

the fundraising for Hal's cancer treatment and Hal's oncologist agreeing to provide cancer

treatment *gratis*. In this case, the FLOSS community did not think of itself or the software that it

develops, but of human life. Often in the FLOSS community, it is the community and not the tools that it provides that matters most.

FLOSS fosters communication. FLOSS fosters communication in many ways. The most obvious is its means to provide access to knowledge and information. Other forms of communication include using FLOSS to communicate with others via the Internet either through video conferencing, email, or forums. In all instances, FLOSS provides a means to communicate with the broader global community. FLOSS also fosters communication that is quite personal. For instance, Eve, Sasha, and Sophia spoke of FLOSS fostering parent/child communication. Whether it was looking for recipes, creating a time capsule, or playing games, FLOSS fostered familial communication by providing an active means of communication. While this communication is technologically based, it is a more active form of technological communication than simply consuming media.

FLOSS also fostered communication by providing a voice to those who would otherwise not have one. An example of this are Eve's sons who, at one time, felt uncomfortable with asking questions (personal communication, September 11, 2013). The same is true of the computer lab at Josephine's learning center. The computer lab provides access to knowledge and information as well as a means to empower oneself when communicating across societal boundaries. Josephine's example of the mother educating herself on her son's illness comes to mind (personal communication, November 7, 2013). Without the access to information and knowledge, this parent would not have been able to voice her concerns to a doctor that did not speak her language (Spanish). This access also assisted the parent in educating herself in order to assess the validity of the doctor's input as the mother was also a member of groups that are often marginalized (immigrants and English language learners).

Advocacy. Advocacy played an important role in the FLOSS and Reglue communities.

Much like the broader FLOSS community, word-of-mouth helped to spread the knowledge of

FLOSS to other community members. On a larger scale, Hal is instrumental in advocating for

FLOSS adoption in Texas Public Schools. Hal has made it his life's work to educate others on not

using public funds to address needs that can be addressed for free (personal communication,

December 6, 2013). Likewise, Sophia refers other families to Reglue (personal communication,

September 20, 2013). Similarly, Morgan helps introduce others to FLOSS when communicating

with them on online forums. In all instances, advocacy plays an important role in educating the

broader community on FLOSS-based options that address current need or that could

economically be substituted for solutions currently in place.

     Voluntarism. Voluntarism is at the heart of the FLOSS community. The very act of

creating a FLOSS program indicates an act of voluntarism; however, the FLOSS community,

itself, is an act of voluntarism that depends on the voluntary actions of others. This includes

volunteering, but voluntarism has deeper implications.

     Voluntarism within the FLOSS community is the drive that keeps programmers,

community volunteers, advocates, participants, non-participants, writers, consumers, creators,

artists, and all who participate in the FLOSS community performing an action that many

interpret as one that does not pay for the services rendered. Many outside of the FLOSS

community have difficulty with understanding why anyone would spend hours of time

developing software that will be given away. To answer this, most FLOSS is free as in price, but

there are examples of FLOSS whose cost is not free. Technical support is also a means for

FLOSS companies and developers to earn income.

     Even so, the popular argument that FLOSS is a poor economic model because one does

not pay for services is quite prevalent. This argument is often used by people or industries who

may feel threatened by FLOSS, stand to lose income or business because of FLOSS, or simply

do not understand the heart of voluntarism that drives the FLOSS community. As for this argument, I ask those to ponder upon the success of companies like Google, Red Hat, and Novell.

It was mentioned earlier that the FLOSS community transcends the software that it develops and supports. The FLOSS community is an active action that wishes to better the greater community even if that action can be interpreted as an act of individualist ambition. The FLOSS community's voluntarism is akin to the scientific community's in that through personal discovery, much good can be had.

It can be argued that there are those who have no interest in developing tools for the greater good; however, the nature of the FLOSS community allows for that with the notion that to participate in the FLOSS community, one must succumb to the tenets of the community, the GPL, or other similar FLOSS licenses. The chances are great, however, that one could take software out of the FLOSS community and then develop those tools for purposes converse to FLOSS community. In this instance, the benefits of FLOSS are immediately revoked as the self-policing nature of FLOSS community is great. Think of Linus' Law mentioned by Catarino and explained in Chapter 4. If there are enough eyeballs out there to squash program bugs, then it would stand to reason that the same is true of ensuring not only the high and communal quality control of FLOSS programs, but also the knowledge of what tools are being used and how they are being used within and outside of the FLOSS community. Licenses also help to protect the FLOSS community from such actions. In some cases, legal action has been warranted.

Technology is a necessity. All participants felt that technology was a necessity for many facets of their daily lives. Even so, some participants felt that a balance was needed when using technology. For instance, Sasha felt it necessary to balance her sons' use of technology with their enjoyment of nature and human contact (personal communication, September 30, 2013). In other

instances, technology was important for communication, one's livelihood, and entertainment. While this major theme is quite obvious in our developed Western framework, it is important to understand that this is not necessarily the case in many areas of the world either by choice or because of the digital divide. In this theme, I did not focus heavily on FLOSS as I understood that the participants' experiences with technology predate their experiences with FLOSS and that technology surrounds us in our daily lives.

     Technology must serve a purpose. Many of the participants felt that technology must serve a purpose. This meant that technology could not simply exist unto itself. Technology had to serve as a means that serves a human endeavor as its ends. Sophia felt this to be true as her busy daily life could not justify the frivolous use of technology for technology's sake (personal communication, September 20, 2013). The same was true of Sasha's interpretation of technology in daily life (personal communication, September 30, 2013). Hal's life's mission to provide disadvantaged kids and their families with Linux-based computers is also a testament to this sub-theme in that Hal interprets computing technology as a great equalizer that provides disadvantaged kids and their families a competitive edge academically. This competitive edge, Hal believes, increases their competitive edge when competing for employment in the future.

     People use the software that they know. This sub-theme was an interesting one in that many of the participants spoke of the software that they used in interesting ways. For instance, many participants used the titles of proprietary software programs when referencing a FLOSS program that performed the same action. For example, documents created with LibreOffice or OpenOffice were referenced as Word documents. The term Microsoft Excel was used when speaking about LibreOffice Calc. In some instances, participants just referred to the type of document using the proprietary software title such as PowerPoint for presentations.

     A few of the participants made it known that they would use whatever software is

available at the time a task must be performed. For instance, Sophia used proprietary software

when her Reglue laptop was no longer working (personal communication, September 20, 2013).

The same is true of Sasha who does all of her personal and professional work on her own laptop

using proprietary software (personal communication, September 30, 2013). In Sasha's case, it is

her sons that use the FLOSS-based computer provided by Reglue. Mike uses proprietary

software when working on his clients' machines (personal communication, December 19, 2013).

It stands to reason, however, that Mike would use proprietary software as he would need

knowledge of the software to assist his clients with their technical difficulties. The data also

conveyed that there is a degree of end-user conditioning that should be explored in a another

study.

FLOSS is similar to proprietary software. Many of the participants found the migration

to FLOSS simple because many FLOSS programs function and look similar to the programs that

they were already familiar with. For instance, LibreOffice and OpenOffice work and look similar

to Microsoft Office. This familiarity helped the participants move through the assimilation period

that many spoke of. There were no instances where a participant did not enjoy or was not able to

adjust to FLOSS.

The Capability Approach and the Study's Findings

This qualitative case study was guided by the following research question: Has FLOSS

helped to expand human capabilities by providing access to information? The study's findings

indicate that the research question was adequately answered through the participants' words and

shared experiences. The theoretical framework utilized within this qualitative case study was

Sen's (1999, 2009) capability approach. When the participants' words and shared experiences are

analyzed and interpreted within the framework of the capability approach, what emerges is

FLOSS' capacity to expand human capabilities by providing access to the world's knowledge and

information. The question, then, centers on whether this expansion of human capabilities is sustainable and in which human spaces is it sustainable. What follows is an analysis of the research question, the capability approach, and the sustainability of the participants' development within their personal human spaces.

Eve. Eve's sons' capability sets were expanded within their cognitive and social spaces. All three of Eve's sons are dyslexic. Since her sons were introduced to FLOSS by Reglue, Eve has noticed both an increase in their confidence to learn new information and a willingness to seek out assistance when needed (personal communication, September 11, 2013). Eve's oldest son is now exploring his educational options post-high school. Eve's youngest sons have developed healthy hobbies that promote learning and enhance their reasoning skills. All three of Eve's sons have experienced a significant improvement in their reading, and their grades in school show this marked progress (personal communication, September 11, 2013). The sustainability of Eve's children's success comes from not only from Reglue's continued support, but also from the larger FLOSS community that her sons are no longer shy of participating in. The opportunities that have opened are of the type that could not regress as Eve sees FLOSS as a door to continued opportunity (personal communication, September 11, 2013).

Sophia. Sophia experienced an expansion of her capability set within her learning space. Sophia is now considering attending an online graduate school (personal communication, September 20, 2013). This opportunity stemmed from the positive experience that she has had both with FLOSS and within her undergraduate education. Taking a cue from the voluntarism of the FLOSS community, Sophia advocates on behalf of families. Sophia also advocates for families in need of computing technology by introducing them to FLOSS through Reglue's services. Sophia now realizes that there are alternatives, and she is open to use those FLOSS alternatives when there is a gap in the technological tools that she needs. Sophia understands that

FLOSS is not a remedy for most, but it is for those who cannot afford the tools needed to complete educational tasks.

      Sasha. Sasha embodies the spirit of voluntarism. She is heavily involved with a local affordable housing endeavor. Sasha's capability set was expanded through her sons. Sasha's sons have been able to bridge the digital divide by using FLOSS (personal communication, September 30, 2013). With FLOSS, Sasha's sons have expanded their capability sets by developing strong social skills and positive educational hobbies. The human spaces positively affected by FLOSS are her sons' education, personal relationships, familial relationships, and self-esteem. Sasha's sons now have the fortitude to venture forth and control their life's journey (personal communication, September 30, 2013).

      Josephine. Josephine continues to assist in expanding the capability sets of the families and students that her learning center serves. The learning center's families now have access to information in their own language. These families are now able to communicate with distant relatives and send money to them via online resources (personal communication, November 7, 2013). Josephine's personal spaces have also expanded in that she and her husband now understand the tool sets available to them with FLOSS. During her interview, Josephine was still amazed at how she had never known of FLOSS alternatives to expensive proprietary software (personal communication, November 7, 2013). At the learning center, Josephine continues to provide adult literacy, computer literacy, and ESL classes for the local community. Josephine credits all of these opportunities to FLOSS and Reglue.

      Hal. Reglue and Hal continue to expand the capability sets of hundreds of children and their families in eastern Williamson County, Texas. Hal is committed to drive the digital divide out of the community by providing FLOSS alternatives to access knowledge and information. Hal's tireless work ensures that the capability sets of Reglue kids are continuously expanded.

Mike. Mike's capability set was expanded when he first learned about Linux and Reglue. Mike has also witnessed the expanding of his family's capability sets (personal communication, December 19, 2013). In turn, Mike's family also assists in expanding the capability sets of their friends. For instance, Mike's daughter introduces her college classmates to FLOSS when they cannot afford the college's prescribed proprietary software (personal communication, December 19, 2013). While Mike is hard-pressed to find employment due to his lack of schooling and certification, Mike does not see this as a deficit in that FLOSS provides him the ability to continuously sharpen his skill set. FLOSS has also assisted in introducing Mike's son to programming. Mike's son now wants to explore programming as a college major and a possible career option.

Catarino. Catarino's capability set was expanded through his work with Reglue. Catarino has seen the growth of his son and wife through their continued use of FLOSS (personal communication, December 19, 2013). Catarino's son is now seeking employment as a GNU/Linux systems administrator, and Catarino's wife has used FLOSS to learn how to type and to become computer literate.

Tove. Tove uses FLOSS to exercise her cognitive abilities after her stroke. Tove is committed to promoting FLOSS and believes others should explore FLOSS as a means to access knowledge and information. Tove's daughter is now a computer programmer and embodies much of Tove's pioneering spirit through FLOSS development. More so, Tove firmly believes in the open source nature of the FLOSS community. As she stated during her interview, Tove believes that "we're put on this earth for a reason" (personal communication, January 10, 2014).

Morgan. Morgan's capability set was expanded seven years ago when she began using FLOSS. Morgan encourages others to use FLOSS when she participates in online discussions and forums. Morgan was not as forthcoming with her information, but she did share that FLOSS

meets her needs. This includes working with her photography and communicating with others online (personal communication, January 18, 2014).

It is clear from the participants' responses as provided in Chapter 4 and briefly above that FLOSS has helped to expand human capabilities by providing access to the world's knowledge and information. In some cases, the expansion of human capabilities was indirect; however, it is clear that all participants have added to their capabilities providing greater variance in their functionings. While the human spaces where this development occurred varies, what is clear is that these human spaces where personal, social, familial, and communal.

Recommendations and Closing Observations

As is the case with most qualitative studies, the opportunity to negate a study's findings will always exist. Be that as it may, a strong component that exists within the qualitative research methodology to firm its findings is the personal connection that can occur between the researcher and the site. The researcher's position to the research site cannot be a removed one. This is particularly true when human word, thought, and emotion are the data set. To be removed would be to remove the depth of discussion provided by the participants. This is the autobiographic strength that heuristic inquiry lends to this study (Moustakas, 1994).

I first came to Reglue not knowing what to expect. Certainly, I did not expect to find myself wanting to learn more from Hal so that I can recreate a Reglue effort in my own community. I still travel to Taylor, Texas, to volunteer my time even as this study has concluded. I would argue, however, that this study is far from complete as Reglue's efforts never cease with Hal tirelessly at the helm. Even so, this does not leave me without recommendations for further study.

Recommendations for future research. Firstly, I would recommend a similar study using a similar non-profit that uses proprietary software to provide access to the world's

knowledge and information. I would like to see and to hear those results and stories. This would help to affirm, negate, or at least confirm if it is technology in general or the software specifically that helps expand human capabilities in accessing the world's knowledge and information.

Secondly, I would allot more time to the study. Another study is warranted with more participants and over time. For instance, it would be of interest to interview the participants' children when they become adults. It would be of benefit to this study to learn from their experiences as I have from their parents as that data would be theirs and not an interpreted version as provided by their parents.

Thirdly, I would recommend studying other FLOSS endeavors similar to Reglue to ascertain if it is FLOSS or the larger than life personality that is Hal driving the participants' success and capability expansion. As Hal is synonymous with Reglue, it would be interesting to see if the same results are attainable with another organization.

Finally, I recommend that other researchers explore FLOSS' capacity to develop and assist in the growth of local ICT industries. This includes exploring the added technological capacity of the workforce that works with or develops FLOSS as well as the addition of technological startups that are FLOSS-based. This exploration could not only be domestic, but also internationally based.

Recommendations for educators and educational policy makers. Firstly, educators and education policy makers should explore the potential cost savings of using FLOSS in local schools. While there is an assimilation period, the potential cost savings could be well worth persevering through that assimilation period. Therefore, it is important that the proper training also be provided to assist all involved in the transition or adoption of FLOSS into their daily workflow.

Secondly, education policy makers and educators should be cautious of creating

technological systems or assigning school work that only functions or is only accessible using proprietary software as this could easily exclude many students and their families who do not have access to that particular computing technology. The digital divide is an all too real reality for many students and their families. It should not fall unto an educator or educational policy maker's lot to inadvertently perpetuate the digital divide. While technology is an important aspect in the daily lives of many, technology is still a financially unattainable tool for many students and their families.

Finally, educators and educational policy makers should know about and communicate FLOSS alternatives to their students and their families as a means of access to knowledge, information, and computing technology. While this will not fully solve the larger issue of the digital divide, it will begin a conversation that is often unknown or ignored. Knowing about and communicating to students and their families about FLOSS alternatives could also begin the transition of adopting FLOSS alternatives not only at the student level, but also at the school level.

In closing, this study is only the beginning of what could become my life's work. The short time that I have spent with Hal has convinced me that by in investing into the community, both the individual and the community are raised. I worry about Reglue's future with Hal's health. I often wonder how much longer Hal will be able to continue Reglue. Hal does not openly speak of such things, but certainly he must think of them. Each effort to ask about Reglue's future in five or ten years was always circumnavigated. It was never clear if Reglue does have a future once Hal retires from the helm. Perhaps Hal's wish for Reglue to metamorphose into an idea rather than remain an entity is what's best. In this manner, the spirit of Reglue could traverse into regions unexplored without being physically bound as it currently is in Taylor, Texas.

Summary

      This chapter explored the study's sub-themes and the capability approach within the framework of the study's findings. The purpose of the study and the research question were then examined within the paradigm of the participants' responses. This chapter concluded with recommendations for further study, recommendations for educators and educational policy makers, and the researcher's closing observations.

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Appendix A

Application for Institutional Review Board Approval

Application for Institutional Review Board Approval
University of the Incarnate Word

Title of Study: Expanding Human Capabilities Through the Adoption and Utilization of Free, Libre, and Open Source Software

College/School or Division/Discipline: Dreeben School of Education/International Education and Entrepreneurship

INVESTIGATORS			
Principal Investigator - A UIW PI must be designated for all projects in which UIW is engaged in research.			
Name: James Simpson	Phone #: █████ 52	E-mail: jdsimpso@student wtx.edu	Address: █████ ST █████ TX
Co-Investigator(s) – List all co-investigators and provide contact information (list each on a separate line)			
Name: N/A	Phone #: N/A	E-mail: N/A	Address: N/A
Faculty Supervisor of Student Project, Thesis, or Dissertation			
Name: Dr. Norman St. Clai█	Phone #: █████ 138	E-mail: stclair@uiwtx.edu	Address: 1301 Broadway ST CPO 293 San Antonio, TX 78209

CITI TRAINING
X All investigators (including faculty supervisors) have completed CITI training and are currently certified

RESEARCH INFORMATION		
Research Category: Exempt **X** Expedited Review ☐Full Board Review		
Number of Subjects: 12-14	Number of Controls:	Duration of Study: 1-3 months

Does this research involve any of the following (check all that apply):
☐ Inmates of penal institutions
☐ Institutionalized intellectually handicapped
☐ Institutionalized mentally disabled
☐ Committed patients
☐ Intellectually handicapped outpatient
☐ Mentally disabled outpatient
☐ Pregnant women
☐ Fetus in utero
☐ Viable fetus
☐ Nonviable fetus
☐ Dead fetus
☐ In Vitro fertilization
☐ Minors (under 18)

FUNDING DISCLOSURES
Funding source: X None ☐Internal ☐External ☐Pending
List all external funding sources (pending and awarded):
This project is completely self-funded.
The funding provides for (select all that apply):   ☐Investigator release time or compensation   ☐Research materials   ☐Graduate assistants, student workers, or other project employees   ☐Travel   ☐Other: Click here to enter text.
Financial Conflict of Interest:
Please describe any financial interest in the funding organization or any similar organization (stocks, board membership, etc):   N/A

SIGNATURES
Original Signatures are required. This application will not be processed until all signatures are obtained. Ensure the document is finalized BEFORE collecting signatures. Any subsequent edits will remove signature verification and require the collection to begin again.
Signature of the Principal Investigator   The undersigned accepts responsibility for the study, including adherence to DHHS, FDA, and UIW policies regarding protections of the rights and welfare of human subjects participating in the study. In the case of student protocols, the faculty supervisor and the student share responsibility for adherence to policies.   7/24/13
Signature of Faculty Research Supervisor – Required for student investigators   By signing this form, the faculty research supervisor attests that he/she has read the attached protocol submitted for IRB review, and agrees to provide appropriate education and supervision of the student investigator above.   Norman St. Clair
Signature of Co-investigator(s)

RESEARCH PROTOCOL

INSTRUCTIONS:
Provide the required information and develop your research protocol in accordance with UIW Institutional Review Board (IRB) requirements specified in IRB Manual 25-27. For explanations on each section, double-click the red Help. To collapse Help text, double-click again.

Section 1: Purpose   YMACRO

The purpose of this qualitative case study is to understand in which human spaces Free, Libre, and Open Source Software (FLOSS) helped to promote sustainable human development by expanding human capabilities (choices) in accessing the world's knowledge and information in one community.

This study will use Amartya Sen's Capability Approach to understand how using FLOSS helped participants from one community expand their capability sets by providing a free and open means to access the world's knowledge and information.

By understanding how using FLOSS has helped to expand participant's capabilities, the researcher will be better able to provide recommendations that could inform practice, policy, and other researchers of FLOSS. The importance of this stems from FLOSS' continued growth in Internet technologies as well as cloud-based technologies. Unlike other FLOSS studies, the focus of this study will be on a shared human experience provided specifically by FLOSS.

Section 2: Background and Significance   MYMACRO2

The significance of the study is to fill a gap in current research on Free, Libre, and Open Source Software. At this time, the ends of this gap include large regional studies to corporate specific studies or software specific studies. There is little evidence in the literature of a human-focused FLOSS study that explores the human spaces that FLOSS affects or influences by providing access to the world's knowledge and information. As one could argue that such an endeavor is possible with proprietary software, this study's purpose will explore this phenomena through the utilization of FLOSS. These human spaces include areas such as education, nutrition, skill building, reading, writing, care-giving, and any endeavor where a human thumb-print is left.

Section 3: Location, Facility and Equipment to Be Used   YMACRO3

Reglue Headquarters, Taylor, Texas; 307 Ferguson Street, Taylor, TX 76574
Linux based laptop (Debian GNU/Linux 7, MSI Laptop, 8GB RAM, 750GB HDD) IP: 166.78.147.154
Linux based cloud server (Debian GNU/Linux 7, 512MB RAM, 20GB)
Audacity
Researcher notebook
PSPP GNU Statistical Software for simple descriptive statistics
Password protected blog (Mediawiki-based blog) IP: 166.78.182.147

Section 4: Subjects and Informed Consent   YMACRO4

All subjects will be 18+ years old. As purposeful sampling will be used as well as opportunistic and snowballing (also forms of purposeful sampling) the researcher is unsure at this time of the gender differentiation. Even so, Reglue makes a concerted effort to introduce FLOSS to women. The researcher will work with Reglue's CEO on ensuring to select participants that is representative of Reglue's community.

Consent Methods

Prior to research, the researcher will work with Reglue's CEO to identify potential subjects. All subjects will be notified prior to research by Reglue's CEO to ascertain whether or not the potential participant wishes to participate in the study. For those who wish to participate, an informed consent form will be provided to them prior to collecting data. All data will be qualitative with minor quantitative data in the form of descriptive statistics. The descriptive statistics will be pulled from Reglue's ongoing database that highlights the type of computer given, the age of the recipients, name and address of the recipients. The information to be used will be the city to highlight Reglue's work in and around not only Taylor, Texas, but also the Texas Hill Country.

Directly before each interview, the researcher will review the consent form document. All participants will be notified that they can elect not to participate in the study at any time.

While Reglue works with children under the age of 18 as well as young and older adults, the researcher will only interview parents and guardians of those under 18 years of age as they will be able to convey the change, if any, in the lives of their children and their own through the use of FLOSS. It is the researcher's hope to be able to interview the college-aged "Reglue Kids" and explore their experiences with FLOSS. The researcher will also interview adults who are participating in Reglue's computer literacy classes.

Once consent is given, a copy of the consent form will be given to each participant. The researcher's copy will be locked in the researcher's filing cabinet at his residence.

Section 5: Subject Compensation   YMACRO7

The researcher will compensate subjects by volunteering time and teaching basic computer literacy classes. In the spirit of the open source community, the researcher teach skill-sets that can then be used by participants and the Reglue community to further enhance their experiences with computing technology both FLOSS and proprietary as the researcher understands that most employers do use proprietary software. Therefore, it is imperative that computer literacy courses also teach how to use proprietary software.

Section 6: Duration   YMACRO5

The study should take approximately 1-3 months once IRB is granted. This time frame is based on the researcher traveling on weekends and on volunteer days

granted by his employer to conduct the study (5 in total). The researcher will also use his Holiday Leave for conducting research in a timely manner. Weekends were chosen as Reglue provides adult computer literacy on weekends. Classes are also held on certain evenings during the week.

Section 7: Research Design (Description of the Experiment, Data Collection and Analysis)   YMACRO6

This study is a case study that will utilize phenomenological inquiry. Merriam (2002) states that with case study, other facets of qualitative research methodologies can be also be used to add to the experience and assist the researcher in understanding a shared experience. The shared experience in this case will be introduction to and the utilization of FLOSS in one community and the experience shared by participatns once FLOSS has become a part of their household. It is important to note that those who receive a Linux based computer from Reglue are trained on how to use their computer; are given a computer upgrade every three years; receive unlimited support locally and remotely; in, some cases, may be given Internet access to assist in providing access to the world's knowledge and information.

Data will be collected in the form of qualitative interviews and a password protected blog. For full transparency, the researcher will never perform one-to-one interviews that do not leave the researcher and the participant alone.

Data analysis will be conducted using Creswell's (2008) methodology for handling and analyzing qualitative data. This methodology includes the following steps:

1. Organize the data
2. Transcribe the data
3. Analyze the data
4. Explore the general sense of the data
5. Code the data
6. Describe the data

All data collection and analysis will be performed by the researcher. The selection of the participants will be purposeful utilizing opportunistic and snowball sampling. The researcher will be introduced to the community by Reglue's CEO who will act as an insider and cultural broker.

The researcher will also launch an online blog as a place for participants to share other anecdotes as well as a place for the researcher to member check with participants. Each participant will be given a login that is unique to him or her. This will build a private area accessible only to the participant where he or she can then member check the transcribed interview. Doing so will also bring a sense of community to Reglue that does not yet fully exist – collaboration between other Reglue community members. This last will be in a public section of the blog. It will also serve as a way for the researcher to remain in contact with the Reglue community as a volunteer and teacher.

Section 8: Risk Analysis YMACRO8

There are no inherent risks in this study. All that will be asked of the participants is time. In this accord, the researcher will work within the participants' schedules to honor their time, occupational obligations, and familial duties.

Section 9: Confidentiality YMACRO10

Pseudonyms will be used for all participants. Data will be kept on an encrypted partition on the researcher's laptop with a daily rsync -a over ssh to a Rackspace cloud server that is also encrypted. Both the partition and the cloud server will be destroyed at the study's conclusion. To do so, an rm -rf * will be performed on the encrypted partition. The partition will then be added back to the LVM pool as a new blank disk as the information will have been destroyed. The same will follow for the cloud server. An rm -rf * will be performed followed by a physical deletion of the cloud server. Committee members will have access to the cloud server at all times during the study's duration. Hence, the committee will be able to ssh onto the server and observe changes to the data. User accounts will be made for each committee member to allow for ssh access. A cron job will be scheduled for a daily rsync -a from the researcher's laptop to the cloud server. The ssh protocol is a secure protocol that allows one to securely log onto a server remotely. Please see http://en.wikipedia.org/wiki/Secure_Shell for more on the ssh protocol. Other commands are below:

rsync – http://en.wikipedia.org/wiki/Rsync
rm - http://en.wikipedia.org/wiki/Rm_(Unix)
cron – http://en.wikipedia.org/wiki/Cron
lvm – http://en.wikipedia.org/wiki/Logical_volume_management

Section 10: Literature Cited YMACRO12

See Attached References Document.

CHECKLIST
Incomplete applications will not be reviewed. Please ensure all documents are completed and submitted.
Submit electronically: X Electronic copy (Word format) of IRB Application X Attachment with informed consent documents X Attachment with instruments used for data collection

If a change in research occurs, the Board must be notified before research is continued.

Appendix B

Letter to Potential Participants

LETTER TO POTENTIAL PARTICIPANTS FOR A STUDY OF
Expanding Human Capabilities Through the Adoption and Utilization
of Free, Libre, and Open Source Software
University of the Incarnate Word

Dear Prospective Participant:

I am James (Jim) Simpson a doctoral candidate at the University of the Incarnate Word in San Antonio, Texas. I am working towards a doctorate degree in education with a concentration in International Education and Entrepreneurship.

You are being asked to take part in a research case study on free and open source software. I want to learn and understand in what areas of life using free and open source software could assist users in expanding their capabilities or choices by providing access to knowledge and information. This includes learning about the advantages and disadvantages of using free and open source software from you.

You are being asked to take part in this study at the suggestion of Reglue. If you decide to take part, I will coordinate a time and place where we can meet to conduct an interview. The interview should take no more than an hour and will be recorded using a computer. There will only be one interview. The questions that I will ask during the interview are attached. I will contact you after I have transcribed the interview to ensure that I have captured your words properly.

At the conclusion of the interview, I will provide you with information about an online blog that you may use to contact me. You will have your own account to the blog where messages to me will be private. There will also be a public section of the blog so that you can read about the progress of the study as well as share information with other participants such as new programs that you have discovered or great ways to use certain programs. Participation in the blog is voluntary. No data collected during the interview will be publicly available on the blog.

There are no risks in participating in this study aside discomfort that may arise from being interviewed and recorded. I will schedule interviews according to your schedule to eliminate any inconvenience for you.

Everything I learn from you in the study will be confidential and will be coded so that you are not identified by your responses. If I publish the results of the study, you will not be identified in any way. All information collected from you will be destroyed at the study's conclusion.

Your decision to take part in the study is voluntary. You are free to choose not to participate in the study or to stop participating at any time. If you choose not to participate or to stop participating, you will not be affected in any way.

If you have questions, feel free to contact me. If you have additional questions later or you wish to report a problem that may be related to this study, you may contact my committee chair:

Dr. Norman St. Clair
1301 Broadway ST
CPO 293
San Antonio, TX 78209
███████████

stclair@uiwtx.edu

The University of the Incarnate Word committee that reviews research on human subjects, the Institutional Review Board, will answer any questions about your rights as a research participant. You may contact them at: 210.805.3036.

You will be given a copy of this letter to keep.

Thank you for your time and consideration.

Sincerely,

James Simpson
███████████

jdsimpso@student.uiwtx.edu

Appendix C

Participant Consent Form

PARTICIPANT CONSENT TO TAKE PART IN A STUDY OF
Expanding Human Capabilities Through the Adoption and Utilization
of Free, Libre, and Open Source Software
University of the Incarnate Word

I, _____, agree to participate in a case study as part of a doctoral dissertation by James Simpson chaired by Dr. Norman St. Clair from the Department of Education at the University of the Incarnate Word in San Antonio, Texas. I understand that the study is titled Expanding Human Capabilities Through the Adoption and Utilization of Free, Libre, and Open Source Software.

I understand that my participation in this case study is voluntary. I can elect to terminate my participation at any time. I also understand that my electing not to participate or terminate my participation in this case study will not affect me in any way.

I have been explained that the purpose of the study is to understand in what areas of life using free and open source software could assist in expanding capabilities or choices by providing access to knowledge and information. This includes providing the researcher my understanding of the advantages and disadvantages of using free and open source software.

I understand that I am being asked to take part in this study at the suggestion of Reglue and that the interview should take no more than an hour and will be recorded using a computer. I understand that there will only be one interview and have been provided the interview questions. The researcher explained that I will be contacted after he has transcribed the interview to ensure that my ideas and words are accurately transcribed.

The researcher explained that at the conclusion of this interview, I will be provided with information about an online blog that I may use to contact the researcher. I understand that I will have my own account to the blog where messages to me will be private. I understand that there will also be a public section of the blog so that I can read about the progress of the study as well as share information with other participants such as new programs that I have discovered or great ways to use certain programs. I understand that participation in the blog is voluntary.

I understand that there are no risks in participating in this study aside discomfort that may arise from being interviewed and recorded and that this interview has been scheduled in adherence to my schedule.

The researcher has explained that everything learned from me in the study will be confidential and will be coded so that I am not identified by my responses. I also understand that if the researcher publishes the results of the study, I will not be identified in any way. All information collected from me will be destroyed at the study's conclusion.

I understand that if I have questions, I can contact the researcher (email:

jdsimpso@student.uiwtx.edu, phone: ▓▓▓▓▓▓▓). If I have additional questions later or wish to report a problem that may be related to this study, I may contact the researcher's committee chair: Dr. Norman St. Clair, email: stclair@uiwtx.edu, phone: ▓▓▓▓▓▓▓.

I have been explained that The University of the Incarnate Word committee that reviews research on human subjects, the Institutional Review Board, will answer any questions about my rights as a research participant. I can contact them at: 210.805.3036.

I will be given a copy of this letter to keep.

I understand that my signature below indicates that I (1) consent to take part in this research study, (2) that I have read and understand the information given above, and (3) that the information above was explained to me.

_____

Participant's Signature   Date/Time

_____

Participant's Email Address   Participant's Phone Number

_____

Researcher's Signature   Date/Time

Appendix D

Interview Questions

1. Can you describe your experience(s) with technology? (Cell Phone, radios, TV, laptop, desktop, software, etc).
2. When thinking about all of these technologies, where does the computer rank in your daily use?
3. What do you think about when you hear the phrase computing technology?
4. How did you learn about Reglue?
5. Can you describe your first impression(s) or thought(s) when a computer running free or open source software was first explained to you?
6. What thoughts did you have when the computer was delivered to your home?
7. What training was provided to you on using the computer?
8. What tasks do you normally perform on your computer?
9. Can you name the software that you use often?
10. What are some advantages provided by free or open source software that are different from your past experiences with computers?
11. Can you describe the drawbacks or disadvantages of using free or open source software?
12. Can you describe your feeling of being connected to the world via the Internet or by having a computer in your home?
13. What opportunities have opened by using the computer? What do you think are the reasons for these opportunities opening?
14. What kind of information do you or others search for when using the computer?
15. Have you witnessed a change in yourself or those who have used the computer? Can you elaborate on those changes?
16. What else would you like to accomplish now that you have access to a computer?
17. Would you encourage or discourage others to use free or open source software? What are your reasons for doing so?
18. Are there any thoughts that have not been covered?