

# The information lives of immigrant and refugee youth acting as Information and Communication Technology (ICT) Wayfarers

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**Abstract**

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The Center for Immigration Studies reported in October 2016 that immigration to the U.S. had reached historic numbers. According to the U.S. Census estimates, 59.1 million immigrants live in the U.S.; this numbers includes 16.7 million American-born children who are under the age of 18. Thus, approximately one in five U.S. residents is an immigrant or minor child of an immigrant parent. This is a significant challenge facing many industrialized countries since the tools and frameworks to better integrate immigrants by a host country are evolving and are not currently designed to deal with the substantial number of people fleeing conflict and wars. Though libraries offer information and internet access and public educational institutions provide instructional support for immigrants, they are not adequate to scale to the ever-increasing tide of documented and undocumented immigrant and refugee flow coming into the United States. Since the flow of new immigrants is not decreasing, there is urgency to develop frameworks that can fluidly facilitate immigrant transition into the societies of the U.S. or other industrialized countries.

Helping immigrant communities to transition into an unfamiliar environment and society continues to be an intractable, sometimes called a wicked or tricky problem in the literature because there is no way of knowing if the proposed solutions can offer a viable

solution until the solution is actually implemented. Most international programs run by industrialized countries focus resources on preparing adults, and therefore indirectly their families, to adapt and become employable in cultures that differ considerably from their home countries. This adult training focus does not address the significant social, psychological and cultural barriers facing people who need to understand the structural, cultural and functional attributes of a different country. It is insufficient to make immigrants employable at a skilled job if they cannot also deal with the significant cultural differences that they face. Most programs do not include, or focus on, youth as communicators to transition immigrant knowledge needed to become functional members of a newly adopted country.

This research explored whether immigrants would adapt faster to their new environments if they functioned as Information and Communication Technology (ICT) Wayfarers between their families and their new host country. This research should also identify whether some immigrant youth are already functioning as Positive Deviants within their community. The approach used in this study was to focus on male/female immigrant and refugee youth, ages 14-19, who are on their journey to become brokers and experts of language, technology, media, and culture. The goal of this study was to determine how, why, and when, or whether these youth act in the role of immigrant youth ICT wayfarers. The primary method fused in this study was the creation of an evolving participatory framework and youth engagement model called Teen Design Days (TDD). Teen Design Days emerged from observations and workshops conducted between 2011 and 2014 at libraries, churches, and neighborhood centers located in immigrant communities in South Seattle in Washington State. This study showed that using a unique

participatory framework (TDD) does capture the voices of the youth as well as was able to identify Positive Deviants in the youth population. It also showed how combining a strategic use of design thinking and design artifacts was effective in offering insights into the Information Worlds (technology, social, information) of ICT Wayfaring youth and their ethnic communities. This research focused on creating and then evolving the TDD participatory engagement model using a pre-pilot, pilot (TDD I) and two youth participatory/co-design workshops (TDD II, II).

The results of this study show the importance of youth in facilitating their parents' and communities' adjustment to their new environments by becoming seekers and sharers of their newly acquired skills and knowledge needed to function in a new country. Without these Wayfaring youth, immigrants arriving in the U.S. would face more challenges to adapt to their new environments. This research demonstrated how each Wayfaring youth had a different model for how they contributed to information sharing and how they facilitated their parents to become comfortable with their new surroundings. Immigrant youth need to balance adapting to a new culture but also retaining their home country traditions if they are going to be effective ICT wayfarers. This study found that immigrant and refugee youth within their ethnic communities had a near unlimited capacity and willingness to help family, peers, community overcome many types of technical, cultural, and social barriers. They also had the capability to design and find unique solutions for the many beneficiaries they serve each day.

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# Chapter 1

## Introduction

### 1.1 Problem: Why Immigration is a Tricky Research Problem

Rates of immigration have dramatically increased due to global civil conflicts. On a worldwide scale, more than 50 million people have been forced to migrate from their homes and home countries. (Amnesty International, 2002) Many immigrant families come from geographic areas experiencing war or frequent acts of terrorism. They may spend years in refugee camps and suffer from torture or witnessing the torture of their friends or relatives. (Amnesty International, 2002) A large proportion of the current immigration group (2015-16) is traveling from Syria. More than three million people (almost half the population of Syria) are migrants being hosted in Turkey, Lebanon, and the U.S. (Amnesty International, 2016)

Many immigrants relocate to another country because their home environments are not safe. Some immigrants arrive in the U.S. as both immigrants and refugees who fear for their lives, their personal and family safety, and their future well-being. These people and their families are poorly prepared to travel to new cultures and environments. They face significant legal challenges to enter a new country, they do not have the financial resources to pay for their travels, and many do not have legal documents identifying where they migrated from. Once they arrive in another country, they must immediately learn new cultures and languages as well as navigate new communication modes and technologies. They have few if any contacts with future employers or even social services agencies. Most of these people are ill prepared to succeed in their new host country.

## 1.2 By the Numbers: A Backgrounder of the Immigrant Situation in the United States

Immigration to the U.S. has reached historic levels. A recent report, based on 2014-15 Census Bureau data, found 59.1 million immigrants (both documented and undocumented) now live in the U.S. (Center for Immigration Studies, 2016) From an age perspective, approximately 42.4 million immigrants are over the age of 18 and 16.7 million are children younger than 18 years of age (Fig. 1.1). The total immigrant population represents 18.2% of the current estimated overall population of 324 million people who currently reside in the United States.

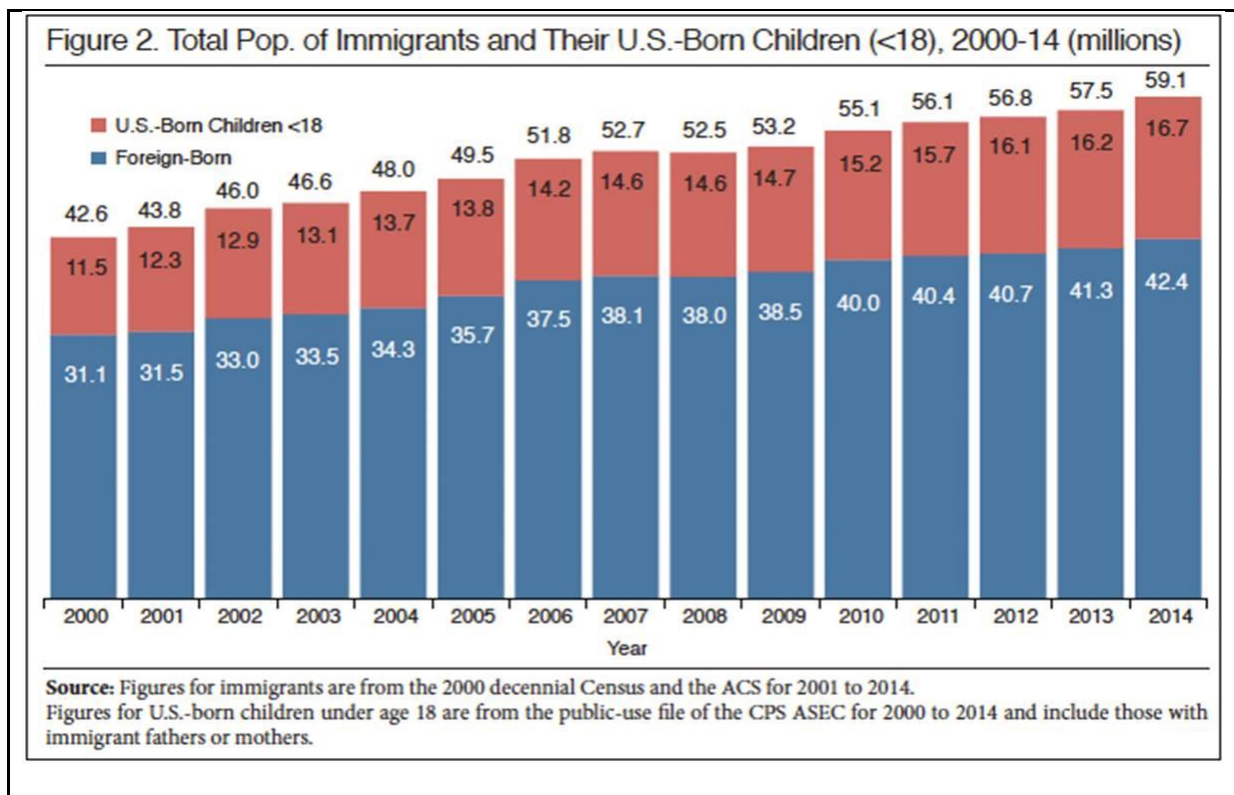


Fig. 1.1. Total Population of Immigrants and their Children. (Camorta and Zeigler, Center for Immigrant Studies, 2016)

When taking into account the impact of new immigration (documented and undocumented) plus births to immigrants between 2010 and 2014, the U.S. population level increased by approximately 8.3 million new residents. (Camorta and Zeigler, 2016) This increase accounts for

87% of the total U.S. population growth increases during this four-year period and is the largest growth of any segment of the census data. (Camorta and Zeigler, 2016) Since the 2016 report, one in nearly every five U.S. residents is now an immigrant or minor child of an immigrant parent. (Camorta and Zeigler, 2016)

While the diversity of immigrants bring incredible richness to the U.S. society, it also carries responsibility for helping immigrants and ethnic minorities to take part fully in the American way of life. The need for help, particularly through effective information services, is acute for several reasons. First, today's immigrant population is vastly more culturally and linguistically diverse than in earlier decades. In 1960, eight of the top ten source countries of immigrants were from Western Europe; the two source countries outside Western Europe was Mexico (#1) and Cuba (#6). (Migration Policy Institute, 2010) In contrast, 39 years later (2009), the top source countries (Mexico, China, Philippines, India, Dominican Republic, Cuba, Vietnam, Colombia, Korea, Haiti) were located across several continents but none from Western Europe. (Migration Policy Institute, 2010) The diversity of countries with different cultures means that migrants need to access many types of information in their host country.

Second, immigrants face ever more complex everyday life issues. The U.S. public libraries are an important source of information for migrants; today 75% have their patrons migrated from over 30 countries and up to 200 nationalities. (Burke, 2008) As "information poor" (Chatman, 1996; Childers, 1975), immigrants' need practical information on a variety of topics that range from: English language instruction; Employment and business opportunities; Location of schools and getting their children enrolled in the right school; Adult education and training; Health information; Transportation; Social services; Housing; Civic engagement; Protection of civil

rights; and learning the immigration and citizenship application process. (Burke, 2008; Caidi, Allard, & Quirke, 2010; City of Seattle, 2007; Srinivasan and Pyati, 2007)

Third, immigrants still face an array of barriers to seeking assistance due to poor language skills and cultural differences. Other factors that make it difficult for immigrants to navigate information streams are finances, transportation, unwelcoming environments, technology access and skills, agency complexity, and knowledge itself of what is available--including libraries and other agencies.

Fourth, immigrants are settling outside of traditional gateway cities where fewer services exist to facilitate their integration into new environments. Services that are not available in rural or smaller towns may include: obtaining instruction in the English language; how to apply for citizenship or green card status; or finding places to live that have “little history or identity with immigration”. (Singer, 2009) Given the 9,214 public library systems in the U.S.—in traditional and emerging gateway areas—“there is an even greater role for public libraries in welcoming and educating immigrants”. (US Impact Study, 2012)

When immigrants first arrive in large cities, several organizations and non-profits provide short-term help and access to resources. This can be language lessons or finding housing for a family for a couple of months. These organizations are less able to finance the longer-term cultural adaptations that immigrants need. Despite strong indicators for an alternative approach to address problems faced by today’s immigrants, U.S. is committing fewer resources to address the significant increase in the number of immigrant youth who need help in transitioning into another culture as well as its educational and health systems.

### **1.3 Satisfying Short-term Needs of Immigrants vs Facilitating Cultural Adaptation**

Rittel and Weber (1973) originally called urban planning and growth an intractable or a wicked problem and could be applied in a broader sense to the context of U.S. immigration because it has been challenging for researchers, policymakers, and governments to develop programs and frameworks designed to address the short-term problems immigrants face. Except for the economic side, researchers have not focused on the longer-term issues that continue to threaten whether immigrants are able to adapt to their new environments. To date, most of the funded research has focused on characterizing the refugees and immigrant populations (both documented and undocumented); immigrant population trends at the international, national, and state levels; and future economic forecasts and the potential impact of immigration policy on these economic outcomes. These types of information are useful for characterizing immigrants as a generic group and documenting whether they successfully pursue health, job and educational opportunities. (NAP, 2017) However, they do not address how successfully immigrants integrate into and adapt to their new environments and societies. This type of information would be very useful to design programs to accelerate the process by which newly arriving immigrants can acquire information and communication technologies to solve problems.

On a short-term basis, churches and many non-profit agencies and organizations provide social and health services, language classes and training for immigrants to improve their employment opportunities as well as finding housing. These support services are important for new immigrants but they only provide short-term solutions to the multiple and diverse problems they face. Further, these organizations do not have sufficient financial resources to provide the long-term support immigrants need to adapt to their home country cultures. Thus immigrants

may continue to struggle with obtaining the basic information that a typical U.S. citizens has known for a long time and can readily access using communication technology tools.

Another issue immigrant families need to address upon arriving in the U.S. is the high degree of uncertainty in coping with the rapid amount of change that is thrust upon them on their arrival in the United States. A new language, a new culture, and finding a job all occur in a compressed amount of time. (Katz, 2011) Often, immigrant parents need to find gainful employment to support their family and the resources they need. This makes it difficult for parents to find the time to learn a new language or to learn new information using communication technologies. It is very challenging for migrant parents to engage in a language they do not yet speak and a culture they have never experienced. (Katz, 2014) Further, immigrants need to be able to absorb a considerable amount of new information that they frequently do not have the context to understand.

Families, guardians, and ethnic community also expect immigrant children and youth to learn the new host culture and language as fast as possible after arriving in the U.S. Despite not having a complete grasp of the language or culture of their new country, youth are required to immediately function as “experts” and highly informed guides for a variety of family, community, non-community members, and peers. (Suárez-Orozco et al., 2015) As immigrant-origin children navigate (or struggle to navigate) new schools, peers, and societal norms, they may concurrently feel pressured to acquire (or maintain) the skills and knowledge valued within their heritage culture. Immigrant-origin youth simultaneously navigate two different worlds, i.e., their host world and their own ethnic community. Sometimes they benefit from the enriching perspective that this position provides and sometimes they face the isolation of being

marginalized by their parents and ethnic community members (Suárez-Orozco et al., 2015), with little or no voice of their own.

Long-term programs, to help immigrant communities to adapt to their new country, require new funding sources. However, immigrant youth and their parents directly compete with America's aging baby boomer population (Americans born between 1946 and 1964) for a fixed number of government programs, budgets, and subsidies. (Migration Policy Institute, 2011) Baby boomers are reaching ages older than 55 years and are starting to retire from the work force at a rapid rate. This places a greater demand for available and limited resources. These retirees expect to take advantage of government subsidies for Medicare, Medicaid, and Social Security benefits into their later years. (Migration Policy Institute, 2011) This means that the financial resources needed to develop a robust immigration policy lacks resources and is less able to compete for limited funds. Therefore alternative approaches are needed to continue to help immigrant communities to adapt to new environments and cultures. One approach to address this problem is to find a solution that will not require the immediate investment of significant funds, and would leverage existing support networks that already exist. This is where youth may become important intermediaries for the communication of information and the use of the technology to find knowledge needed to derive solutions for complex problems.

#### **1.4 Solution: Immigrant Youth Functioning as Information and Communication Technology Wayfarers (ICT wayfarers)**

For immigrants arriving into the U.S. from agriculture-based societies, it will be more challenging for them to become comfortable and facile in acquiring information and using communication technologies. In these societies, it is less common to use these modes of communication to gain knowledge. Thus, immigrants are immediately immersed and expected to

function in an information-based society and culture in which they have no prior knowledge or experiences. Dan Samuelson from World Relief Seattle whose organization is on the front lines working with incoming immigrants observes that: “This can be a multi-stage leapfrog jump from culture to culture running from agricultural to industrial and them to Information/technology based. We see the Immigrants that (our) agency works with who are often expected to adapt to their unfamiliar environment, learn English, and adopt new values, beliefs, and customs of the predominant American culture within a very short amount of time. This process of acculturation and adaption begins as soon as immigrants and their families encounter U.S. culture, often starting at the airport upon arrival in the U.S.”. (Meeting with Dan Samuelson, Director World Relief Seattle, 2014) For immigrant families migrating to the U.S., this can be stressful and an overwhelming experience. (Baptise, 1987; Rumbaut, 1994)

Any framework, with the goal of facilitating immigrants to adapt to their new environment over longer time frames, has to be designed within the context of the unique characteristics and the cultures of each immigrant group. Immigrants arriving in the U.S. are increasingly diverse which suggests that one model or framework will be incapable of responding to or addressing how to accelerate the process for immigrants to navigate their new environment. (Fix and Passel, 1994) Further confounding this problem is the extremes in the educational achievement levels attained by immigrants, e.g., either they have less than nine years of K-12 education or they have advanced degrees from Universities in their home countries (Fix and Passel, 1994). Therefore designing frameworks or tools at the local level for immigrants continues to be an intractable problem because one model or framework will not work in each immigrant community.

Not only adult immigrants but immigrant-origin children have to navigate (or struggle to navigate) new schools, peers, and societal norms. They may concurrently feel pressured to

acquire (or keep) the skills and knowledge that are valued within their heritage culture as they adapt to the norms of a different country. Immigrant-origin youth navigate and broker two different worlds; their host world and their own ethnic community. Sometimes they benefit from the enriching perspective that this position provides and sometimes they face the isolation of being marginalized by their parents and their ethnic community members, with little or no voice of their own.

While adult immigrants often focus on meeting the financial needs of their family and the cumulative needs of their ethnic community (Suárez-Orozco, 2015), the immigrant children and youth are expected to teach the community about American culture and the English language. Immigrant youth enrolled in the American school system will constantly learn and improve their English language skills. Therefore immigrant youth are able to serve as cultural and language tutors, and pass on the knowledge they are gaining directly back to the family members, peers, and to the community. This community expectation of their youth is understandable since schools teach the youth the English language (after the youth learn English themselves) and much more. Schools also provide some skills in how to use technology to access services, and gradually teach the other skills required to survive and navigate the new American host culture. (Suárez-Orozco et al., 2011) This supports the idea of why youth are ideal candidates to become ICT wayfarers. They already have some of the technical and language skills as well as the cultural awareness that are associated with ICT wayfarers.

### **1.5 Study Research Questions and Objectives**

Three research questions were addressed during this study to explore whether the efficacy of immigrant programs can be improved if immigrant youth have a larger role as information and

communication technology wayfarers in their ethnic community. The method used to explore these research questions gave a voice to immigrant youth that helped to explain why some youth are more effective in functioning as information and communication technology wayfarers, and positive deviants. This research also explored how immigrant youth function as ICT wayfarers and/or Positive Deviants when an ethnic community has ‘tricky’ problems to solve that require a new understanding of information and communication technologies. Such knowledge would facilitate immigrant programs to include educational programs designed specifically focus on the role of immigrant youth as adaptive agents for their ethnic communities. The focus of these programs would be to increase immigrant youth efficacy as information and communication technology wayfarers, and formalize their use of design thinking to solve complex problems within their ethnic community.

Designing programs for immigrant-origin youth is challenging because youth have to navigate (or struggle to navigate) new schools, peers, and societal norms. They concurrently feel pressured to acquire (or keep) the skills and knowledge that are valued within their heritage culture as they adapt to the norms of a different country. Immigrant-origin youth navigate and broker two different worlds: their host world and their own ethnic community. Sometimes they benefit from the enriching perspective that this position provides and sometimes they face the isolation of being marginalized by their parents and their ethnic community members, with little or no voice of their own. It is important to understand how they successfully or unsuccessfully navigate these worlds using technology to understand complex data or new information since this understanding can accelerate the rate at which adult immigrants adapt better to a new environment. This is the reason why youth voices are important for them to describe the technology and information challenges they experience and how they respond to them while

functioning within two cultures. This understanding is not possible from reading research papers since this is knowledge that is just emerging and few studies have used the youth voice to understand how to facilitate their adaptation to a new society.

### **1.5.1 Research Questions**

The following research questions were asked for this study:

**Research Question #1** - How do the Information Worlds of immigrant wayfaring youth reflect their social norms, social types, information value, information behavior, and information boundaries?

**Research Question #2** - How does the selective use of technology by youth ICT wayfarers break down barriers and increase the effectiveness of ICT wayfaring activities while supporting their roles as positive deviants?

**Research Question #3** - How does Design Thinking and Design Learning through hands-on solution prototyping provide insights into the information lives of immigrant youth and their communities?

### **1.5.2 Research Objectives**

The following research objectives were integral to the research described in this dissertation:

- Determine if immigrant youth ICT wayfarers exist and gain a first-hand and much deeper understanding of how ethnic minority youth serve as information, technology, language, and cultural brokers/mediaries within their social networks and larger ethnic communities.
- Conduct a series of Teen Design Days (TDD) workshops and create a **related** method that incorporates a modified and adapted version of design thinking and participatory design focus to promote immigrant youth engagement. Use the TDD workshop approach to focus on particular benefits, e.g., information, library services, community agency, innovation, and youth development.
- Examine the information, technology, and social worlds of immigrant youth ICT wayfarers to gain an understanding of whether they perform as ICT wayfarer. Also examine how youth ICT wayfarers develop their own learning, skills, and knowledge and whether they eventually pass this knowledge and personal experience to their family, friends, and ethnic community.
- Develop a framework/model for how immigrant and refugee youth, between the ages of 14 to 19 years of age, acquire the skills to become ICT wayfarers and function as a Positive Deviant. Determine whether the immigrant youth population can be trained to function as Positive Deviants.
- Implement a workshop format to allow youth opportunities to refine their ICT wayfarer skills to form solutions to problems they face. Provide youth space to tell their own stories as well as create their own solutions through prototyping and scenario development.

## **Chapter 2**

### **Literature Review**

#### **2.1 Information and Communication Technologies**

In the scientific literature, people who provide intermediated activities have been described in several diverse ways: as “brokers” (Provan and Human, 1999), “bridgers” (Bessant and Rush, 1995), “gatekeepers” (Metoyer-Duran, 1993), “lay information Mediaries” (Abrahamson and Fisher, 2008), and “Technology intermediaries” in the context of Human Computer Interactions (Sambassivian et al., 2010), and “brokers”. (Katz, 2011; 2015) Fisher et al. (2016) define the term ICT (Information and Communication Technologies) Wayfarers as information brokers who are adept at surfacing the needs of others in their social circles, and who provide information and other assistance between the dominant culture and their community. Within this framework, ICT wayfarers engage in varied aspects of information work, ranging from creating information, to searching, managing, storing, sharing, remixing, annotating, validating, translating, contextualizing, producing, and explaining information. (Fisher, Bishop, & Yefimova, 2016)

Information mediaries are people who seek information and perform instrumental tasks on behalf of others, without necessarily being asked to provide these services or engaging in follow-up discussions. (Coward and Fisher, 2010; Abrahamson and Fisher, 2007; Abrahamson, Fisher, Turner et al., 2008) Glimpses of information mediary behavior have been observed as gatekeepers (Metoyer-Duran, 1991), proxy searchers (van Doorn, Stappers, & Gielen, 2013), information-acquirers-and-sharers, and encounters. (Erdelez, 1997; Erdelez and Rioux, 2000; Marshall and Bly, 2004). Technology, web 2.0 specifically, has facilitated and exponentially

accelerated the rate at which people are able to behave as information mediaries, as well as the efficiency in which they communicate and record information automatically as tweets, texts, and emails.

An Information Mediarist or ICT wayfarer in its most simple form is defined as an agent/actor that facilitates the interaction between information and an information seeker. (Farmer, 2014) This agent is not always human but may be a software information intermediary, web-based search engine such as Google's Chrome Browser, or Microsoft Edge Browser, or Apples Safari Browser, or a database integration system that acquire, analyze, and present information when given a search query. In international development projects, they are often associated with the diffusion of information, knowledge, technology, innovation, and adaptation practices. For example, they may show someone how to operate a cell phone or a computer, where to find health information or gain access to the Internet, how to understand commodity prices, or even how to find job listings.

Keeping on the human side, since this dissertation is a social and information science study and not computer science-based, the names given to individuals (humans) who demonstrate this behavior include "brokers" (Provan and Human, 1999) or "bringers." (Bessant and Rush, 1995) In several cases, intermediaries are liaisons who link other actors in organizational networks and communities. This view is rooted in social network analysis, most notably in the work of Granovetter on "weak ties" (Granovetter, 1973) or that of Burt on "structural holes." (Burt, 1982)

The global impact study by the University of Washington's Technology and Social Change group defines an information mediary or infomediary as one who combines a set of technological resources and coaching to meet users' information needs and communication capabilities.

(Coward et al., 2008; Global Impact Study, 2010; Ramirez et al., 2010; Coward and Fisher, 2010) In their study of Public Information Accounting (PAC) from 2007 through 2012, they defined information mediaries as anyone who has friends or family members who use public access venues on their behalf, “proxy users”; the PAC study focused on venues like cybercafés, telecasters, and libraries in 50 countries worldwide. (Global Impact Study, 2010; 2013)

Intermediated technology mediaries are often asked to, or paid to manage and, use technology on behalf of others, i.e., their beneficiaries. Mediaries are bound by some explicit obligation to broker or transfer information and, as Gould and Gomez add, “deliver information in a culturally appropriate manner by considering the norms of each group of people whom the information intermediary is connected to.” (Gould and Gomez, 2010) The landscape study of 26 emerging market countries strongly supports the existence of these explicit roles. (Coward and Fisher, 2010; TASCHA, 2008) According to the latter study, the PAC venues that most successfully meet local information needs of underserved communities include strong information mediaries, both formal and informal, and for engaging community members. (Gould and Gomez, 2010)

A real-world example of a formal information intermediary is the Community Knowledge Worker (CKW) program funded and operated by the Grameen Foundation ([www.grameenfoundation.org](http://www.grameenfoundation.org)). The CKW disseminates health and agricultural information to the members of a specific lower income community using a mobile phone. They then collect data about the community in which the CKW operates. The Grameen Foundation is an example of an organization that plays a formal information intermediary role by its staff performing formal information intermediary tasks in a field setting.

Theo Schilderman suggests there are eight attributes of formal information mediaries (which he calls key informants), as shown in Table 2.1. Whether they operate as individuals or within formal information intermediary organizations, these formal information mediaries are important to the development role of PAC venues and to global development. (Schilderman, 2001) These functions provide some structure for the information intermediary tasks in PAC venues.

Table 2.1. Three main functions of information mediaries mapped to Schilderman’s attributes of information mediaries. (Gomez, Fawcett, & Turner, 2011; 2012)

<b>Functions</b>	<b>Infomediary Attributes (Schilderman)</b>
Share Information	(1) Capacity to provide information in an accessible format (2) Willingness to share information rather than hold on to it (3) Ability to get hold of information and adapt it to a local context
Help Users	(4) Experience, education, knowledge, and reliability (5) Accessibility, proximity, and helpfulness
Build Relationships	(6) Social sensitivity and capacity to involve residents (7) Leadership qualities, influence, and moral authority (8) Ability to foster trust in the relationship with residents

In a natural extension of Schilderman’s work, Gomez, Fawcett, and Turner (2011; 2012) mapped the eight information intermediary attributes to the three main information intermediary functions in Public Access Computing (PAC) venues, e.g., Cyber Cafés and Telecenters. They identified the following information intermediary functions: Share information, Help users, and Build relationships (Table 2.1) The fieldwork reported by Gomez, Fawcett, and Turner (2011; 2012) was conducted in Colombia between January and June 2010 in collaboration with a team of local research assistants to derive these functions. Gomez, Fawcett, and Turner (2011; 2012) offer a comprehensive understanding of PAC venues in Colombia and the role information mediaries (both formal and informal) play in them. In the latter study, several different approaches were used to triangulate the research outcomes, e.g., statistically representative surveys with the depth and insight of semi-structured interviews, and characterizing the context and interaction of focus

groups in workshops held in different communities. This mapping can be applied more broadly to most infomediary functions across Public Access Computing (PAC) venues worldwide and beyond the public access infomediary community.

In contrast to formal information mediaries, where people may be compensated for performing their infomediary tasks, informal information mediaries have implicit socially-constructed roles. They are often referred to as lay information mediaries or LIMs. This term was first coined by Abrahamson and Fisher (2007) to describe the phenomena of everyday people who seek information in an informal capacity for others (known as “muses”), without necessarily being asked to do so or requested to engage in follow-up. Based on their research with users of a consumer health website (Abrahamson et al., 2008) along with a meta-analysis of related studies, Abrahamson and Fisher (2007) found that information seeking was motivated by social constructs and individual context. Although prior research shows that LIMs may be of any age or gender, more recent research shows that in some situations (such as people seeking health information, or parents seeking information on behalf of their children) certain age groups and women are more likely to act as LIMs. (Abrahamson et al., 2008) The LIM behavior (or LIMB) often occurs among new immigrants in the U.S. who use the help of LIMs to adapt successfully. (Courtright, 2005; Fisher et al., 2004)

In a 2010 study of individuals with free access to computers and the Internet, two-thirds of the people used libraries and the Internet to find information on behalf of others. (Becker et al., 2010) This latter study was statistically robust since it included over 50,000 survey participants across all 50 states. It provides strong evidence that LIMB and LIMs may drive the information ecosystem in the U.S. Also, this study suggested that LIM behavior may also differ by country or by a countries development status, e.g., indexing a person’s economic status. However, these

insights are a relatively unstudied phenomenon outside the U.S. and among immigrant communities within the U.S.

## **2.2 Information Worlds**

Conceptionally, research on ‘Information Worlds’ focuses on the social aspects of information in settings of all sizes, along with the interactions between those multiple worlds. The theory draws heavily on two well-known scholars and philosophers. The first scholar, Elfreda Chatman, contributed to the ideas and concepts of small worlds and information poverty and their limited access to formal information resources and economic resources (Chatman, 1987). In Chatman’s view, living in a small world is lived with the constraints imposed by either tight limits placed on the availability of information resources, limited information access, or a set of social norms that tends to discourage the world’s inhabitants from looking beyond the boundaries of that world for the information they need. (Jaeger, 2009) In the case of immigrant communities the source of these social norms could originate from the values and cultures of the host country or from the country of origin, but most often originate from a combination of both.

According to Paul Jaeger and Gary Burnett, the second key contributor to the concept of Information Worlds is Jürgen Habermas, a philosopher who created the general theory of Lifeworld’s, which focused on the broader societal context of information in the public sphere. The core theoretical concept for the “public sphere” is an idealized space within a society, needed for the functioning of democracy, where independence of both state power and corporate influence exists. It is a place where information can freely flow and debate, on matters of public and civic concern, can openly continue. (Corner, 1995, pg. 42) The public sphere may be conveyed as the sphere of private people who come together as a “public”. (Habermas, 1989, pg.

27) Habermas added the concept of an information lifeworld where the whole ensemble of human relations coordinates and reproduces through communication practices and information exchanges. (Brand, 1990, pg. xii)

In contrast to Chatman's localized, small-scale, small-world, Habermas's lifeworld is expansive and reaches across a broad swath of culture; members of a social collective normally share a lifeworld. (Habermas, 1992, pg. 109) A lifeworld weaves the varied information resources, voices, and standpoints of all the members of a given society into the shared information and social environment.

Jaeger and Burnett note that Chatman's contribution to the idea of an Information World takes a micro view of information in social contexts and ignores the broader context in which studies of small communities exist. This is especially relevant in situations where more than one community comes into contact or conflict with each other. The unique small worlds help us understand the normative behaviors and choices of individuals who live within them. However, Habermas gives no consideration to the ways in which the broader society might interact with or functions in localized contexts and within specific communities. Though Chatman takes a narrow view and focus, and Habermas a broad view and focus, they cross at a bridge and extend both of their concepts into multiple-level theories of Information Worlds that give a more nuanced understanding of the intersections between information, information behavior, and the diverse cultural contexts within used to go from macro to micro.

Each of the two views disregard issues outside of their very broad or very narrow scope. As a result, each world view taken separately is very isolative and can be problematic due to the overlapping, intersecting, variety, and interactions which all impact and show how information is conceptualized and used within and across worlds. Small worlds allow a person to share a similar

cultural and intellectual space. That is, those things that hold this world together include a common assessment of information worthy of attention, social norms that allow its members to approach or ignore information, and appropriate behaviors that people believe in for this world. (Chatman, 2001)

The need for a theory of Information Worlds stems from the fact that Chatman's small worlds are vital to understanding the normative behaviors and choices of individuals who live within them. However, there is a need to recognize that small worlds are situated within a large lifeworld, and that there are boundaries between worlds across which individuals may move. (Jaeger, 2009, pg. 29). Fisher et al. (2005) extended this idea further by highlighting the fact that people received information through interpersonal interactions that may otherwise seem trivial. Their concept of "information grounds", which are locations where people gather for purposes unrelated to information, such as a barbershop, or a medical clinic, yet engage formal and informal information exchanges. (Fisher, Durance, & Hinton, 2004; Fisher and Naumer, 2005; Fisher et al., 2005)

Chatman and Habermas, with their narrow and small world/broad lifeworld view within the theory of Information Worlds, acknowledge that intermediate worlds exist. These intermediate worlds can mediate or intervene between worlds that are conceptually separated as macro, mezzo, and micro world frameworks. It was hypothesized in this study of immigrant and refugee youth, in their roles as information and communication wayfarers, often mediate between the intermediate worlds and the broader and narrower worlds.

When Jaeger and Burnett created the theory of Information Worlds, they talked about a set of five interconnected theoretical concepts which form the tenets of Information Worlds: social norms, social types, information value, information behavior, and boundaries. In a 2001 paper,

Chatman outlines three fundamental concepts of small worlds: social norms, social types, and information behavior. (Burnett, Besant, & Chatman, 2001). Three of these concepts from Chatman are brought into Jaeger and Burnett's principles to give a theoretical backing to the first three concepts of the theory of Information Worlds.

Chatman's fourth concept of a "worldview" is transformed in the theory of Information Worlds because the worlds are not completely isolated and do interact with each other. The fourth concept, "information value", holds the idea of social capital as one way to put a value on information and the idea that useful information for one world may not be useful or relevant to another. (Jaeger and Burnett, 2009) Also, because of the interaction between and among sociable information worlds, the concept of "information boundaries" and specific boundary objects (Star, 1989) can be easily found because the theory of information worlds focuses on the ways in which information is embedded in the social worlds of individuals.

### **2.3 Youth as Information Mediators**

Even though many published studies have reported on the topic of immigrant youth functioning as information mediaries for their families and their ethnic communities, the everyday Information Worlds of youth are still poorly understood. A comprehensive review of youth as information mediators has not been written but several studies are beginning to provide insights on critical driving variables that will help researchers design their future research projects. For example, Meyers, Fisher and Marcoux's (2007; 2009) fieldwork generated the Tween Day Methodology and identified five library service principles to focus on social, affective and credibility aspects. Examples of other tangential studies that explored youth behavior include: Todd and Edwards' (2004) work on Australian teenage girls' experience with

drug information; Hamer's (2003) and Mehra and Braquet's (2007) examinations of the coming-out experiences of youth; and Shenton and Dixon's (2003) research on interpersonal information-sharing of British youth between the ages of seven to 17.

Youth have preferred modes of communication, e.g., cell phones, as well as they decide who they will include in their communication network, e.g., friends and family. Two-thirds of the youth, between the ages of eight and 18 years, own a cell phone which they use for conversing, listening to/playing/watching other media, and texting (90 minutes daily for middle and high schoolers). (Rideout, Foehr, & Roberts, 2010) Agosto and Hughes-Hassel (2005; 2006) reported urban and racial minority teens preferred friends and family as their information sources, and cell phones was their primary tool for communication. Fisher, Marcoux, Miller et al. (2004) found migrant Hispanic farm workers and their families in Washington State engaged in interpersonal berry-picking, using individuals as their formal information retrieval systems; They often maintained these relationship over a lifetime instead of relying on single or a short series of interactions with a variety of people. Researching immigrant child mediators, Chu (1999) showed that once immigrant youth become comfortable speaking English, they may become their families' primary information mediary. Also, Chu (1999) wrote that immigrant youth bilingually carry out adult responsibilities which require a sophisticated grasp of more than one vocabulary.

Before immigrant youth can become effective ICT mediators, they will need to address many potential value conflicts and incompatibilities between their new peer groups driven by Generation Z'ers in the host country schools and their own heritage culture. For example, the heritage culture may or may not have had a smart phone, a computer, or Internet access while these are common and normal technological tools for youth in the host country. Balancing ones'

heritage culture with the new culture of their host country is tricky since it is easier for immigrant youth to adopt the new customs and practices of their host country and to become a member of a new 'tribe'.

If immigrant youth are unable to balance these cultural conflicts, they will not be able to function as ICT wayfarers since they need to function and communicate between two cultures. The everyday tasks an ICT wayfarer may also require them to broker information that is place- or business-specific, e.g., schools, workplaces, medical and social service centers, as well as in the home. (Katz, 2011) An ICT wayfarer may need to be able to function as an intermediary for a diversity of brokering activities, e.g., cultural, language, technology, and informational.

As youth mediators bridge at least two cultures, they also need to determine the best approach to introduce information that crosses cultural boundaries and may be uncomfortable for a group of people to discuss. Immigrant youth are already successfully navigating these potentially conflicting topics to communicate information to their community members. For example, the Youth Community Informatics (YCI) Project studied the use of information media by marginalized youth to engage with their local communities and the issues affecting their lives. (Bruce, Bishop, & Budhathoki, 2014) This project reported how youth functioned as designers and creators of a diversity of media approaches to share their perspectives on critical local information needs. The YCI Project reported how one group of African-American youth created a multimedia digital directory of community assets for teens. Another youth group created a library in the local juvenile detention center. Teen males, representing the Haitian Diaspora in Chicago, created a video about the use of surveillance cameras in their neighborhood. Ethnic minority high school students created podcasts dealing with health, identity, and other everyday needs.

Immigrant youth, therefore, are expected by their family and community members to become critical thinkers of massive amount of data in a variety of topics and then translate that knowledge to their parents and community. Being able to move within the confines of a technology world will accelerate the rate at which an ethnic community functions and adapts to their host country. The immigrant youth will not learn how to become critical thinkers by attending K-12 classes. The U.S. public educational system is ill prepared to educate K-12<sup>th</sup> grade students to critically make decisions (Harvard GSE, 2016). Historically, Western science and education have relied on specialized, de-contextualized and standardized approaches in their classrooms. Thus, youth in general are not educated to become deep learners until later in their education experience. This is a systematic problem for ~80% of U.S. high schools where no instruction on deep learning occurs; this is in stark contrast to private schools or schools in affluent neighborhoods (Harvard GSE, 2016). The students learn basic knowledge but as they progress in school they find themselves caught in an educational system designed for American youth. The immigrant youth need to become highly educated in management, science and engineering, which is often referred to as “STEM” related subjects, but also fit into the cultures and customs of their host country. The dissonance that students feel but do not understand, and is ignored by the public schools, is a major reason for the high failure rate schools experience with immigrant students.

Community and family expectations aside, these youths in most cases do not have well-informed guides or experts to help them acquire the English language, cultural, technological, nor educational skills that are needed to survive and thrive in their new host environment. These youths need to become critical thinkers to take the large amount of information that technology makes available to us today. Also, these technological tools may not be available because social and economic inequalities result in asymmetrical use or application of information and

communication technologies. Immigrant youth need to be able create new knowledge rather than be passive recipients of silos of knowledge as they facilitate their parents to function with new information and to use technology to respond to the problems they face. They need to be empowered to use emerging technologies to develop creative solutions to deal with the multitude of problems each family faces.

## **2.4 Cultural Probes**

For all citizens of a country, it is important to have skills and methods to acquire and share information using technology. Content and communications providers format and give information in a variety of ways. This means that non-immigrant teens, their use of technology tend to employ a variety of platforms and they choose the tool to match the content and purpose for their need. Social media has been the technology of choice for teenagers, using their social and creative needs. Educators of teens need to incorporate technology into their practices, providing access and opportunities for teens to optimize their technology use. Today's adolescents, ages 12 to 18, are often characterized as digital natives because many of them have grown up in a digital world. Most of them have some kind of access to technology, although the digital divide still exists.

The most difficult challenge is how to access and understand multiple data sources and streams to solve problems. This is especially an issue for immigrant youth who become knowledgeable in the use of all of this technology but still need to integrate their heritage culture within the context of their new culture. This requires the integration and linking of art, music and social norms and values into a critical data assessment approach. Youth need to be able to move between different Information Worlds and critically evaluate the information for its utility to

solve community problems. The research question being addressed in this paper was ‘How does Design Thinking and Design Learning through hands-on solution prototyping provide insights into the information lives of immigrant youth and their communities?’

A useful technique to integrate and link different cultures is the one developed by William Gaver. He is a designer, artist, and professor from the Royal College of Art in London, created cultural probes (or design probes). He included several of his colleagues in an “art first” technique to inspire ideas in the design process. (Gaver et al., 1999) The technique evolved from the ideas behind space exploration probes, which returned data from far away, and from medical probes that poked into the nooks and crannies to provoke a reaction. (Gaver et al., 1999) The goal of these probes was to gather inspirational data about people's lives, values, thoughts, and culture to stir up a designer’s imagination and consider alternatives. The original probes were small packages that included artifacts (like a map, postcard, camera, or diary) along with evocative tasks, such as taking photographs over everyday life in the context of residents in a home for older adults. The probes were given to a targeted group of people (such as the elderly) who recorded specific events, feelings, or interactions. (Gaver et al., 1999) From a designer’s perspective, probes were used to elicit inspirational responses from people, to better understand their culture, their thoughts, and values, to stir up a designer’s imagination and consider alternatives.

Since his original work, the definition of cultural probes has been expanded to include ways to gather user-generated artifacts and perspectives from a given population. This could include diary studies or other types of fieldwork. Though William Gaver himself said, during a 1:1 conversation at the 2013 Microsoft Research Faculty Summit, that the low-fidelity prototypes created by immigrant youth during the in-situ community workshops should not be considered

cultural probes, per se. (Fawcett, et. al, MSR Faculty Summit, 2013) In fact, in the literature, Gaver and his associates have criticized the wide variety of applications of and scientific approaches to probes as being a misunderstanding and misapplication of their original purpose. (Gaver et al., 2004)

Regardless of Gavers' direct or indirect feedback, several social, computer, and information scientists have synthesized a wide variety of publications and projects involving the use of probes in an article titled "How Probes Work." (Graham et al., 2007) Designers first used probes as a resource, but now they are used in multiple disciplines converging on this technique, such as engineering, design, social science, and ethnography. Graham and his colleagues concluded that differences in vocabulary, methods, and disciplines make it somewhat of a forgone conclusion that very different stances will exist around the purpose and use of probes. Probes have been operating across different communities of practice (Wenger, 1988) with different vocabularies, practices, and notions of rigor in data assessments. These communities often have different ideas of what design is and who does it. (Graham et al., 2007)

To increase our understanding of the information, technology, and social worlds of immigrant youth and their community stakeholders, we designed from scratch an emerging in-situ community workshop and data gathering to be implicit "cultural probes" within immigrant community settings. Though we did not use explicit cultural probes, as defined by William Gaver (Gaver, 1999), the interactions with the youth during their skits, sketches, and design presentations and their self-written narratives as Information Mediarities were essential in understanding their ICT wayfarer transactions. In this study, youth designed low-fidelity prototypes during their development and critique stages, and their final presentation to the community were all rich sources of cultural data and inspiration. (Fawcett, Fisher, et al., 2013)

The Teen Design Days participatory community workshops led to a deeper understanding, albeit incomplete, of the invisible, non-transparent world of immigrant youth and visualized their life in an ethnic community.

Findings by Graham (Graham et al., 2007) and his colleagues are summarized in Table 2.2. Graham's focus was on the use of probes in research studies across several disciplines and communities of practice. Comparisons of these characteristics with the design of the in-situ ICT wayfarer community workshops called Teen Design days was used to capture data for this study. The in-situ ICT wayfarer workshops served to gather data from the subjects and their context, just as if they were explicitly design cultural probes.

Through the workshops, and use of implicit probes, we learned about the community at a deeper level than would have been possible using other research methods. Using the in-situ workshop format and guided by Gavers' cultural probe principals. The TDD workshop were able to gather insights into the worlds of immigrant youth and the stakeholders in their ethnic communities that we would normally not be seen without using a "probe" in a short period of time. The Seattle area was an ideal environment to conduct this study since the percentage of foreign-born residents has increased from 11% in 1980 to 20% in 2010. Immigrants come from more than 70 countries and speak more than 90 languages (City of Seattle, 2007), with the claim that there are more than 100 languages spoken in Kent and the surrounding area (World Relief Interview, 2015). Seattle Public Library and King County Library System have needed to respond to this increasing influx and diversity of people.

Table 2.2. Comparison chart of characteristics of probes across various communities of practice and in situ community workshops.

<i>Characteristics of Probes Across Various Communities of Practice (Graham et al., 2007)</i>	<i>In Situ ICT Wayfarer Community Workshops (Teen Design Days)</i>
<b>Capture artifacts.</b> All probes include some form of capture device and are used for data collection.	Useful artifacts were captured during the workshops, including video capture of workshop participant skits, lo-fidelity designs, presentations of potential solutions form the youth back to the community, and diagrams of information, technology, and social worlds of the ICT wayfarers.
<b>(Auto)biographical accounts.</b> Probes generate accounts of people’s individual lives.	As part of the workshop agenda, workshop participants wrote 2-5 ICT wayfarer scenarios that offered significant insights into their lives and the lives of the stakeholders in their immigrant communities.
<b>Making the invisible visible.</b> Engaging with probes involves participants recording a point of view in the moment and making specific actions, places, objects, people, wishes, desires, emotions, and intentions visible.	The dialogue, design artifacts, and visual artifacts captured from the workshops gave the immigrant youth a voice that they did not previously have nor were they completely aware of.
<b>Participant as expert.</b> All probes are participatory. They explore, and at times redefine, the investigator-participant role. “Users can become more active contributors instead of being only passive sources of data.” (Hukko, 2004) Probes are part of a process of shifting the responsibility for describing situations and lives from the investigator’s perspective alone, to both the participant and the investigator.	At the beginning of the TDD Design Days workshops it is often difficult for the youth to become full participants and take on the role of workshop leaders. However, at some time during the workshop the participants eventually make a leap/breakthrough and start to drive their own skits, scenarios, and designs. During the TDD workshops, we relied on the participants to initiate these actions by purposely not being overly directive, though this was difficult until the youth actually understood their role in the workshop.
<b>Dialogue and conversation.</b> At the heart of how probes work, probes start a conversation, a dialogue that continues from initially handing over the probes to examining the returns over time.	Workshop participants often began the workshop with fear and apprehension. However, during the ongoing dialog, breaks, and lunch, their relationships with other youth participants, community leaders, researcher facilitators, and their stakeholders grew significantly.

## Chapter 3

### Methodology

#### **3.1 Creation of Teen Design Days Field Methods - Implementation of Information Worlds with Immigrant and Refugee Youth**

This study presents an empirically-grounded framework and field engagement method for understanding the everyday-life information lives and Information Worlds of immigrant and refugee youth 14–19 years of age. This study was designed to capture the voices and the actions that these immigrant wayfaring youths have with their beneficiaries and learn how they mediate and navigate their complex Information Worlds composed both largely of Information and Communication Technology (ICT).

The primary capture framework and method used in this study is a newly created framework called Teen Design Days (TDD) that draw from a range of research methods such as participatory design (Schuler and Nakimoka, 1993; Simonsen and Robertson, 2013), community-based action research (Hacker, 2012, 2013; Ledwith and Springett, 2010) and Positive deviance (Pascale and Sternin, 2010), ego-centric social networking analysis, (Scott, 2017; Ellison, 2007), and rapid prototyping. (Egger, 2000) The workshops themselves were built on prior work conducted by Meyers, Fisher, and Marcoux (2007; 2009) called Tween Day. The approach integrates these perspectives and methods into a multi-day workshop format developed specifically for youth of 14-19 years of age. Teen Design Days (Fawcett and Fisher, 2012) was created as an experimental and evolving youth engagement method in the form of an in-situ multi-day community workshop. The workshop was delivered by a group of senior researchers'

familiar with facilitating youth and with prior knowledge in these disciplines and fieldwork experience, and community development work both in and outside the U.S.

The Teen Design Days participatory workshops were designed and developed to gain an understanding of how and why immigrant and refugee youth act as ICT wayfarers to members of their communities and social networks. It focuses on the use of technology within an ethnic community, and the direct interactions with teens and their beneficiaries such as teachers, elders, peers, and other stakeholders. For this study, the 1-to-1 engagement model with 12 to as many as 26 immigrant youth participants per field engagement was designed to capture a deeper understanding of the role of youth as ICT wayfarers. The workshops were purposefully planned to allow youth to actively brainstorm, experience design thinking (Brown, 2009) and design learning and learning by doing (Druin, 2009). During the workshops youth were encouraged to apply their creative ideas to build physical representations, frameworks, scenarios, and prototypes of their ideas through low-fidelity prototyping, design critique and feedback, as and design thinking. (Brown, 2009)

The research methods used in this study drew much of its roots from ethnography. To effectively answer the research questions proposed by this study, a team of researchers and doctoral students developed a method of community engagement that created a neutral ground for both participants (youth) and researchers. In some workshop segments the youth were given control of the workshop outcomes and proposed solutions. The Teen Design Days community engagement model and workshops can be viewed as an evolving and adaptable multi-day community engagement workshop format.

In this study, the evolution of the TDD model is apparent from the progression from a pilot test (Teen Design Days 1) to a full 3-day workshop format (Teen Design Days II and III). This

method is unique in contrast to most of the youth current research studies because it very rapidly places the immigrant youth workshop participants in a position of equal power and contribution to the research, compared to keeping the youth at arm's length and view them as "research subjects".

Teen Design Days (TDD) involved capturing in-depth data about the journey of ethnic minority to become ICT wayfarers and their experiences. These were captured through a variety of instruments and observations that demonstrated and described their information mediary behavior and their social context while using technology to serve a variety of beneficiaries that covered a broad age range of diverse relationships. The Teen Design Days workshops were geared for a slightly older youth compared to the original Tween Days designed by Fisher et al. (2007; 2009). The Teen Design Days workshops expanded on the original Tween Days which used focus groups for Tweens (ages 9-12) engagement by adding cultural elements, and including adapted versions of design thinking and rapid prototyping. TDD also infused a stronger research element throughout the recreational and gaming portions of the workshop agenda so that these exercises were both fun and reinforced to the participants the core concepts and purpose of the workshop.

In Teen Design Day workshops, youth represent and discuss their ICT wayfarer experiences using a variety of techniques and actively take part in low fidelity prototyping of potential ICT services and applications as well as in the development of a scenario or story context for their prototype solutions. During the workshops formed groups, the youth created and developed a solution with their own hands and their own ideas. The solutions worked best when considering the youths own local context as community members and their own family members, while

producing representational prototype solutions and ICT wayfarer task descriptions as the main research artifacts.

To obtain access to the youth, the researchers on this project often used a local gatekeeper/ boundary spanner who was either a community worker already engaged with the youth, a school official, or a local librarian in a library system that served the community. Teen Design Days workshops I, II, and III were held at libraries, community centers, and churches in the Seattle area. Such locations are gathering places or “information grounds” (Fisher, Landry, & Naumer, 2007) for many immigrant communities across the U.S. At Teen Design Days I, II, and III, participants reflected on their ICT wayfarer behavior by creating their own first-person ICT wayfarer scenario descriptions and social networking and information word diagram and cultural probes (Gaver, Dunne, & Pacenti, 1999; Graham et al., 2007; Sanders et al., 2014). This typically involved a mix of artifact capture-methods including storytelling, hand-drawn images on papers or as one workshop participant demo used their own skin, and dramatic play, as well as design, low fidelity prototyping, and some programming principles. Smart phones, laptops, Microsoft Surface tablets, and other devices were used during these TDD workshops I-III. These hardware tools were combined with technology experts from the University of Washington, professional designers from Microsoft and Amazon product design teams, and scientists from Microsoft Research. They all contributed in unique ways so that there could be a better engagement with teens in current and future ICT wayfarer behaviors.

In the Teen Design Days workshops, participants are elucidating some of the following facets of ICT wayfarer behavior:

- Surfacing information needs
- Information encountering
- Information creating and remixing
- Information management

- Information sharing and giving
- Use of technology both by ICT wayfarers and their beneficiary stakeholders
- Using social network analysis and Information World diagrams
- Applying principles/theory of information behavior and information literacy
- Use of design and design thinking.

At each of the Teen Design Days, project staff and community members focused on meeting the young people's developmental needs (Davidson and Koppenhaver, 1992) for physical activity, competence and achievement, self-definition, creative expression, positive social interaction, structure, and clear limits. Several types of observatory data were collected including the workshops, field notes (contextual observations while interacting with teens, before, during, and after workshops), method notes (reflections on techniques for collecting data), and theory notes (documentation of ideas and connections with the study's theoretical frameworks and other phenomena). (Chatman, 1992)

### **3.2 Video and Audio Capture to Increase Trustworthiness**

One of the challenges of using the Teen Design Days capture framework was that the research team members were continuously challenged to scale within the workshop framework because of a ratio of 4 researchers to as many as 26 very active youth participants, who were often all simultaneously involved in TDD workshop activities. Because of the attention needed to keep all participants focused and the same time ensure that all of the participants interactions were correctly captured, we used digital still image capture, digital audio capture, and concurrent digital audio/video capture using multiple camera angles. This information as well as other results are available from the author by request and is not included in the dissertation.

For validation and trustworthiness of the workshop participants data, these audio and video captures were brought into an editing studio and labeled, volume edited, and then put into segments. In a post capture edit phase of analysis these were then reviewed and themed. Once

themed the digital captured streams were reviewed, with the most relevant transcribed and then coded using the coding book which was also used for coding the participants' narrative descriptions. From the coding, the themes and analysis were performed.

Using triangulated digital capture methods (observation, video/audio capture, transcription) were experimentally used in TDD II and III were useful in capturing a full spectrum dataset. The research team found the post capture analysis very deep with findings and very useful as they began experimenting with using digital video and audio capture (with transcription) of the participant's skits, iterative designs, final design solutions presentations and roles plays during the workshops. Though video and audio capture can be difficult to analyze because of the sheer volume of data generated and especially without the services of a professional video editor working many hours with the dissertation author, the Teen Design Days research team found these capture elements were extremely useful due to the very rapid delivery of the student skits and role plays during specific Teen Design Days exercises the need to recall specific participant details post workshop.

Though not a consideration during the first planning phases of Teen Design Days, and the pilot, Teen Design Days I, video and audio capture and recording became a requirement for all TDD workshops, especially for detailed post-workshop analysis. Though youth of all types are typically reluctant to be on a video capture, the team and the video crew figured out how to make the youth comfortable with being recorded and found the inclusion of video and audio capture offered significant value to the learning and insights from TDD.

The youth also felt comfortable being recorded because the participants used fake names to keep their privacy and actual identity anonymous. The transcripts from the audio portion of the capture proved to be invaluable for analyzing prototypes after the workshop ended. The TDD

team, also found that the video capture from the video footage was an effective dissemination tool for communicating with sponsors, parents, partners, and other interested researchers about the findings of our TDD workshops.

To create a connection between the youth and their community, Teen Design Days concluded with a community showcase where the youth informants/participants shared their experience with their parents, project funders, instructors, community workers, and city staff. This activity had a longer-term goal of selecting and highlighting the best prototype designs for further development and implementation at a future time.

The first TDD pilot workshop was a two-day version and happened at the New Holly community center in the offices of Horn of Africa services (HOAS), South Seattle, Washington. The second and third workshops Teen Design Days I and II/III, were held at the Foster Tukwila Library and St. Thomas Catholic Church, respectively.

### **3.3. Teen Design Days: Description of Activities and Typical Workshop Flow**

The first Teen Design Days (TDD I) workshop took place over the course of two days during the Presidents' Day public school holidays in 2013. It was hosted by the Horn of Africa Services (<http://www.hoas.org>) and included twelve teenagers from 14 to 19 years of age and from East African families. Activities were planned that would be fun and engaging for the youth. The workshop was digitally captured, from which a short film was produced. The primary goals were to test techniques of gathering data about ICT wayfarer behavior in a face to face interactive setting and to gain a better understanding of how young people think about their information behaviors. Selections from the workshop were digitally captured by a part-time video professional using a digital DLSR and who agreed to offer limited video services for the youth

teams to produce a short film about the project. The primary goals were to create a “context proof” by testing techniques of gathering data about ICT wayfarer behavior and to gain a better understanding of how young people thought about their Information Worlds, communities, and behaviors.

Day 1 of this first Teen Design Days U began after an initial icebreaker game and participative policy setting for the workshop. Youth were asked how they defined key terms, including information, technology, social network, and design. Next a discussion was started about the various kinds of people the youth knew and communicated with. This was followed by a more specific exercise in which the youth combined the “inspiration” stage of design thinking with the youth telling a story about a specific incident involving ICT wayfarer behavior (either with and without digital technology). During this activity, youth were invited to use any method that they felt comfortable with to create a representation of their ICT wayfarer-beneficiary interaction by drawing a picture, sketching a diagram, or creating a skit. The results were presented by the youth within a group setting and discussed. At the end of the first day of Teen Design Days I, the youth were given a homework task to complete for the next day: to create either a diagram or a story about their social network and how information was exchanged within it.

To maintain an ethical framework for doing social science research and field work, an application for protecting human subjects was filed with the University of Washington’s Institutional Review Board (IRB) for the School of Information Science (iSchool). This application was reviewed and approved by the board. Assent and consent forms were signed by each participant and their parent/guardian as needed. The Horn of Africa Services (HOAS)

community worker and his assistant helped to translate the forms and the planned workshop content to parents/guardians.

Though most of the participants spoke average or above average English, the HOAS staff helped administer and translate before, after, and during the workshop as needed. To maintain an ethical level of anonymity and privacy with participants, the youth were asked to give themselves a pseudonym (fake name) which was used throughout the workshop. No questions were asked of the participant or their parents regarding current documented immigration or green card status. We maintained these ethnical research protocols throughout the workshop and extended to Teen Design Days I, II, and III.

In designing TDD I, the research attempted to plan activities that the research team hypothesized would be fun and engaging for the youth. We captured the workshop digitally using the video capture mode of a Canon DLSR, from which was produced a short film that was shown at the MacArthur Digital youth conference in Chicago, a month later. During the MacArthur Digital youth conference several members of the Teen Design Day I were given the opportunity to fly to Chicago and participate in the conference. At MacArthur Digital youth, the research team delivered our first Teen Design Days “train the trainer” workshop to an audience of around 80 conference participants.

The primary goals of TDD I were to test techniques of gathering data about ICT wayfarer behavior in the field as well as gain a better understanding of how young people think about their information behaviors. After an initial icebreaker game and participative approach (community procedures) for the workshop, the youth created their own rules of engagement and behavior standards. We began by asking youth how they defined key terms, including information, technology, social network, and design. The researchers were pleasantly surprised when the

youth held each other accountable for what was on the community procedures. Light and Lively (L&L) games /exercises were interspersed at every 30-45 minutes of the workshop. For TDD I, L&L games exercises were not used for research purposes but only as distractions and activities for the kids. This idea changed in future TDD workshops.

The L&L activities were often followed by a topically thematic exercise in which the youth combined the initial “inspiration” stage of design thinking with telling a story about a specific incident involving ICT wayfarer behavior (with and without digital technology). Next, a discussion was started about the various kinds of people the youth knew and communicated with. These activities were then followed by a more specific exercise in which the youth combined the “inspiration” stage of design thinking with telling a story about a specific incident involving ICT wayfarer behavior (both with and without digital technology).

At this stage of the workshop, youth were asked to use any method they felt comfortable to them to use design thinking to tell a story, such as drawing a picture, sketching a diagram, or creating a skit. They presented their results to the group and discussed. At the end of the first day, youth created either a diagram or a story about their social network and how information was shared/exchanged within it amongst their friends, peers, teachers, and other community members. For homework outside of the workshop, the youths were asked to create one or more diagrams and as many as 2-3 stories about their social network and how information was exchanged within it.

For Teen Design Days I-III, we collected 46 Information World diagrams and approximately 148 narrative descriptions from the 61 youth participants. The capture process varied between Teen Design Days I and II where we asked the participants to create an Information World diagram often called a social networking or social world diagram in the literature as homework,

and with no connected between the narrative description and the Information World diagrams. These diagrams were created as separate and unrelated artifacts, though both were analyzed using the general coding schema/code book as shown in Appendix 1. Note that only a relevant sampling of the Information World diagrams are offered in this dissertation but are available upon request by the author. Specific examples of the Information World diagram for the first two Teen Design Days workshops, I and II, are located in Appendix 2.

For Teen Design Days III, we changed this artifact capture protocol and requested the participants create both an Information World diagram and one or more written narrative descriptions that were directly related to each other. This change in capture method for the 3<sup>rd</sup> TDD workshop allowed the researchers to better understand and correlate the descriptions with the diagrams yielding a very rich dataset. However, making this changed also caused the participants to create a more pictorial vs. diagrammatic images, thus making it slightly more challenging to analyze this visual information created by the participants, see a sample Information World diagram and narrative combination in Appendix 3.

To evaluate the Information World diagrams, we began by creating an array grid with the coordinates A-J on the X axis and 1-15 on the Y axis. The initial processing created a well-defined gridding system, so that each element of the image could be uniquely referred to in detail and allowed us to use the code book for themes and categories, where appropriate. After overlaying the grid on top of each of the diagrams a narrative description of each diagram was created using the new gridded reference points. These Information World narrative descriptions were then revised, analyzed, coded, and edited several times to extract the specific themes as they related to ICT wayfarer activities.

Thinking back and moving forward for future Teen Design Days we recommend that researchers ask participants to use “Think Aloud Protocol” much like an in-lab usability test to create Information World diagrams in an interactive manner. This would decrease the observed tendency by several youth participants to just copy other participants’ work to meet deadlines. It is also recommended, that separate follow up interview sessions be done with each workshop participant after the first diagram has been created so that there is a better triangulation between the participants, their intentions, and their created artifacts.

The Information World sketches/diagrams in TDD I that were produced by the youth participants combined social network diagrams, their own art, symbols, connections, and their own annotations including misspellings and grammar issues which is typical of someone who speaks English as a second language. The sketches were contextual representations, with a flowchart, processes, and written annotations.

The second day of the workshop included a debriefing session in which youth shared the diagrams and stories they created, as well as an in-depth session on design thinking. For the latter, the youth first learned the process of design thinking in a hands-on fashion in which they worked in groups to create a better paper clip. This exercise was drawn from the Intel Foundation Design and Discovery curriculum for youth science education (see <http://www.intel.com/content/dam/www/program/education/us/en/documents/K12/design-and-discovery/fg-design-process.pdf>). The participants then applied design thinking to their ICT wayfarer experiences by brainstorming a few improvements in technology and libraries that would support their work in finding and sharing information with their family, peers, and others in their local community.

On both day 1 and day 2 of TDD I, the research team continued its focus on the developmental needs of youth. To meet participants', need for physical activity, games were included that had them on their feet and moving around. In the obstacle course game, one youth was blindfolded. The others each chose an object from the room and placed it in the way of the person who could not see. Then, everyone had to work together to give the blindfolded youth instructions to navigate safely from one side of the room to the other, tying directly into the guiding and interpreting activities that the youth often engage in as an ICT wayfarer helping a beneficiary.

TDD II also used some traditional short written questionnaires. One collected demographic data and included a few basic items on technology use and information behavior. On several occasions during TDD I the team also used a traditional short written questionnaire. One instrument, called a "face sheet" was filled out after registration and check-in on day 1 of the workshop. This instrument collected demographic data and included a few basic items on technology use and information behavior with some of the results in Chapter 4.1 thru 4.4 of this dissertation. Another face sheet type questionnaire and group feedback were used to evaluate the TDD workshop itself.

Teen Design Days III occurred over a three day period as originally designed by Fisher, Bishop, Fawcett, & Magassa (2013). Youth, between the ages of 14 to 19, were recruited from the Saint Thomas Catholic Church in South Seattle a few weeks before the scheduled workshop event during the spring break of the Seattle public schools (April 2014). All participants were either refugees or immigrants from Burma or were children of immigrant refugees (13 girls, 12 boys) where the families were originally from Burma, Bhutan, Congo, Somalia, or Sudan. Some participants were from the Mae La refugee camp just across the Thai border of Burma. The

research team applied the same ethical standards/constructs that we did for Teen Design Days I and II (assent, consent forms, anonymized names for participants etc.). All youth completed all three Teen Design Days and each received a \$150 cash stipend.

Microsoft Research donated a 2-3-person video capture crew with HD cameras and digital recorders to document the workshop sessions; they took over 4,000 digital still images during the TDD III workshop. All 24 hours of TDD III were video and audio recorded yielding multiple terabytes of data accompanied by researchers' field notes, youth artifacts, and evaluations.

The expanded TDD agenda completed a public-school survey on ICT wayfarer behavior intended for a future roll-out to Seattle Public Schools. As homework, the youth participants were also required to submit 3-5 written scenarios (ICT wayfarer narratives) on situations they had been in recently acting as ICT wayfarers. The students took part in the ICT wayfarer skits and role-playing as well as the light and lively (L&L) activities over the 3-day workshop.

Theories provide general knowledge and principles that can be used to build on existing knowledge and test research questions. (Hjørland, 2000) For this research, the relevant theory derives from Information Mediarities that integrate 'Information Worlds' and 'Information and Communications Technology (ICT) Wayfarers'. 'Positive Deviants' and 'Design Thinking' are also relevant concepts that contribute to describing the process for how immigrant youth become information mediaries and provide an opportunity for proposed solutions within their ethnic immigrant communities.

In most cases, families or guardians expect children and youth to serve as the experts and highly informed guides for them to navigate within a new society. (Suárez-Orozco et al., 2015) This is an ideal approach to further foster since children and youth readily utilize a wide variety of technological and non-technological methods. Most immigrant children accept their need to

act as the readily available expert guides to American culture, language, and technology uses. Their parents, ethnic community members, and other stakeholders often assume that youth can find solutions at a moment's notice (or at a click of a button). This belief is based on the apparent success of youth in accessing information, doing their homework, or helping parents to purchase a train ticket, or to figure out the bus schedule.

When immigrant youth perform the functions mentioned above, they assume broad roles as 'Information Mediarities'. Therefore, this research used 'Information Mediarities' as the lens in which to research the role of immigrant youth as providers of expert knowledge for their constituent immigrant communities, peers, and family members. (Gomez and Gould, 2010; Gomez, Fawcett, & Turner, 2012)

## Chapter 4

### Results

#### 4.1. Analysis of Teen Design Days - *Demographics of participants in TDD pilot workshop*

The goal of the first TDD pilot workshop was to demographically characterize the participants and to begin to identify who were the most active and effective ICT wayfarers. At the beginning of each workshop, and as part of the check-in process, the workshop participants were asked to complete a general survey of themselves and their families called a “face sheet”. A face sheet is a general survey asking specific questions of each of the participants like their age, gender, when the participants arrived in the U.S., when their parents arrived in the U.S., how many different languages spoken at home, and what information and communication technology (ICT) was available at home.

Figure 4.1 summarizes the total workshop participant number, broken out by gender and age range for Teen Design Days I-III and this summary represents information from 61 youth workshop participants. There were 12 participants for the first pilot workshop at Horn of Africa services, 23 participants for TDDs II, and 26 for TDD II; this resulted in a total of 61 participants for TDD I-III. There was an equal gender distribution at the pilot workshop with six males and six female participants ranging from 14 years old to 19 years old with an average participant age of 16 years of age. The gender distribution for TDD II was slightly skewed was eight males and 14 female participants with an average age of 16.5 years of age. The gender distribution for workshop participants in TDD III was again equal with 13 male and 13 female participants with an average age slightly higher than the other two workshops of 16.9 years of age.

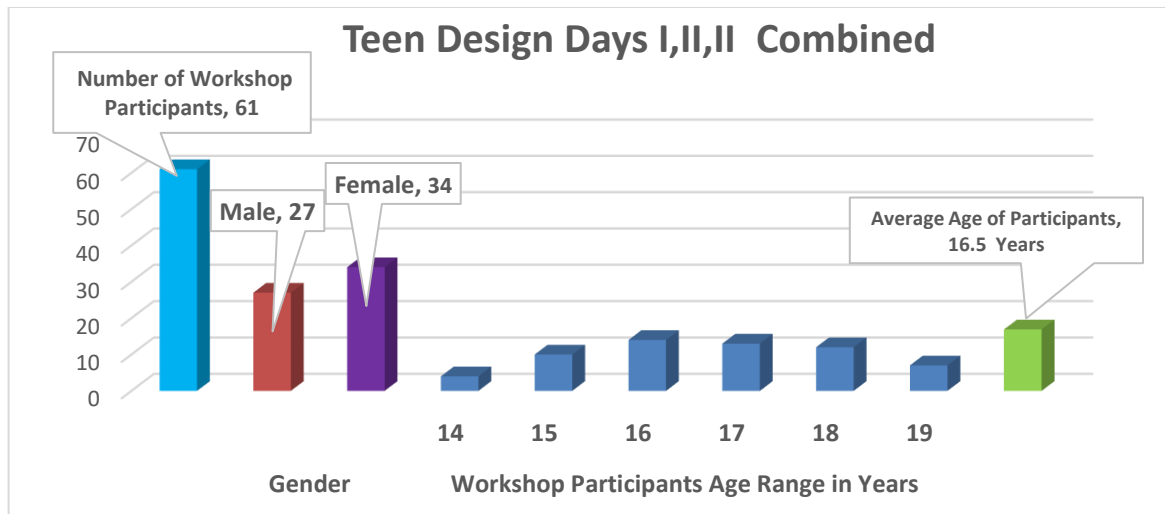


Fig. 4.1. Number of participants, their gender, and age range from Teen Design Days I-III.

The overall gender distribution for all three workshops was 27 males and 34 female participants making it near equal distribution across the genders with the average age at 16.4 years; there was one no response. During the workshop if a participant appeared to be out of the recommended age range of 14 to 19 years old for the research, the participant was asked to supply a birth certificate to support their reported age. The research team only had to verify the age of one participant for Teen Design Days III held with the Burmese community at St. Thomas Catholic Church in Tukwila. The average age range of workshop participants was 16 to 18 years.

Participants for each of the Teen Design Days' workshops were recruited from different immigrant community in South Seattle (Fig. 4.2). Teen Design Days I participants were recruited from the Horn of Africa services and the New Holly area suggesting participants would have been born in Somalia or somewhere close to Somalia in East Africa. However, over half of the workshop participants for the pilot TDD I were born in U.S., with the rest born in East Africa (e.g., Somalia, Kenya, or Ethiopia). This shows that some parents of workshop participants

arrived in the U.S. before giving birth to their children or participants came to the U.S. before their parents and stayed with family members before their parents arrived.

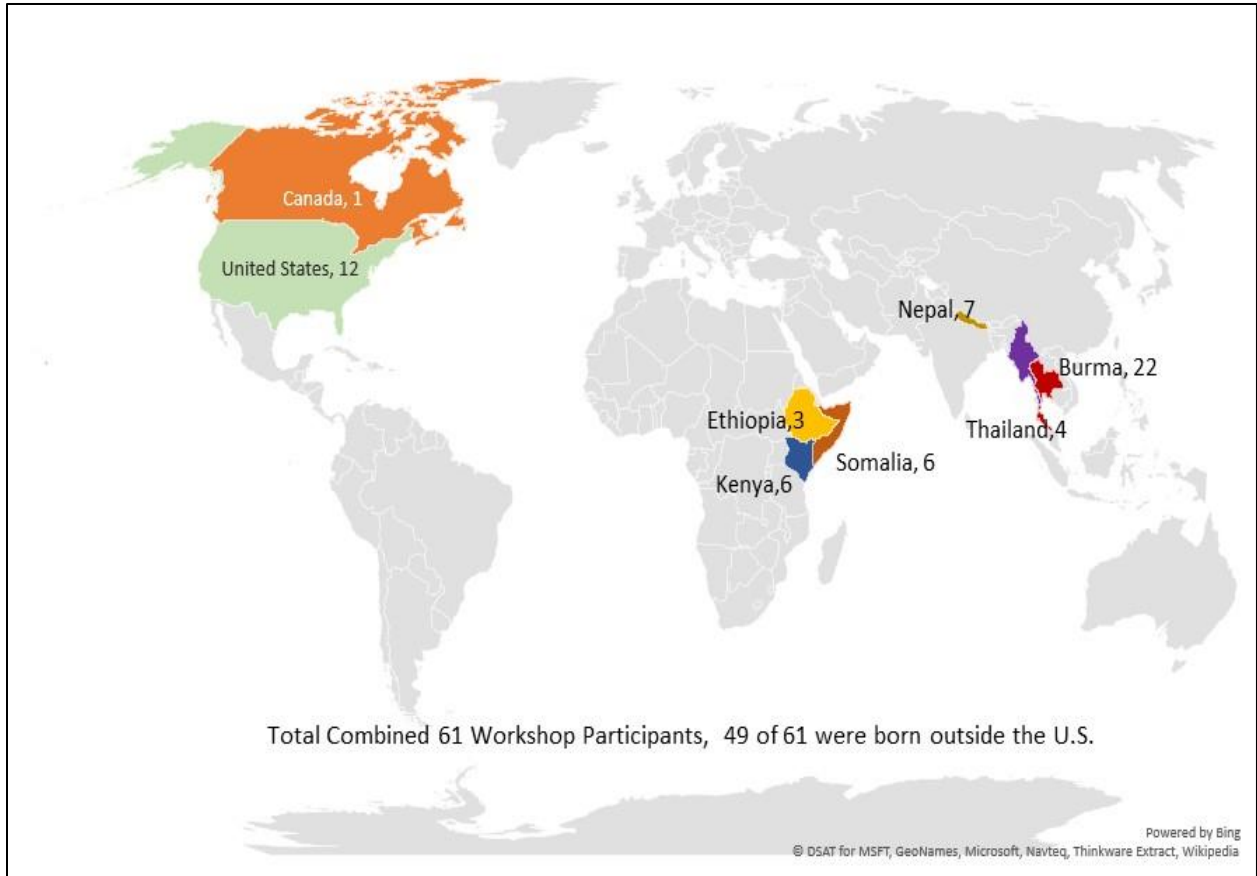


Fig. 4.2. Geolocation, place of birth, and number of participants in Teen Design Day Workshops I-III.

Participants for Teen Design Days II were recruited from Foster high school in the Tukwila area with the expectation that there would be a wide variety of birthplaces. Figure 4.2 shows the distribution of birth locations for all participants. For Teen Design Days II, five of the 23 participants were born in the U.S. The remaining participants were born outside of the US, in Somalia, Kenya, and Ethiopia, as well as seven were from Nepal and one from Canada.

Workshop participants for Teen Design Days III were recruited from St. Thomas Catholic Church which serves as one of the main community centers for the Burmese (Myanmar)

immigrants in South Seattle. At the time of the workshop the community worker said there were about 3,000 documented and undocumented Burmese and Thai people living in the City of Tukwila area, in South Seattle. Out of the 26 participants in TD III, none of the workshop participants were born in the U.S. while 22 were born in Burma and four in nearby Thailand. Overall for the three workshops, 12 of the 61 Teen Design Day workshop participants were born in the U.S. and the rest of the participants in one of the Horn of Africa nations, or in Nepal, Canada, Burma, or Thailand.

#### **4.2 Teen Design Days I-III Participant's Arrival Date in the U.S.**

For all 3 of the Teen Design Day workshops, the estimated dates of arrival of participants and their parents into the U.S. was recorded on the face sheet data and shown in Table 4.1. Some further analysis and comments were added, based on comparing the two dates. The factsheet data collected for Teen Design Days I showed that three out of the 12 participants was incomplete since they did not give an arrival date for either their parents or themselves. The data suggested that only two out of the 12 participants arrived in the U.S. at the same their parents and in one case the parents were still not in the U.S.

Table 4.1. Arrival dates of parents to the U.S. compared to youth workshop participants. Teen Design Day I-III combined.

	Parents Arrived in the U.S. <u>Before</u> Youth	Youth Arrived in the U.S. <u>Before</u> Parents	Youth Arrived in the U.S. <u>After</u> Parents or <u>were born</u> in the U.S.	Parents Arrived in the U.S. <u>After</u> the Youth	Parents Arrived in the U.S. at the <u>Same Time as Youth</u>	Parents are still <u>not in</u> the U.S.	No response recorded by Workshop Participant
<u>TDD I</u> No. of Participants	0	0	4	0	2	2	3
<u>TDD II</u> No. of Participants	9	0	5	0	8	1	0
<u>TDD III</u> No. of Participants	4	0	0	0	22	0	0
Teen Design Days I-III Total No. of Participants	13	0	9	0	32	4	3

For Teen Design Days II, there were five instances where the arrival dates of parents were reported but the participants marked a response as “N/A”, meaning they were born in the U.S. (Table 4.1). For the participants in the workshop, eight out of 23 arrived in the U.S. at the same time as their parents. In only one instance, the parents had still not come to the U.S. Also, nine out of 23 participant had parents who had arrived in the U.S. before their children; in some cases, four to seven years elapsed before the youth participants reconnected with their parents in the U.S.

The Teen Design Day III workshop had the largest number of parents and youth participants arriving at the same time to the U.S., i.e., 22 of 26 participants arrived at the same time as their parents to the U.S. (Table 4.1). The remaining participants arrived after their parents to the U.S.

and often this was three to four years later. For the Teen Design Days III, no participants were born in the U.S. or arrived in the U.S. before their parents (Table 4.1). Overall, about half of the participants, 32 out of 61, arrived in the U.S. at the same time as their parents. The remaining participants either arrived before their parents or their parents arrived before their children, or the parents have still not arrived in the U.S.

### 4.3 Languages Spoken at Home by Participants in Teen Design Days I-III

All participants of the Teen Design Day workshops I-III were asked about how many different languages were spoken at home, including English (Table 4.2). All participants in TDD I spoke mostly a combination of English and Somali, Cham, or they spoke English, Somali, and either Arabic, Oromo, or Swahili. No participants in TDD I spoke “English Only” at home and English was the second, third, or fourth language for participants who spoke English, Somali, Chinese, and Swahili. Most of the languages spoken at home were regional Somali dialects based on where the participants were born before coming to the U.S.

Table 4.2. Number of workshop participants and the number of languages spoken at home in Teen Design Days workshops. Teen Design Day I-III combined.

	No English Spoken at Home	English Plus 1 Language Spoken at Home	English Plus 2 Languages Spoken at Home	English Plus 3 Languages Spoken at Home	English Plus 4 Languages Spoken at Home
Teen Design Days I No. of Participants	0	3	4	4	1
Teen Design Days II No. of Participants	17	3	2	0	1
Teen Design Days III No. of Participants	26	0	0	0	0
Teen Design Days I-III Total No. of Participants	43	6	6	4	2

For Teen Design Days II participants were recruited from Foster high school which is located near the city of Tukwila, 17 of the 23 participants did not speak English at home (Table 4.2). In these cases, 12 out of the 23 participants only spoke Somali or Nepali at home. The other five of the 17 participants who do not speak English at home, spoke more than one language at home - 1 participant spoke Nepali/Hindi, and two other participants spoke two other languages. The other languages spoken are regional dialects of Ethiopia and Northern Kenya and Arabic/Somali or Amharic/Oromo; these are dialects of the larger regional business language of the Arab world and are spoken beyond state and country boundaries. These languages are consistent with the geographic locations noted in Figure 4.2 showing the geographic birth locations of the workshop participants.

For the youth participants surveyed that did speak English at home it usually was spoken in combination with Somali (Table 4.2). As noted above, in several cases only Nepali/Hindi, Amharic/Oromo, or Arabic/Somali are spoken at the participants' home. In some cases, participant spoke as many as three to four languages at home including a core of English/Somali combined with Hindi, or Arabic and Amharic.

For Teen Design Days III, recruited from Saint Thomas Catholic and represented participants from the Burmese community, no English was spoken at home for all 26 workshop participants (Table 4.2). In all cases, only one or two languages and dialects from Burma were spoken at home. These dialects included Burmese, Zopau, Tedim, Karenni, Hakha, Chin, and combinations or one to two languages. These languages were local or regional dialects of Burma/Myanmar.

Overall, English was not spoken in 43 out of the 61 participant's homes (Table 4.2). Speaking English occurred in schools or interacting with individuals and entities outside the ethnic community. The languages and dialects that the participants spoke at home were

consistent with their country of origin, region, and that of their parents. Speaking these regional dialects at home was a way to preserve and teach the language, culture, and traditions from the families' country of origin. This suggests one of the key challenges that most immigrant youth face is that they live in several language worlds and language is the cultural descriptor for most countries. So, they must balance communicating information without becoming lost in the multiple cultures that they have to bridge. At home, several languages can be spoken but only English is used in their high school. Therefore, each participant needs to learn the local language of the region they migrate to and function and balance several cultures.

#### **4.4. Computer or Smartphone use at Home by Participants in Teen Design Days I-III**

One of the assumptions tested during the Teen Design Days was whether the ICT wayfaring participants were really "Information Poor" (Chatman, 1993, 1996), i.e., not having access to computing devices either from a home computer or from a smart phone. As shown in Table 4.3, only 34 out of the 61 or 56% of the participants in the Teen Design Days I-III had both a computer and a smart phone at home. Only two out of 61 participants did not have either a computer or smart phone at home.

Table 4.3. Availability of computer and smart phone technology at home. Teen Design Day I-III combined.

	No. Workshop Participants	Computer at Home	No Computer at Home	Smart Phone at Home	No Smart Phone at Home	Both Smart Phone, Computer at Home	Neither Smart Phone or Computer at Home
Teen Design Days I No. of Participants	12	12	0	9	3	9	0
Teen Design Days II No. of Participants	23	20	3	13	10	13	1
Teen Design Days III No. of Participants	26	23	3	15	11	12	1
Total No. Participants Teen Design Days I-III	61	55	6	37	24	34	2

Based on observations made during the Teen Design Days workshops I-III, few participants fit the description as being “information poor” as described by Chapman (1993; 1996). Less than 3% (2 out of 61) of the Teen Design Day I-III participants did not have access to either a computer or a smart phone (Table 4.3). Also, less than 10% (6 out of 61) of the Teen Design Days I-III participants did not have access to a computer at home but showed that they either acquire access to the internet via the smart phone or some other public access computing venue such as a community center, school, or library (Table 4.3).

Typically, ICT wayfarers used their technology access as way to meet the needs of their beneficiaries and overall of their community. In this study, 55 out of the 61 Teen Design Days I-III participants had either a computer, laptop, or tablet in their home and 37 out of the 61 participants had a smart phone at home. Therefore, the youth within those communities who were acting as ICT wayfarers were not information poor and had access to technology such as smart phones, computers, and access to the internet.

#### **4.5 Analysis of Social Elements of Information Worlds and Lives of Immigrant Youth ICT wayfarers**

The main idea underlying the theory of Information Worlds, as designed by Jaeger and Burnett, was to offer a framework through which multiple actions between (1) information, in the broadest sense information is the sum of all facts, knowledge, conveyed between individuals and groups through face to face or virtual means. It also included (2) information behavior, searching, and seeking information, and (3) the many social contexts within which it exists, e.g., home, school, community. The analysis and framework of Information Worlds often starts at either the microworlds or small worlds as described by Chatman (Chatman, 1996) or Habermas's (Habermas, 1992) lifeworld known as the Macroworld or public sphere. Once the macro and microworlds have been somewhat defined and better understood, then the mesoworlds (intermediate worlds) (Jaeger and Burnett, 2010) become clearer as one of the only conduits that often exist between the smaller and larger Information World conceptual frameworks.

For some researchers, Information World theory has been considered to be too general and been criticized that its application has been done in a cursory manner by many scholars. (Yu, 2012) However, the theory argues that both immediate influences simultaneously shape information behavior, e.g., friends, family, co-workers, and trusted information sources of the small worlds in which the individual lives. (Jaeger and Burnett, 2010) Further, larger social influences shape information behavior, including public sphere institutions such as libraries and even media, technology, and politics. These levels, though defined as separate entities for analysis and observation, do not function in isolation. The temptation is to ignore any level in examining information behavior which can result in an incomplete picture of the social context of information.

In this study, we observed through direct interaction with workshop participants and observation during Teen Design Days I, II, and III workshops that immigrant and refugee youth play roles in their communities as Information Mediarities and ICT wayfarers. They are most often the virtual link needed for a community to survive as these youths go between the small and isolated worlds of immigrant communities and the larger public sphere of U.S. society and culture. In this study, how information was valued and used within these immigrant communities was shaped by both the ICT wayfarer themselves and their beneficiaries' who are most often the friends, family, peers, of ICT Wayfaring youth. Youth ICT wayfarers facilitated the flow of information between and within Information Worlds from small to meso to macro.

A summary of major social tenants of Information Worlds are its five focused social elements or aspects. The narratives and sketches produced by the participants during the Teen Design Days will be used to show how immigrant youth are functioning as Information Mediarities and ICT wayfarers through the social elements described below. These are:

1. **Social Norms:** most often stand for any Information Worlds agreed-upon, commonly-accepted, observable behaviors within that world. A social norm within an Information World sets the parameters that show its members acceptable standards and codes of behavior. (Burnett, Besant, & Chatman, 2001)
2. **Social Types:** Social types most often have given functional titles such as "Teacher" or "Coach", through typing the roles that define actors and provided as well as how these types are valued within the community.
3. **Information Value:** What value (either monetary (\$) or social), priority, trustworthiness information has which may reflect its source and shared sense.
4. **Information Behavior –** The broad range of seeking, searching, and finding information that are not integral to all the members of given world.
5. **Boundaries:** Sometimes the most interesting part of observing an Information World are the places where the elements of an Information Worlds interact and often influence each other.

As with any social structure within Information Worlds, the elements within Information Worlds are often interrelated and constantly interact with and influence one another. (Jaeger and Burnett, 2010) In this study of 61 immigrant and refugee youth during the Teen Design Days I, II, and III workshops, examples of each of these social elements of Information Worlds was observed, as well as shaped the value and the flow of information within, between, amongst the immigrant communities and between the youth ICT wayfarer and their network of beneficiaries. The artifacts were captured directly from the youth ICT wayfarers during these Teen Design Days workshops in the form of participant first person narrative descriptions and Information World diagrams. Some specific examples will be offered next, that highlight the expression of each the five social constructs of Information Worlds. It was clear from the artifacts and analysis that each participant fits into two or more of the five social elements of the Information World. All names in the following examples are not their real name to keep anonymity of the participants but were generated from a culturally appropriate and gender specific name generation tool.

In the TDD, Pankaj's narrative describes two of the social elements of Information Worlds: Social Norm and Information Value. Therefore, Pankaj is thinking about what things we should pay attention to and what things we should not (Chatman, 1996; Chatman and Pendleton, 1995) which enables him to understand his communities' behaviors and how it fit within the proper context of things. When Pankaj describes his beneficiary and the ICT wayfarer-Beneficiary exchange with Rang, he is describing the social tenant #1, Social Norm. Rang is much older (37 years of age) than Pankaj and they are related. Rang is Pankaj's mother and does not speak English as well as Pankaj does, so he help (helped?) his mother often, especially after coming to the United States. Pankaj wrote,

*First helip (Help?) I always mom in interpreting things such as letter, appointment etc.... She is 37 years old. I knew to help my mom \*\*\* I knew English well. I am helping my mom since I arrived United State. When I help my mom I also gain the knowledge and know more \*\*\*\*. My mom always help me in everything she means lots to me. I learn how interpret can help people and how it makes life more easy*

Within Asian communities outside the U.S., and behavior often carried across the Pacific by immigrant communities, is the expectation that children perform many functional activities for their parents without question. These activities include translation and interpretation as part of the immigrant community social norms. Pankaj notes that his mother, Rang, arrived in the U.S. before he did, showing a time gap (exact gap not documented) and geographic separation between family members “*helping since I arrive in the United States*”.

Pankaj’s narrative also describes social tenant #3, Information Value. Since Pankaj’s arrived in the U.S., he has helped his mother interpret and translate because “*he knew English well*”. The act of helping his mother leads him to “*gaining knowledge and knowing more*” by receiving value in the form of new knowledge and the personal satisfaction helping his mother who often reciprocates by saying that “*his mother always helps me*”. Pankaj also gains the benefit of learning how to interpret by helping his mother which then allows him to help and make the lives easier for others within their immigrant community context.

Another TDD participant Soe Bo describes the social tenet #2, Social Type, in the following narrative,

*When I was in the freshman year my ELL teacher help me and show me how to use a computer because it was my first time in life using computer. My teacher show me how to open and cas (case) in to the computer. She also showed me how to close a computer after using I passed on what I knew about computer to new student who first came to America because I knew the feeling of people who had to live in other countries and know nothing.*

In this narrative, Soe Bo describes his ICT wayfarer activities with Jessica who is Soe Bo's English Language Learning (ELL) teacher at school and their ICT wayfarer-Beneficiary exchange. In this case, Soe Bo is the beneficiary and the ICT wayfarer is his ELL teacher. They are not related to each other, and in this case the Beneficiary is younger than the ICT wayfarer. Soe Bo describes how his teacher taught him how to use a computer for the very first time during his freshman year in high school. Soe Bo describes how he passed on the computer knowledge he gained from the ELL teacher to another new student who first came to America at a later date. Soe Bo was motivated to help the new student with learning how to use the computer because he knew the feeling people have who come to live in America from another country and "know nothing". Soe Bo's empathy and remembrance of the situation he experienced led him to becoming an ICT wayfarer and to pass on his computer knowledge to a new student who had recently immigrated to the U.S.

Another participant, Baasaweyne, sketches/draws his first-person Information World diagram describing Social Types as well as Boundaries (Information World social tenant #2 and #5, respectively; Fig. 4.3). For Social Types, Baasaweyne describes acceptable standards and codes of behavior. (Burnett, Besant, & Chatman, 2001) or when other members of the world simply tend to defer to him for guidance without formal recognition of this leadership. Starting with "ME" and a head sketch of Baasaweyne with a smile, at the upper left-hand corner of the diagram. Though not the exact center of the diagram, the use of "ME", with a self-portrait is representational of a first person self-generated egocentric diagram. Most of Baasaweyne Information World diagram flows out of the egocentric "ME" with single arrows, boxes, labels, a diagram, and then branches into three major domains.

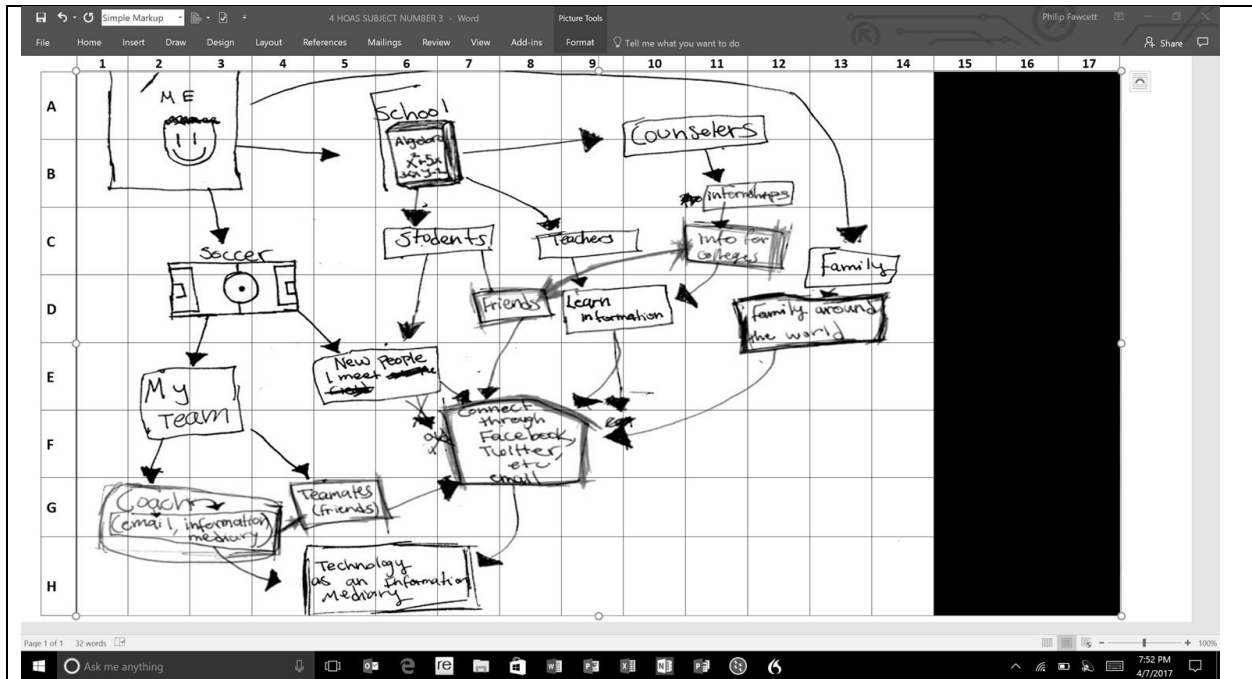


Fig. 4.3. Baasaweyne’s Information World diagram. Reference Source Teen Design Days I.

One domain is Baasaweyne’s soccer team represented by a diagram of the soccer field and a label “soccer” (Fig. 4.3). He highlights “My team” and his coach as an information mediary and his main method of delivering information to the team as email. He also calls out technology itself as an information mediary. Baasaweyne branches from “My team” by highlighting teammates, and in parents “friends” who mostly connect through social media (Facebook, Twitter; and email). Baasaweyne often switches between other ICT wayfarers that he interacts with as well as beneficiaries in the types of information that they exchange within each domain. All members of Baasaweyne Information World elements end up with the technology focused exchange mechanism (Facebook, twitter, email, etc.) represented by a box.

Within the domain school, Baasaweyne divides his information World into Teachers, Students, and Counselors (Fig. 4.3). Baasaweyne then delineates “friends” and “new people I meet” that all connect through social media and email. Teachers are named functionally as a group that Baasaweyne learns information from and then connects through social media and

email. Counselors are identified by the information they provide, which is labeled as “internships, information for colleges” showing an aspirational goal of attending college after high school. The only double arrow in Baasaweyne Information World diagram goes from “information for colleges to friends” indicating discussions with peers about attending universities as well as with counselors.

Baasaweyne describes the element #5, Boundaries, for his “family” (Fig. 4.3). He highlights a connection with other members of the “family around the world” through social media and email. This suggests not all of his family members live in the United States. Baasaweyne is a link between his family and community in the U.S. and his family around the world as he performs his ICT wayfarer activities.

For her Information World diagram, Thura Wai draws and describes/annotate her and her family’s experiences at the emergency room with her sister who experienced at least three bad seizures (Fig. 4.4 below). The very top of the diagram is the word “Emergency” spelled out and boxed. There is also clock face, with 1 o’clock on it showing the early start to the emergency room trip with Thura’s sister and family. Thura has each member of her family drawn as a female stick figure and labeled from left to right, “Me”, “Sister”, “Dad”, and “Mom”. Thura also has a picture of a hospital bed next to her sister.

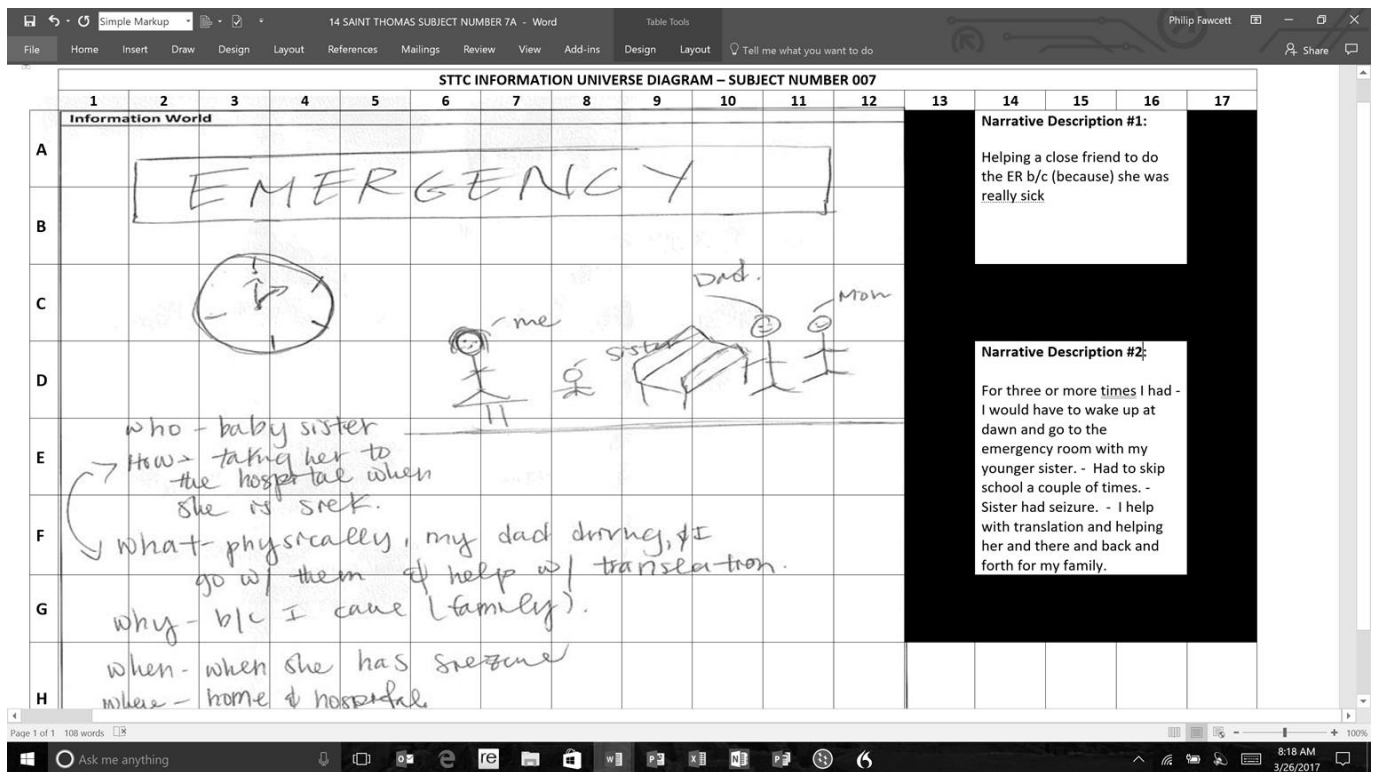


Fig. 4.4. Thura Wai's Information World diagram. Reference Source Teen Design Days III.

Thura, then annotated the Information World diagram with the 5 W's and 1 H (e.g., who, what, when, why, where, and how) as she describes the emergency room situation with her family (Fig. 4.4). Thura begins her annotations with **who** as her "baby sister" and the **how** as taking her to the hospital when she is sick. The **what** of the situation described as physically, when dad is driving and I go along with them to help them with translation. Thura then annotates with the **why** saying because I come with my family. The **when** her sister has a seizure, and the **where** is at the hospital. The 5W's and a H (who, what, when, where, why, how) were part of the workshop content and teaching at St. Thomas Catholic teen design days workshop, working with the Burmese community.

Thura then describes her peer beneficiary friend Nine Cho and their ICT Wayfarer-Beneficiary exchange (Fig. 4.4). The beneficiary and the ICT Wayfarers are not related to each

other, but are peers who are close in age. Thura helped Nine Cho go to the emergency room because she was sick. In another example, Thura Wai describes her peer beneficiary Yi Yati and their ICT Wayfarer-Beneficiary exchange. The beneficiary and the ICTWAY are related to each other, with the beneficiary younger than her older ICT Way sister. Thura Wai describes waking up at dawn and going to the emergency room with her young sister. She had to skip school a couple of times because his sister had a seizure. Thura Wai then help his sister with translation to the doctors and helped her get back and forth, doing it mostly for his family.

Another example of Information Value, information world social tenet #3, is apparent with Malar Yu's Information World diagram (Fig. 4.5 below). Malar Yu offers three separate narrative descriptions and three corresponding Information World diagrams. In Info World diagram #1 at the top of the diagram, Malar Yu provides an Information Grounds label as "Schools". He then shows a picture of a bookshelf labeled as "before" then offers annotated text he communicates daily with the teacher asking for help her in her room. He then provides a diagram of an orderly bookshelf now labeled as "after, when I help my teacher", where Malar is functioning as the ICT Wayfarer and his unnamed teacher is the Beneficiary.

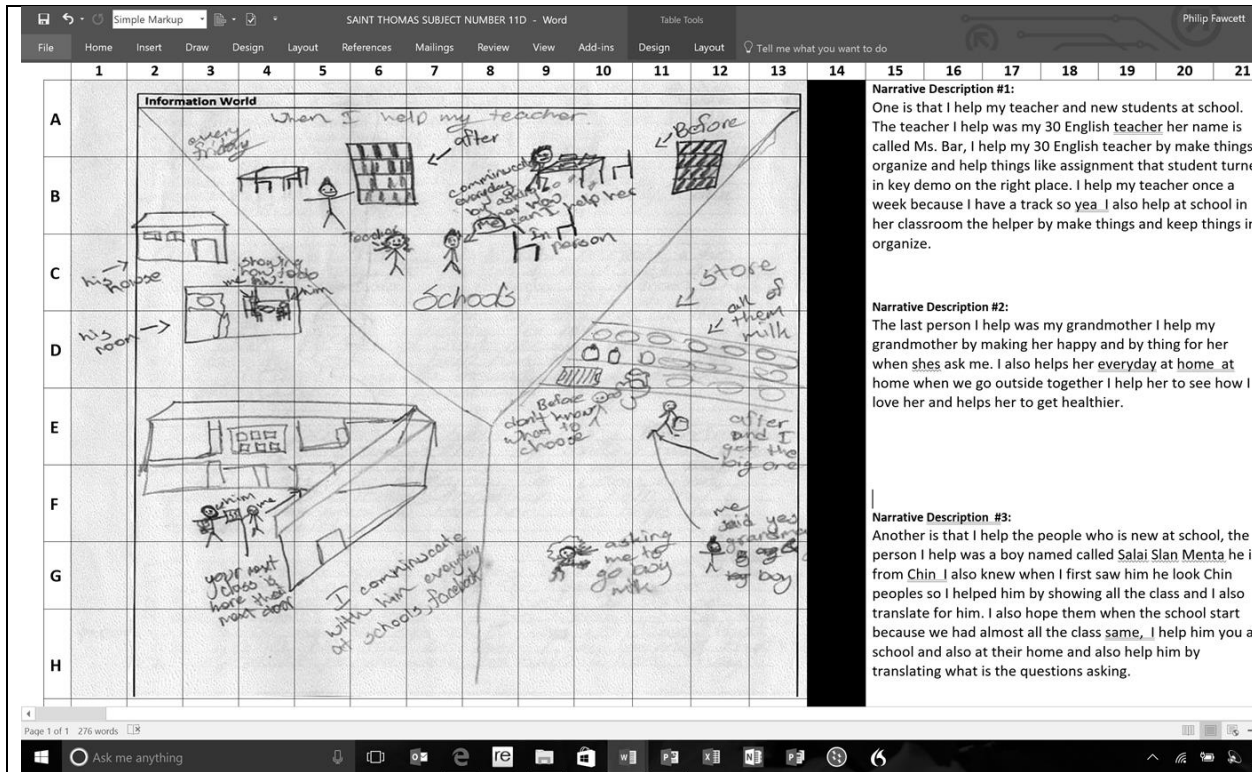


Fig. 4.5. Malar Yu's Information World diagram. Reference Source Teen Design Days III.

In Figure 4.5 Malar Yu gives an Information Grounds label as “Store”, where he drew a picture of a grocery store shelf with milk cartons. In this Influx diagram, he again uses the “before” and “after” labels. At the “before” annotation Malar annotates the diagram with “don’t know what to choose?” He then annotates the diagram with a scenario with his grandmother annotated by her asking Malar “to go get the big milk”. He then labels “after” as “pulling the big milk off the shelf” and then ends the scenario with his grandmother saying, “yes and calling him a good boy”.

In the diagram above, Malar also gives three Information Grounds images and labels it as “His House”, “His Room”, and a drawing of “School” (Fig. 4.5). In each location, Malar is showing someone friendship and directing his new friend around school and meeting him at his friend’s house. He then closes the Information World diagram by noting that he communicates with his “friend” on Facebook every day. In this case Malar is the ICT wayfarer and his

beneficiary, Sali Slan Mentra, was a new student that arrived on campus from the Chin region in Burma.

In other examples, Malar Yu and describes his peer beneficiary Ms. Bar, and their ICT wayfarer-beneficiary exchange abbreviated as an “IBE” elsewhere (Fig. 4.5). Ms. Bar is Malar’s English 30 teacher who he offered to help her track and organize assignments and to track each week’s student submissions. He also mentions that he helps Ms. Bar in her classroom by making things and keeping things organized for his teacher.

In another example, Malar Yu describes his peer beneficiary Yi Tun and their ICT wayfarer-beneficiary exchange. The beneficiary and the ICT wayfarer are related to each other, but are far apart in age since Yi Tun is Malar Yu’s grandmother. Malar Yu describes helping his grandmother by doing things that make her happy and by doing things that Yi Tun asks Malar Yu to do. Malar Yu asks his grandmother every day when she is at home and when they go outside how Malar Yu can help her. Malar Yu says he wants to help his grandmother to help her to get healthy and that he loves her.

Malar Yu describes his peer beneficiary as Salai Slan Menta and their ICT wayfarer-Beneficiary exchange (Fig. 4.5). The beneficiary and the ICT wayfarer are not related to each other, but are peers who are close in age and speak the same original language. Malar Yu describes the situation as Salai Slan Menta is new at school but came from the same Chin region in Burma as Malar Yu. Malar Yu helps Salai Slan Menta by showing him around the school and takes him to all his classes. During his introduction to the school, Malar Yu translated for Sali Slan several times as he showed Sali Shen around the school. Since they were in some of the same classes together, Malar Yu was able to help Sali Slan understand the assignments in the class. In addition to Malar Yu, the ICT wayfarer, helping at school, he was also able to help Sali

Slan, the beneficiary, at their home. He would translate when questions were being asked since Sali Slan more than likely was not proficient at English.

Another participants Information World diagram is shown in Figure 4.6 below created by Ko Kyat who creates her annotated diagram of her Information World by a literal representation of a drawing of the earth, labeled “earth” (world). This is an example of Information Worlds social tenant #4, which is Information Behavior. Information Behavior may include a range of practices related to information, e.g., information seeking, informal information exchange, information hoarding, sharing, archiving, collecting, and avoiding. It also refers to practices and beliefs related to appropriate, or inappropriate information sources within a world. For example, one world may particularly value libraries as information sources, and thus will seek information in them, while another world may emphasize interpersonal information sharing as the preferred form of information acquisition. (Jaeger and Burnett, 2009) In Ko Kyat’s diagram, she describes what she learned from the Teen Design Day workshops about information and her own experience being an ICT wayfarer. Each annotation around her Information World diagram offers some fact about her information behavior and her interactions with her community and the beneficiaries she serves.

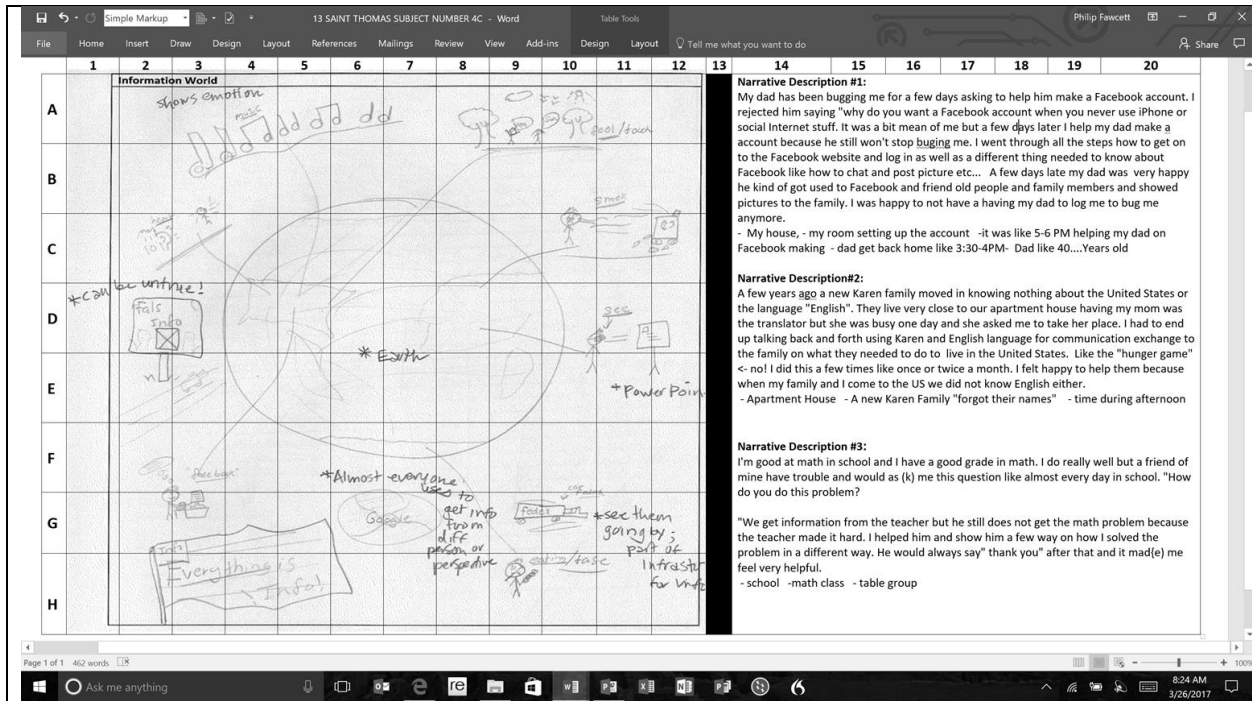


Fig. 4.6. Ko Kyat's Information World Diagram. Reference Source Teen Design Days III.

Starting with A/B 2-6 Ko draws some musical symbols and makes a note that music is a source of information and can be “emotional” (Fig. 4.6). Navigating around Ko’s diagram down and to left of the musical notes is an annotation that in Ko’s Information World information can be taken in by being “heard”. Below this annotation, she then draws a sign labeled “Fals Information” (False Information?) and adds the annotation that information “can be untrue”. Below Ko’s “Fals (False) information” annotation sign is a picture of someone using a computer and annotated as a “Facebook” showing the use of a social media application in Ko’s Information World. Continuing downward Ko draws an American flag and makes an annotation that “everything is Information” in her information World diagram.

Moving from left to right at the bottom of the Ko’s diagram is an annotation with “Google” (highlighting the Google search engine) and comments that “almost everyone uses (Google) to get information” (Fig. 4.6). Just to the right is a stick figure holding some food with the

annotation “Eating/Tas” (Tasting?) as a way of getting information and experiencing information. Just above the human figure is a drawing of a truck labeled “Fed Ex” with the annotation that the Federal Express truck also has a car feeder “car feeder” (Fig. 4.6). This drawing shows an interesting new idea of delivering information to cars directly vs. home package delivery. The Fed Ex truck annotation is labeled with a “\*” and an annotation that Ko sees these trucks “go by” and “views them as part of the infrastructure for Information”.

Moving up from on the far-right side of Ko’s diagram is a figure looking at a PowerPoint with the annotation that the figure is using her sense of “seeing” to take in information (Fig. 4.6). Above that is a figure smelling the food being cooked at what appears to be a food truck with the annotation that figure is using her sense of “smell” to take in information. Above that is another sense illustrated for information intake via “smell” with an outside scene with trees for feeling/touching as a way for information intake.

In her diagram, Ko Kyat describes her older beneficiary father Hein Way and their ICT wayfarer-beneficiary exchange (Fig. 4.6). This is also another example of Information World social tenant #4, Information Behavior. The beneficiary and the ICT wayfarer are related to each other, father/daughter. Ko Kyat describes the scenario that her father has been “bugging her” for a few days asking her to help him make a Facebook account. Ko Kyat remarked that she did kept asking him why he wanted a Facebook account when he never uses his iPhone or any other social media/Internet stuff. Ko Kyat said that it was a bit mean of her to not help her father. After a few days, she helps her dad make an account because he would not stop begging her. She went through all the steps of how to create a Facebook account and how to get on the website with her dad. She also showed him how to log in and everything he needed to know about uploading pictures on Facebook. After opening an account for her father and uploading the software, her

father was happy and could get on Facebook as well as connecting with all other friends and family members. With Facebook, her father connected with other family members who showed up on his account and shared pictures of the family. Ko was happy to because she did not have to show her dad how to log on anymore or bug her about getting a Facebook account.

Caray’s Information World diagram describes social tenant #5, Information Boundaries both in and across boundaries (Fig. 4.7). His Information World in terms of the beneficiaries and types of information exchanged along with the technology that the ICT wayfarer uses. Each beneficiary during the various ICT wayfarer beneficiary exchange (IBE) exchanges that Caray is involved in and the technology that he uses with each of his beneficiaries are shown in his diagram. In some cases, technology use competency and ability create the Information World Boundaries, in others it is the beneficiary’s age or their Social Type, tenant #2, such as “Mother, Father, Grandma, and Friend”.

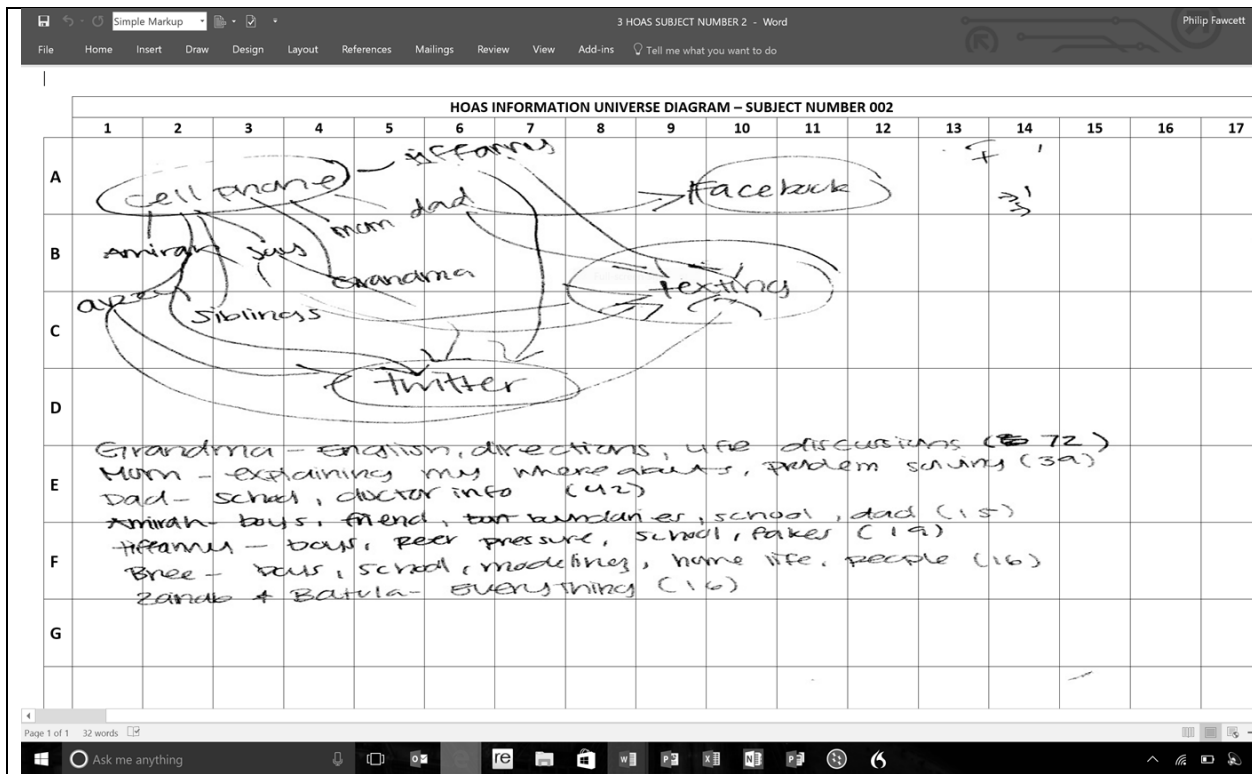


Fig. 4.7. Caray’s Information World diagram. Reference Source Teen Design Days I.

Caray has no starting point in his diagram in contrast to the typical Information World diagram which starts with a circled “Me” in the middle of the diagram (Fig. 4.7). Caray sketched a story based on the use of cell phone technology with all his beneficiaries, including Tiffany, mom, dad, grandma, Amirah, Jay (who is not described further in the handwritten list), Avzey (who also is not further described in the handwritten list), and the siblings (who are also not further described in the handwritten list). With Twitter, Caray (ICT wayfarer) connects with Avzey, Amirah, and Jay (who again is not further described in the handwritten list), and Tiffany. Dad is the only one who connects to Caray via Facebook. These connections are described further in Table 4.4.

Table 4.4. Caray’s beneficiaries as an ICT Wayfarer. (Taken from bottom half of Caray’s Information World diagram)

<b>Name</b>	<b>Relationship to Caray</b>	<b>Age</b>	<b>Technologies used to communicate</b>	<b>Types of Information that Caray obtains</b>
Not Given	Grandma	72	Cell Phone	English, Directions, Life Discussions
Not Given	Dad	42	Cell Phone, Facebook, texting	School, Doctor Information
Not Given	Mom	39	Cell Phone	Explaining my Whereabouts, Problem solving
Amirah	Not Given	15	Cell Phone, Twitter	Boys, Friends, School, Dad
Tiffany	Not Given	19	Cell Phone, Texting, Twitter	Boys, Peer Pressure, School, Fakes
Bree	Not Given	16	Not Given	Boys, School, Modeling, Home Life, People
Zanab & Batvla	Not Given	15	Not Given	Everything

Table 4.4 shows how each ICT wayfarer often customizes each ICT wayfarer - Beneficiary Exchange for each beneficiary, e.g., the 15 to 19-year-olds named in the sketch as Mira, Tiffany, Bree, and Zanab and Batva whose relationship was not indicated in Caray’s Information World

diagram. It also shows how the ICT wayfarer is engaged in a variety of topics with some focusing on delivering basic technology information and some on the needs of each individual Beneficiary that the ICT wayfarer serves.

#### **4.6 Examples of ICT Wayfarers Showing Positive Deviant Behavior**

Three examples of ICT wayfarers showing positive deviant behavior are show as examples in sections 4.6.1- 4.6.3.

##### **4.6.1 Ko Hein's Information World diagram**

Ko Hein's Information World diagram has three scenes that directly correspond to Narrative Description #1 (top), Narrative Description #2 (middle), and Narrative Description #3 (near the bottom of the diagram) (Fig. 4.8). Ko Hein also offers some additional annotations at the very bottom edge of the diagram that describe his own skill sets and career aspirations. Each scene in the diagram describes a different beneficiary but each has the same ICT wayfarer, Ko Hein. All three scenes show how Ko Hein have been observed by a family member, Ko Hein's father, and other community members as having a proven understanding of technology and the culture and systems in the United States. Ko Hein has done this so successfully that Ko Hein father has started referring his friends to Ko Hein to solve their technology and other related issues and help others better adapt to life in the United States. The following describe each of Narrative Description/Information World pair noted in Figure 4.8.

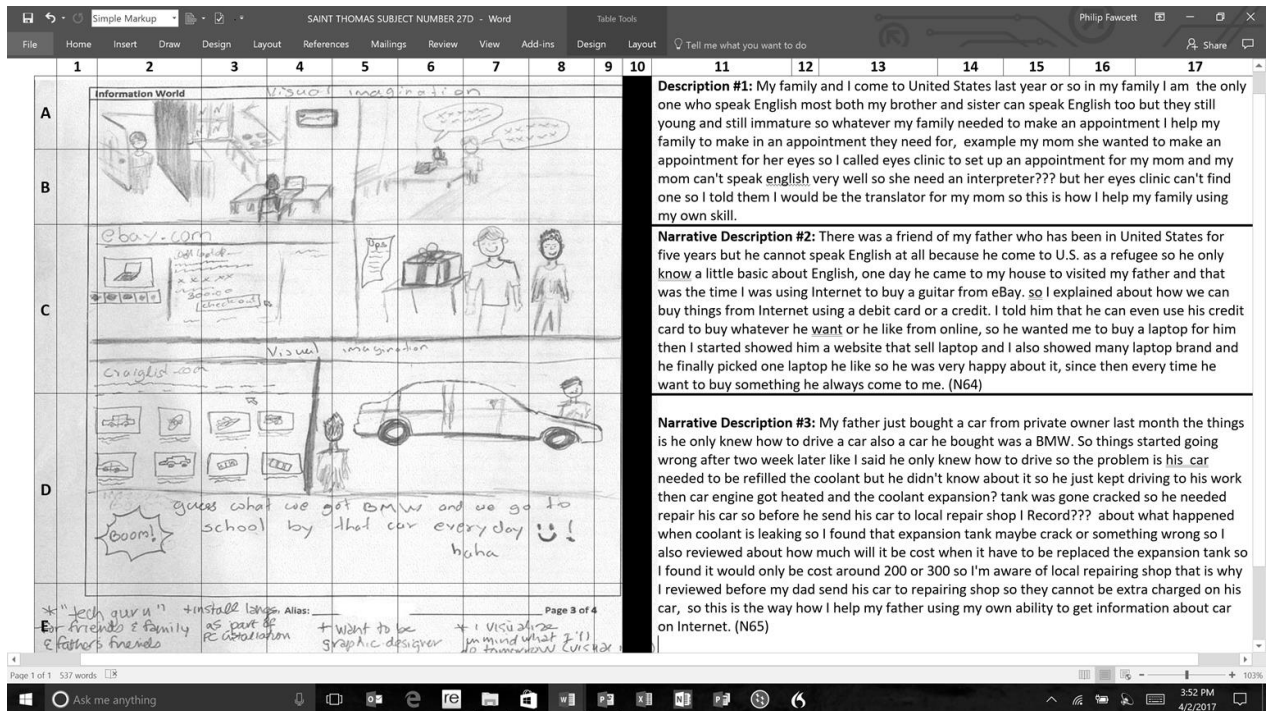


Fig. 4.8. Ko Hein’s Information World diagram. Reference Source Teen Design Days III.

The Narrative Description #1 Ko has drawn an eye clinic and shows Ko taking a family member to the lobby and then to the exam room. Ko Hein helped the family to make appointments when they need it. For example, he helps his mom who wants to set up an appointment to have her eyes checked. Since his mom cannot speak English very well, she also needs an interpreter at the eye clinic to talk to the eye doctor. However, the eye clinic cannot find an interpreter and therefore So Ko Hein translates for his mom. This is one example of how he uses his skill set to help his family. Ko annotates the first scenario with the label “Visual Imagination” showing that his drawings represent his visual perspectives on the ICT wayfarer-beneficiary exchange scenarios (Fig. 4.8). He further describes coming to the United States a year ago, and that he is the only one in his family who speaks English. Though his younger brother and sister can speak English, they are still too young and immature to help the family with needed appointments.

In Narrative Description #2, Ko Hein is shown at the middle of the larger diagram with an annotation of “Ebay.com” (Fig. 4.8). The narrative description and image indicate that Ko Hein’s father has enough confidence in him that he is starting to refer him to his friends when they need help. In the visual images, there is a drawing of the laptop that Ko is helping his beneficiary choose and then buy off eBay. It also shows Ko and his beneficiary receiving a delivery package with the new lap top from U.P.S., thus completing their E-Bay transaction.

The Narrative Description #3 shows Ko helping his father use Craigslist to buy the car they were thinking about buying (Fig. 4.8). However, instead his father purchases the car from a local seller in their neighborhood. In the diagram, Ko does not show the cracked radiator overflow coolant tank but does mention the challenge in the narrative description text. Ko then adds the label “Guess what we got, a BMW, we go to school in that car every day. Ha-Ha” as well as the label “Boom” indicating some prestige and excitement.

At the very bottom edge of the diagram Ko describes his own skill sets and career aspirations by offering a few asterisks with some annotated labels describing himself, such as:

1. \* “Tech Guru for friends and family and father’s friends”
2. \* “Install languages as part of PC installation”
3. \* “Want to be a graphics designer”
4. \* “I Visualize in my mind what will happen tomorrow”.

Ko Hein describes his one (ICT Wayfarer) for the benefit of his mom at the eye doctors’ office and many other beneficiary activities and relationships. He also described his career goals as wanting to give ICT Wayfarer-Beneficiary exchanges with his peers and ethnic community. For example, he describes his beneficiary interactions with Yaza and their ICT Wayfarer-Beneficiary exchange. The beneficiary and the ICTWAY are not related to each other, and Yaza is an older friend of Ko Hein’s father. Yaza has been in the United States for five years and can only speak a little English. When Yaza came to the US as a refugee, he could not speak English at all. One

Day Yaza saw Ko Hein using the Internet and eBay to purchase a guitar. Yaza was curious and asked Ko Hein to explain to him about how to use the Internet to buy things using either a debit or credit card. Ko Hein explained to Yaza that he could use his credit card to buy anything online and Yaza then asked him for help to purchase a laptop from the Internet. Ko Hein showed Yaza a few websites where many different laptop brands were available. Yaza finally selected the laptop that he wanted and told Ko Hein that he was very happy about it. Now, anytime Yaza needs to purchase something on the Internet he always comes to Ko Hein for help.

In another example, Ko Hein describes his beneficiary Tun Zaw and their ICT wayfarer-beneficiary exchange. The beneficiary and the ICTWAY are related to each other and the beneficiary is Ko Hein's father. Ko Hein describes the purchase of a BMW by Tun Zaw from a private owner. Tun Zaw but did not have any experience maintaining a car. After two weeks of driving the car Tun Zaw started having problems with the cooling system of the car. Ko Hein comments that Tun Zaw needed to be filling the coolant reservoir in the car on a regular basis. However, Tun Zaw kept driving the car and eventually the coolant expansion tank overheated and cracked. Ko Hein's father needed his car repaired and wanted to know the repair cost before sending his car to the shop. Ko Hein went to the Internet and found out how much it cost to repair a coolant expansion tank, which was between \$200 and \$300. Ko Hein learned the estimated cost to repair the coolant tank so that his dad would not be overcharged.

All three are examples of how Ko Hein used his computer skills, knowledge of the culture and system in the United States, and the Internet to help his family, his father's friends, and his father individually. He showed his skill as a positive deviant behavior type when acting as an ICT wayfarer.

#### **4.6.2 Naresh's Information World diagram**



types of information and method of delivery by the ICT wayfarer as the control mechanism of what is proper or not within Naresh's Information World. They also reflect what is most acceptable to the beneficiary depending on the beneficiaries' English language competency, understanding of American culture, and understanding and use of technology. Naresh provides two branch nodes that extend out of the Knowledge People: 1) "areas of expertise", one for "science" and the other for "math"; and 2) "Need Information" as shown in two sub-branches labeled "school" and "inspiration". The school has a further branch node labeled as "ways to advance", with two sub-sub nodes labeled as "Storage" (not legible?) and "not personal" also indicate some information value from an Information World perspective.

Naresh then offers some communication limitations about sharing information with Strangers, showing an explicit Information World boundary based on the types of information that are exchanged or in this case not exchanged (Fig. 4.9). Naresh then recommends that with strangers that you only provide "just a greeting" and then adds "don't go personal" and that strangers are a definite "no trust". Naresh has a specific information behavior and an information value for connecting with strangers in a limited day. Naresh then offers some recommendations for how he works with teachers and his observations about their information value and behavior when working with "Teachers". He begins with saying that they "help with some things" that are "school related". He also includes that "if you have an issue at home" that teachers can provide "moral support".

The node labeled "Family" describe how Naresh views the relationship pairs/nodes with his family, all of which stands for Information Value. Some examples in Naresh's Information World diagrams are written out as: "If you have a problem" ... "they provide support", help with

“personal issues” .....but “not school, and “need assistant” (needs assistance? ).. with “money... [information value] “it depends” on who that family is and “who you like”.

Naresh also describes his relationships with his classmates and the information each offers which shows information behavior (Fig. 4.9). The first connected node is labeled “rumors”, [an information value] the middle node is “what’s going around” and a related annotation, “It depends on what”, and to the right is classmates who “share the world” and “don’t really trust” also showing an information value or the value that is perceived for certain types of information by Naresh. Naresh’s describe his relationship with his Coach and shows both and information value and an information behavior, e.g., “motivation” and “inspiration”, “personal stuff” and “like a family”.

In addition to the labeled nodes and sub-nodes in Naresh’s Information World diagram, there are several non-nodes based labels offered by Naresh in his Information World diagram.

He annotated,

- Ways to get technology to people: Advertise, put on popular sites and social media, Understand each other.
- Technology is best used for information and people to communicate and understand each other. and learn what is going around the world move to (?).
- Technology provides- a broader understanding, knowledge, connect, understand, move forward.

These comments are representative of Naresh’s information value, comments, and recommendation on technology distribution, uses of technology. He also makes a broader connection to how technology can add value to becoming a better ICT wayfarer using technological means and how technology helps to cross information boundaries.

### 4.6.3 Gaboose's Information World diagram

Gaboose (not her real name) describes her Information World diagram” at the near center of of the diagram (Fig. 4.10). Though not the exact center of the diagram, the use of “Myself”, is representational of a first person self-generated egocentric diagram, aka “Me”. Gaboose’s Information World diagram appears to show a diverse set of information types and information tasks, information grounds, beneficiaries, social media, and their relationship to Gaboose. They also show multiple social aspects of her Information World including Social Norms, Social Types, Information Value, and Information Boundaries that allow a deeper understanding of Gaboose’s Information World. It also describes many Gaboose’s beneficiaries, which are mostly are being served by Gaboose, as the main ICT wayfarer within her very large actual Information World as represented by her Information World diagram.

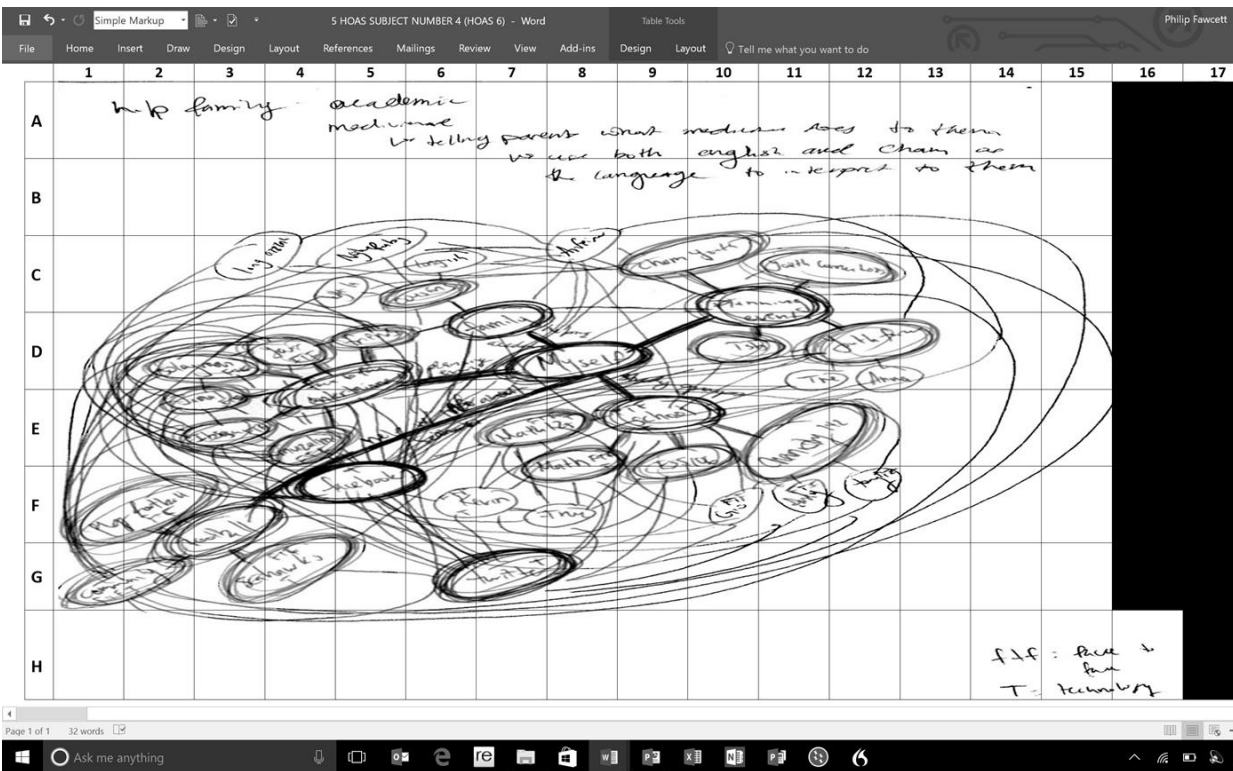


Fig. 4.10. Gaboose's Information World Diagram.

The Information World diagram itself is very complex with over 40 separate nodes and was created in a very expressive way, based on the line thickness and annotations throughout the diagram as it contains nearly 40 separate round nodes which are the typical circular node style in most social diagrams (Fig. 4.10). Though hard to read except when zoomed out at 140% +, the Information World diagram flows with single arrows, thick and dark circles as well as very light and non-dense circular nodes which are all represented by circles across the Information World diagram and are further described in detail below.

Within each node, Gaboose has created an annotation that represents three social elements of an Information World (information value, information behavior and information boundaries) using two distinct annotations for information exchanges, these are: face to face annotated as “FTF” and technology annotated as “T”, for node and each beneficiary interaction. For example, the node labeled “School” is annotated with a “F2F” showing that most of the interactions between ICT wayfarers and beneficiaries at “School” are Face to Face. Gaboose has also created an annotation that shows when a technology comes into play during an ICT wayfarer exchange with a beneficiary, by annotating the node with a “T”. Another example are some social media relates nodes such as Facebook nodes and the Twitter nodes are both marked with a “T”, showing that most of the interactions between ICT wayfarers and beneficiaries are using some form of technology because Twitter and Facebook requires a technology to be accessed, and automatically exclude those what do not have it. In some cases, certain nodes are marked with both a “F2F” and a “T” showing how technology offers a form of information boundary crossing by allowing a both a Face to Face interaction that is supplemented by technology based interaction and vice versa. For example, the node marked “Kevin”, a person in Gaboose network connected to both the Facebook and Twitter nodes. Indicating that the beneficiary “Kevin” works

and interacts with Gaboose both in a Face to Face and Technology mode, during their information exchanges.

In summary, the main nodes in Gaboose's Information World diagram are connected via a set of thick lines out of the center node labeled "Myself". In the Information World diagram, they are circled and annotated with a "F2F" and/or a "T" and are labeled: Facebook, Twitter, annotated by a "T", School annotated by both F2F and T, Events which only have labels and no annotations, Family which only have labels and no annotations, entertainment which is annotated by a "T". Each of these main nodes and their respective in and out connectors/points will be discussed further in latter parts of this document. Gaboose's Information World diagram describe his ICT wayfarer role and his Information Behavior and Information Value as:

1. to "help family" with academics
2. to "help family" with Medicine
3. "Tell" Parents what medicine does to them
4. Gaboose remarks that "he uses both English and Cham to interpret for them".

#### **4.7 Design and Design Thinking by Immigrant Youth**

Design Thinking was used extensively all three Teen Design Days workshop. Design thinking typically has three steps: Inspiration, Ideation, and Implementation. During the first Teen Design Days Workshop, Teen Design Days I, the participants were given an in-depth session on design thinking. In TDD I, the youth first learned the process of design thinking in a hands-on fashion in which they worked in groups to create a better paper clip. Though still experimental and the outcome unknown how the immigrant youth would react, we drew from the Intel foundation design and discovery curriculum for youth science education (<http://www.intel.com/content/dam/www/program/education/us/en/documents/K12/design-and-discovery/fg-design-process.pdf>).

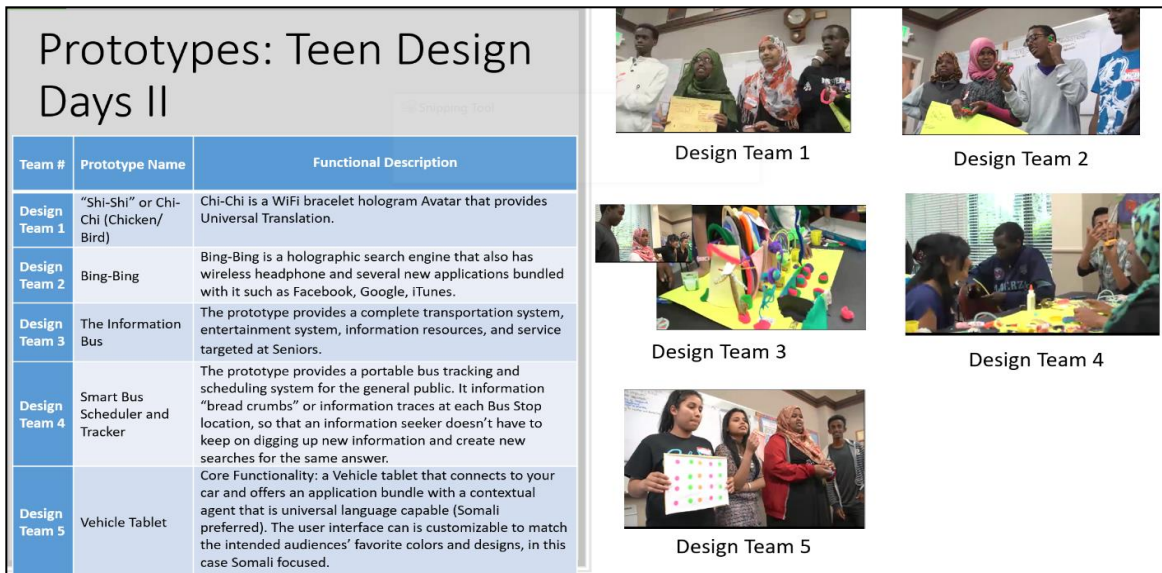


Fig. 4.11. Teen Design Days II Design Teams and low fidelity prototype summaries.

At the end of day 1 of TDD II, participants were asked to create a diagram of their Information World and/or create 3-5 written scenarios describing an information scenario they had been involved in (Fig. 4.11). As part of the workshop, youth presented many ICT wayfarer stories and skits based on their own experiences. These included explaining a telephone bill to a parent, searching the Internet to find medical information when a snowstorm prevented the family from going to the doctor's office, sharing religious and cultural information, giving tips to peers about sports and how to avoid fights, helping relatives find their way around town, aiding tourists with local information, and helping friends with their homework. Translating for parents or teachers, other relatives, and friends was also demonstrated and acted out as a regular occurrence. This activity was the setup for the youth to begin transitioning from their now explicit knowledge of being an ICT wayfarer to create designs that would enable other ICT wayfarers.

The expanded TDD II agenda included more in-depth design sessions focused on creating "the perfect cell phone" and "any tool or resource that would help an ICT wayfarer do their job better," (Fig. 4.11). On the afternoon of Day 2 the workshop for Teen Design Days II included

an introduction to the Touch Develop programming language and programming skill development, which allowed a non-programmer to create apps for computers and mobile devices by tapping on the screen.

The design and programming sessions were facilitated by the research team combined with volunteer industry experts and the actual inventors of Touch Develop from Microsoft Research. During this part of the workshop we used Microsoft Surfaces to write code and prototype on. Some of the youth picked up the programming aspects of Touch Develop better than others.

The youth were then asked to form design teams with the goal of jointly creating solutions for the community that would also help them become better ICT wayfarers within that community. The youth workshop participants used craft supplies to design and create ICT wayfarer tool prototypes and scenarios. The prototypes for Teen Days II included a wristwatch cell phone, a multimedia information kiosk at bus stops, and a free van for the elderly equipped with “comfy seats” and information monitors that would take the seniors to/from their homes and various information and educational hubs (including museums and classes). See Figure 4.11 for a summary of the designs that were create in Teen Design Days II.

One interesting observation that ties the Information Worlds idea of a social context is the idea of a “social norm” for the youth who are members of the Muslim tradition within their community. A social norm is an expectation of what is acceptable and not acceptable within a social group, (Jaeger and Burnett, 2010) and you will notice in the design team pictures in Figure 4.11 that several the young women who took part in the workshops were wearing head coverings as required by their Muslim tradition. This showed a social norm and expectation as outlined Information World tenent #1, expected by both their parents and their community. It was also observed during the workshops that when male and female members were on the same team

became a challenge initially, because of Muslim traditions that prohibited working and interacting closely with members of the opposite gender. Though cross-gender contact was limited within the ethnic community itself based on the Muslim tradition, this changed at school causing a potential value conflict between the strong religious culture of their home, home country, and Muslim tradition, and acceptance within the new culture. Over time design teams appeared to transcend these constraints and ignore some of the Muslim traditions so that they could carry out their team design goals. In this case it appeared that the members of the community had conditional and contextual social norms. This issue was not observed in Teen Design Days III, though present in TDD I, II, due to the fact that most participants for TDD III were not Muslim. However, we did experience similar observations from Teen Designs Days I, held squarely within the Somalian community and who followed the Muslim traditions.

These ideas reinforced those from the pilot work with Somali youth about creating and posting YouTube videos about cooking, travel and music for their mothers and others not literate in both English and their native languages. During the design thinking phase of Teen Design Days II, the more in-depth design sessions focused on doing new ICT wayfarer tasks such as inventing prototype solutions that would use technologies and services to benefit their community. There were five design teams of 3-5 students each focused on creating a design to better their local community when acting as an ICT wayfarer.

All the teams used craft supplies and sketching, to create their final low-fidelity presentation/prototype. On several occasions, we observed students switching between their native tongue and English (sometimes in the same sentence) while during their designs. As with the other workshops, teams were encouraged to invent “any tool or resource that would help them become better ICT wayfarers”. In this workshop, the research continued to expand the

reflection period of the “light and lively” games to include discussion of information behavior in the games. Youth also presented ICT wayfarer stories and skits based on their own experiences such as translating at a medical appointment with their parents, and even translating for a teacher at school.

There were several interesting prototypes created by the student design teams for Teen Design Days II, including a device called Shi-Shi which was a hologram bracelet and Bing-Bing, a holographic search engine, see Figure 4.11. There were also several designs for providing both scheduling and bus information for the elderly, or “older people” as the design team called it. A bus designed for older people and a Smart Bus scheduler that had the ability to give non-bus related information to those who were standing at the bus stop - a central meeting place of sorts for the community at Foster.

Design team #1 created a holographic Wi-Fi bracelet that had a built-in avatar that gave universal translation (Fig. 4.11). It also had a holographic foldable screen that offered the 3D avatar capability. A holographic avatar was named Shishi which in Mandarin meant bird or chicken. The design team combines several ideas into one wearable device that would allow the bracelet to become a multilingual Universal translator to help its owner navigate through culture that only spoke English, when the owner may not. The hologram would have Internet access as well as applications such as Facebook and Gmail and would connect to the bus system to allow someone to also get the bus schedule. It can also share information such as PowerPoint and other applications and for the interface there be a comic strip that could be adaptable to the specific situation that the device owner found themselves. The design team made the device waterproof as well as being a mini Wi-Fi hotspot the same functionality as a cell phone but wearable versus something that you carry. During the design critique for design team number #1 feedback was

positive though there was a concern about whether someone would wear it 24 x 7 and still have it charged. The feedback on the hologram was that it was a fantastic way to share data in a digital way, and that it would be helpful if the hologram could offer instructions for tasks such as buying groceries or even an emergency going to the hospital.

Design team #2 created a prototype watch and earpiece called Bing Bing (Fig. 4.11). The device would give universal translation as most of the other designs did, as well as the ability to search for information and would be glow-in-the-dark so that the watch could be seen no matter how much light was available. One of the features of this prototype was that it had a 30- year warranty. The holographic watch also had applications such as Facebook and a search engine so that it would have Internet access. The design team had a microphone so that someone else could speak into it and use the universal translator.

During the design thinking phase of Teen Design Days III, the more in-depth design sessions focused on doing new ICT wayfarer tasks such as inventing prototype solutions that would use technologies, services for the Saint Thomas Catholic Church and their own local Burmese community (Fig. 4.12). There were six design teams of 3-5 students each focused on creating a design to better their local community when acting as an ICT wayfarer. All participants were either refugees or immigrants from Burma or were children of immigrant refugees (13 girls, 12 boys) came from families that were originally from Burma, Bhutan, Congo, Somalia, or Sudan.

Some of the participants were from the Mae La refugee camp just across the Thai border of Burma.

In the Teen Design Days III, all teams used craft supplies and sketching, to create their final low-fidelity presentation/prototype (Fig. 4.12). On several occasions, students were observed switching between their native tongue and English (sometimes in the same sentence) while working on their designs. As with the other workshops, we encouraged the teams to invent “any tool or resource that would help them become better ICT wayfarers”.

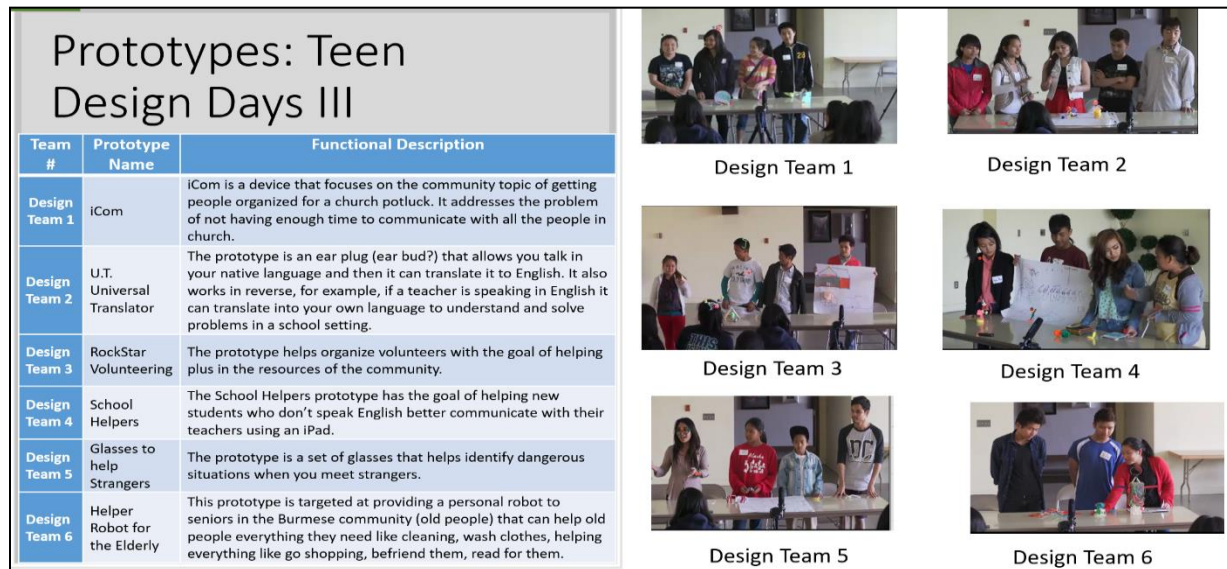


Fig. 4.12. Teen Design Days III Design Teams and low fidelity prototype summaries.

In this workshop, the research continued to expand the reflection period of the “light and lively” games to include discussion of information behavior in the games. Youth also presented ICT wayfarer stories and skits based on their own experiences such as translating at a medical appointment with their parents, translating for a teacher to fellow student for a homework assignment, as well as sharing religious and cultural information.

Though this seemed like a normal uneventful workshop, the research team felt that the students had a less than average grasp of the English language than prior participants, which made communicating a challenge. On one occasion, a student refused to be part of a design team since he had been taught by his family that because of their wealth, he was part of the “elite class” within the Burmese community. He was also happened to be a local gang member and the other team members were not only of a lower economic class but also were non-gang members. On the last day of the workshop this elite/gang member student convinced 2-3 students to not take part in the workshop. The student also brought in a parent who spent an hour or so arguing with the community worker. Though the 2-3 students returned, the elite student did not return and did not received a stipend. In another instance of the challenges of working in this environment, the City of Seattle shut off the electricity for the last day of the workshop putting a premium on the battery power for the digital cameras as well as hot food for the workshop participants.

The youth participants went through two iterations of design for their projects and then presented their final design at one of the most well-attended community celebration ceremonies at the end of the 3rd day of the workshop. During the final design phase, professional designers from Microsoft product teams and Amazon product teams came and coached the youth workshop participants.

The youth had a challenging time doing design critique of their peers and professional designers after their first design iteration. In most cases they could not synthesize both the negative input and challenges to their designs and then create an innovative design using the old design. Most youth would overly focus on the negative (and often time were take the comments personally) instead of learning from the comments and then trying to create a newer solution

considering both the old and the new. It was unclear if the reason for this was cross cultural, lack prior experience with this design technique, or the maturity level of the workshop participants.

There were several interesting prototypes created by the student design teams including a device called iCom (Fig. 4.12). The name iCom is short for community. The goal of the prototype was to solve the problem of not having enough time to communicate and scale across the large church population represented mostly by Burmese immigrants and refugees. Design team number 1, claimed that iCom would cost around \$500. The iCom device had one key feature which was consistent throughout all the designs which was the ability to do universal translation across languages. This appeared to be one of the larger problems within the immigrant community populations. One of the interesting features of iCom was that it had speech recognition and speech output tied in the universal translation. The other reason that iCom was created was that the youth noticed that when a new refugee or immigrant arrived at the church they typically do not have enough time help the newcomer to connect to the community at large. One of the safety features that the team noted was that if you get the information from iCom you might not get sick as often because you interact with people who have been sick and you obtain information that will help you to find health care. The design goal of iCom was to help people and have fun at the same time.

Another team created a wearable Universal Translator that could translate between their native Burmese language Karen (Karenni), to English and then back. Another team focused on the communal garden at St. Thomas Catholic Church which was an outreach program of Saint Thomas Parish. The garden project began to offer a place for local refugees and others to grow and have access to healthy food though was not continued through the final designs.

One of the interesting prototypes from Teen Design Days III, from design team number #2 was called U. T. or the Universal Translator. This showed one of the key challenges within the community, i.e., the ability to speak and understand the English language. The prototype offered the ability to take in any language and then translate it into the user's ear so they can then understand what the speaker is saying and be able to respond in context. The prototype allowed for reverse translation as well where the speaker would speak in the other language and then translated back out to the listener. Another feature of the U. T. prototype was the ability to have protection so that when the device was dropped it would not break, because of the strong materials it was made of. Another example of the U.T. prototype was the idea that a person could wear this device to work and then be able to communicate more effectively with their boss or other workers without needing a human translator or interpreter.

Design team #3 focused on volunteering and strengthening the community by helping others. This appeared to be a key theme for the design team and stood for a strong value for the community as well as a shared experience among the youth since they all arrived in the U.S. with their families. Some interesting features of this design was an awareness tool was to help elementary school children in the Burmese community with school activities, including helping them with their homework. The team also had the idea of offering a tent that could help the considerable number of homeless people in the community that the youth had observed needed some form of shelter and protection from the elements. In this case the tent will be made of wood and would be a single shelter that would give a place to live for the homeless in the community. The final summary point of the design was that if you volunteered you can pass on goodness to other people and make the community a better place with more peace and safety.

Design team #4 came up with the idea of having school helpers as part of their design. One of the main goals was to help the community who did not speak English as a first language to better understand English and the community around them. The problem that the team called out was that they often had a problem with speaking English with a high-level of confidence, especially in a school setting. The team came up with a wearable device that had an ear bud that could translate any language. The “School Helpers” device might also help translate the school rules, the class schedule, the location of places they needed to go to via GPS. The number of languages that would be translated would be unlimited based in the design and could go from one language to another fluidly. Another feature school helper was the idea of a having a security camera built into the device so that it could not be stolen or so that it would warn the owner the device had been taken.

The prototype of design team #5 was developed to help strangers within the community (Fig. 4.12). One of the primary features was that was designed to identify strangers, using a set of glasses. The glasses would have the ability to scan someone and be able to look at the database and tell if they are dangerous or not. It would have a camera on it as well as a map that can only be seen by the person wearing the glasses. It would also send out an emergency help message over the network if there was a dangerous situation arising with a stranger. One of the issues that came up during the critique for design team #5 was the fact that in the Pacific Northwest there is not always enough sun to drive a solar powered device. Therefore, the design team acknowledged this but felt the combination of a watch and of the built-in motion charging would compensate for the lack of solar power. Another feature of this set of classes was the ability to have night vision as well as map access for navigation and for safety. It also would send out an alert to others who own the watch to avoid a certain area, again with the main purpose of keeping

the owner safe. The glasses and the watch together would also be able to offer instructions on how to give CPR or other situations if you came upon the need in emergency.

Design team #6 from Teen Design Days III, decided to build a robot, a personal robot with the goal of helping older people in their community. The robot would be able to be a companion as well as offering information to help older people, e.g., gardening, helping to clean the house, doing laundry, and keeping the bathrooms clean. The personal robot was also designed to help older people so they do not become lonely by helping them make friends or to connect with other robot owners. The robot was designed to play music or read to older people and translate for them. The robot could also be used as a mobility help or something that an older person could stand up against and be helped to walk. During the final demo, design team #6 built a physical prototype robot though it was not functional but was an effective way of demonstrating their concept. Though quite futuristic but fitting into the latest trend of self-driving cars the youth design team designed their personal robot to be able to drive for the owner. The design team estimated that the personal robot would cost about \$10,000.

All design teams were creating solutions that addressed problems the youth perceived facing their community. They developed design concepts and solutions that would resolve many of the critical problems facing their families and ethnic communities. The most essential element of the design workshops was that the ICT wayfarers were able to create low-fidelity presentations or prototypes of their solutions for the problems they were resolving. The immigrant youth were using design thinking in their process even though they were from very diverse communities, used multiple languages and sometimes had a poor grasp of the English language so they were not effective communicators.

## **Chapter 5**

### **Discussion**

Since the number of immigrants has reached historic numbers, there is a need to address the tricky problem of facilitating the adaptation of 59.1 million immigrants who live in the U.S., including 16.7 million American-born children who are under the age of 18. (Center for Immigration Studies, 2016) Also, the number of immigrants is forecasted to grow more rapidly over the next 10-15 years. While three-fourths of these dependent immigrant children are citizens by birth, their parent's non-citizen status (either by one or both parents) and their own lack of information, language, cultural, and technology skills significantly diminishes the children's prospects of participation and integration into the U.S. society. This is a significant challenge facing many industrialized countries since the tools and frameworks to better integrate immigrants by a host country are evolving and are not designed to deal with the enormous number of people fleeing conflict and wars. Since the flow of new immigrants is not decreasing, there is urgency to develop frameworks that can fluidly facilitate immigrant transition into the U.S. or other industrialized country cultures and societies.

Today's immigrant population is vastly more culturally and linguistically diverse than in earlier decades when most immigrants were of Western European descent. (Migration Policy Institute, 2010) They also face ever more complex everyday life issues and significant communication and technology challenges. They need practical information on a variety of topics since their families migrated to a highly industrialized country. To live in such a country requires them to immediately obtain information on a variety of topics that will determine how quickly and successfully they adapt to their new culture. They need to be able to acquire

information on several topics: Where can you get English language instruction?; Where can you find employment and/or business opportunities?; How do you enroll your children in the right school?; Where can you find opportunities for adult education and training?; Where can you get health information and treatment?; How do you use the transportation network; Where can you find social services?; How do you find and pay for housing?; Who can you get help and protection of civil rights?; and Where do you go and how do you fill out the forms for immigration and citizenship applications?. (Burke, 2008; Caidi, Allard, & Quirke, 2010; City of Seattle, 2007; Srinivasan and Pyati, 2007)

The immediate needs of immigrants can only be resolved if they learn English, can figure out how to and where to buy food or find a place to live and can maneuver around institutional structures to obtain short-term basic health benefits. (Singer, 2009) Most organizations that facilitate immigrants settling into a new region of a country focus on helping adults to find the immediate information they need to survive in a new culture. However, this is challenging since Chatman (1996) and Childers (1975) called today's immigrants as "information poor". The types of information streams they need to navigate are diverse, and may include finances, transportation, unwelcoming environments, technology access and skills, agency complexity, and knowledge itself of what is available. Also, since many immigrants to the U.S. settle outside of traditional gateway cities, they find fewer services to help them to integrate into a new culture and country.

There are several immediate challenges that the adults in immigrant families face before they can take time to learn a new language. All of challenges happen in a compressed amount of time. This means that adult immigrants do not have time to learn a new language, learn the social norms and boundaries of a new culture, or figure out where to find information. It is very

challenging for migrant parents to engage in a language they do not yet speak and a culture they have never experienced. (Katz, 2014) Further, immigrants need to be able to absorb a considerable amount of new information that they frequently do not have the context to understand the information they are being given. Immigrant families also need to deal with the high degree of uncertainty and the rapid amount of change that is thrust upon them at a given time.

Today many immigrant families, guardians, and ethnic community expect immigrant children and youth to learn the new host culture and language as fast as possible after arriving in the U.S. Despite youth not having a complete grasp of the language or culture of their new country, they are needed to immediately function as “experts” and highly informed guides for a variety of family, community, non-community members, and peers. (Suárez-Orozco et al., 2015) At the same, immigrant-origin youth must learn to simultaneously navigate two different worlds, i.e., their host world and their own ethnic community. Sometimes they benefit from the enriching perspective that this position provides and sometimes they face the isolation of being marginalized by both their parents and ethnic community members (Suárez-Orozco et al., 2015), with little or no voice of their own. As immigrant-origin children navigate (or struggle to navigate) new schools, peers, and societal norms, they may concurrently feel pressured to acquire (or maintain) the skills and knowledge valued within their heritage culture.

This study had three questions that addressed the challenges faced by immigrants and the role of immigrant youth in helping their ethnic communities to adapt to a new culture and society: How do the Information Worlds of immigrant wayfaring youth reflect their social norms, social types, information value, information behavior, and information boundaries?; How does the selective use of technology by youth ICT wayfarers break down barriers and increase the

effectiveness of ICT Wayfaring activities while supporting their roles as positive deviants?; and How does Design Thinking and Design Learning through hands-on solution prototyping provide insights into the information lives of immigrant youth and their communities? Each question will be addressed in the following sections.

### **5.1 Research Questions 1 and 2: Do Immigrant Youth Function as ICT Wayfarers?**

Even though many published studies have reported on the topic of immigrant youth functioning as information mediaries for their families and their ethnic communities, the everyday Information Worlds of youth are still poorly understood. A comprehensive review of youth as information mediators has not yet been written but several studies are beginning to offer insights on critical driving variables that will help researchers design their future research projects and information designers and professionals to create new offerings that enable ICT wayfaring activities. This study addressed two questions related to ICT wayfarers and their beneficiaries and contributes to the emerging knowledge in this field. The questions focusing this research were:

- (1) How do the Information Worlds of immigrant wayfaring youth reflect their social norms, social types, information value, information behavior and information boundaries? And,
- (2) How does the selective use of technology by youth ICT wayfarers break down barriers and increase the effectiveness of ICT wayfaring activities while supporting their roles as positive deviants?

In this study, the immigrant youth taking part in the TDD workshops reflected the social norms, social types, information values, information behavior and information boundaries that characterize ICT wayfarers. Further, this study showed that they effectively used technology to provide their ICT wayfarer functions. This occurred immigrant youth needing to straddle two

cultural worlds, acquire the knowledge to use technology to gather information, and produce solutions to problems facing their community using the information they acquire.

Adult immigrants often focus on meeting the financial needs of their family and the cumulative needs of their ethnic community (Suárez-Orozco, 2015). In contrast, the immigrant children and youth are expected to teach the community about American culture and the English language. Immigrant youth are enrolled in the American school system so they are constantly learning and improving their English language skills and using this new found skill to help their peers, family, and community members. Therefore, immigrant youth are able to serve as cultural and language tutors, and pass on the knowledge they are gaining from the American public-school system directly back to the family members, peers, and to the community. This community expectation of their youth is understandable since schools teach the youth the English language and much more. Schools also provide some skills in how to use technology to access services, and gradually teach the other skills required to survive and navigate the new American host culture. (Suárez-Orozco et al., 2011) This supports the idea why youth are ideal candidates to become ICT wayfarers.

The demographic and technology use information collected during this study show the challenges facing any immigrant youth to function as an ICT wayfarer. They originate from several different countries with a diversity of cultures. A large portion of the youth arrive in the U.S. before their parents or after their parents have already moved to the U.S. – only half of the youth arrived at the same time as their parents. Many continue to speak their heritage language at home but need to communicate in English at school. This requires them to function independently or be dependent upon other family members or people not from their culture. Half of the youth in this study did not have a computer at home which implies that they would not be

successful ICT wayfarers. Despite all these barriers, the youths at TDD I, II, III workshops did function as ICT wayfarers showing their ability to balance the demands of two or more differing cultures, languages, and social expectations.

This study focused on assessing whether youth would be able to function as ICT wayfarers and helping their parents and other immigrant community members by sharing information, helping other users and building information relationships using technology. To figure out whether immigrant youth could function or become ICT wayfarers, they needed to provide three functions (Share information, Help users and Build relationships) that characterize information mediaries. (Gomez, Fawcett, & Turner, 2011; 2012) This research proved that the youth provided all three functions that are critical for information mediators and ICT wayfarers.

The sketches and narrative produced by immigrant youth during the workshops supported their role as information mediaries. For example, several teens chose stories to illustrate their ICT wayfarer behavior by narrating incidents involving: helping a young cousin who just arrived from Africa get oriented to U.S. schools; teaching a new student how to play basketball; showing an aunt how to use the internet to look for a job (and then accompanying her to the job interview); and helping a friend learn how to use the latest social media, such as Facebook and Twitter. The sketches produced by the young people combined social network diagrams with flowchart processes and written annotations. One diagram described helping a mother with understanding medical information. Another mapped out Facebook relationships and communication purposes. Another depicted helping a mother communicate with a cashier at the store. Another placed the teen in the center and showed the large network of people with whom information of several types was shared.

These examples document how these youths are providing the main functions necessary to become Information, Communication, and Technology (ICT) wayfarers and how important their activities are to their parents and peers, and how contribute to the long-term survival of themselves and their ethnic communities. We found also that members of ethnic communities are not “information poor” as defined by Chatman in a large part due to the efforts of ICT wayfarers, and in fact are quite facile in information mining to address their communities’ problems. (Chatman, 1996) Some immigrant youth are better than others at being ICT wayfarers and have forged a greater number of information networks to acquire the knowledge they need to help their parents and ethnic community. These youths are functioning as positive deviants and can become models for other immigrant youth to emulate.

Immigrant youth function as Information Mediarities which contrasts the non-immigrant youth who are better positioned to play such a role and should have fewer barriers to provide such services. Non-immigrant youth do not need to learn a new language or navigate a new culture. Non-immigrant youth are also adept at using technology to find information. Two-thirds of non-immigrant youth own a cell phone which they use for conversing, listening to/playing/watching other media, and texting (90 minutes daily average for middle and high schoolers). (Rideout, Foehr, & Roberts, 2010) Non-immigrant youth, however, typically are less likely to begin to function as Information Mediators to their family or community. In contrast, immigrant youth are capable of functioning as Information Mediarities because of their ability to adopt technology to acquire and communicate a diversity of new information. Also, they keep the strong links to their ethnic communities and a continued interest to help their parents and ethnic community. Since the immigrant youth originated from countries where technology was

not available, it is quite amazing how rapidly they adapt to new cultures without giving up their heritage culture.

The immigrant youth have their preferred modes of communication just like the non-immigrant youth, e.g., cell phones, and use emails, Facebook, or Twitter. Immigrant youth communicate within these information networks and in some cases, are beneficiaries themselves, especially when their social network becomes virtual, as noted in Figure 4.10, G6-G7, and F5-5. They also decide who they will include in their communication network, e.g., friends, family, teachers, counselors, or coaches. Researching immigrant child mediators, Chu (1999) showed that once immigrant youth become comfortable speaking English, they may become their families' primary information mediary. Also, Chu (1999) wrote that immigrant youth bilingually carry out adult responsibilities which requires a sophisticated grasp of more than one vocabulary and cultural context.

This suggests that for immigration policy to accelerate the rate at which immigrants adapt to their new country, there should be a focus on youth and providing them a framework in which they understand the roles they play for their parents and ethnic community. The TDD workshops was an effective approach to understand immigrant youth through their lens instead of using the researcher's eyes.

### **5.2 Research Question 3: ICT Wayfarers as Design Thinkers and Positive Deviants**

Helping immigrant communities to transition into a new environment and society continues to be an intractable or tricky problem. Most international programs focus resources on preparing immigrant adults to adapt and gain employment in cultures that differ considerably from their home countries. But, it is insufficient to make immigrants employable at a skilled job if they

cannot also deal with the significant cultural differences that become barriers to becoming part of a new community. Immigrants need to figure out how to find information and ultimately how to utilize this knowledge to become effective members of society. Immigrants need to learn a new language but also need the educational and technological skills to develop solutions to problems that they face. Immigrant adults are less effective in acquiring and sharing information when they move into new cultures because of the multiple pressures placed on them to simultaneously learn a new language, get a job, and find a place to live.

Since the focus has been on how to facilitate the adaptation of adult immigrants to a new culture and society, less attention has been paid to the youth immigrants and whether they should have a role in the general adaptation of their ethnic community to a new culture. Recent research has shown the importance of immigrant youth in facilitating and mediating their parents' adjustment to their new environments by becoming front facing information seekers and sharers of their newly acquired skills and knowledge. However, this research has not explored the youth's perspective on becoming information mediaries but used a bottom up - participatory approach to explore the issue in general. The research question being addressed in this study is unique because it studies the problem using the voices of the ICT wayfaring youth themselves to think how they can and do function as information mediaries. The research question that was posed was:

*(3) How does Design Thinking and Design Learning through hands-on solution prototyping provide insights into the information lives of immigrant youth and their communities?*

To address this question requires an understanding of what makes a person a positive deviant and to be able to function as a design thinker. Insights into the most difficult problems come most often from **extreme users** and not from center of the bell curve (Brown, 2009; See

Fig. 5.1). In a comparable way, design thinkers look for work-arounds and improvise solutions and find ways to incorporate those into the offerings they create. They consider what are call the “edges”, the places where “extreme” people live differently, think differently, and consume differently. Extreme users are most often a superset of the typically core user depicted in Figure 5.1 below. Because of this, in most cases solutions created by extreme users will also apply to core users. Children and youth can be considered “extreme users” since they often magnify issues that we have as adults. (Brown, 2009) Based on their skill set and adept use of technology, ICT wayfarers are “extreme users”.

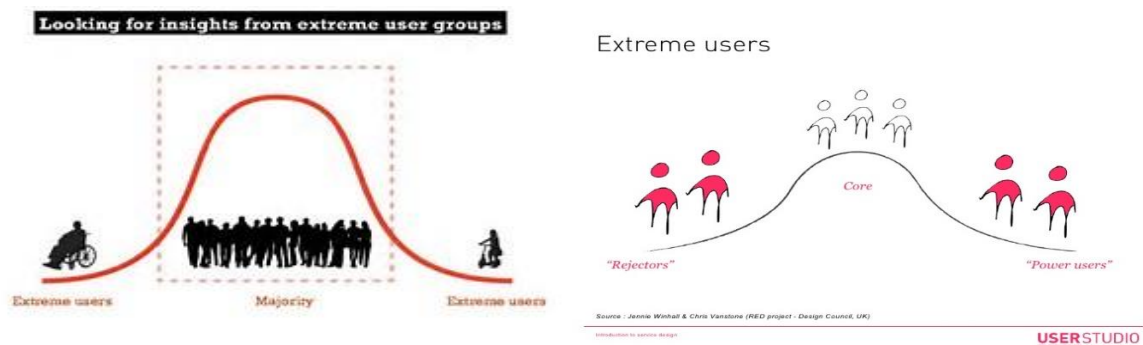


Fig. 5.1. Design thinkers who are extreme users mapped onto a bell-shaped curve. Typically, the extremes will tell you more than Core Users will. Most insights and compelling motivations are discovered by understanding why these extreme users are either rejectors or power users. (Brown, 2009) Source: Adapted from Left: [www.slideshare.com](http://www.slideshare.com). Right: Jennie Winhall and Chris VanStone (Red Project, Design Counsel U.K.)

By focusing on the extremes, the problems, needs, and methods of solving problems are magnified for all user types: Rejectors, Core, and Power users. First, you must identify the extremes of your potential user base, which has been already done by identifying who the ICT wayfarers are. Once identified, it is recommended that you should engage with this group to establish their feelings, thoughts, and behaviors, and then look at the needs you might find in all

users. It is important to note that the purpose of engaging with extreme users is not to develop solutions for extreme users, but to sieve out problems that mainstream users might have problems voicing out; however, in many cases, the needs of extreme users tend to overlap with the needs of the majority of the overall population. During this study, examples of problem solving by immigrant youth proved their ability to solve problems as extreme users. The immigrant youth also demonstrated functions similar to positive deviance as described by the developers of this concept in Vietnam. (Singhal, Sternin, & Dura, 2008)

Immigrant youth learn to navigate (or struggle to navigate) new schools, peers, and societal norms which produces and delivers the information needed for their family and ethnic community to adapt. Immigrant-origin youth simultaneously navigate two different worlds, i.e., their host world and their own ethnic community. Successful immigrant youth functioning as Information Mediarities need the right tools or practices to utilize information embedded in the social worlds of individuals and connect information found in multiple Information Worlds. Immigrant youth are successfully sharing information needed by their ethnic communities but are often not aware that they are providing ICT wayfarer functions to their communities.

Immigrant youth use technology to find and share information to solve problems within the larger context in which a problem exists, however, technology makes too much information available at a given time. Therefore, technology users such as immigrant youth need to become critical thinkers and figure out how to use multiple sources of data to help the family or community to solve problems within the social construct of their dual cultures. This study demonstrated how immigrant youth using Design Thinking capabilities to integrate and link the social elements of Information Worlds to solve problems. This study also showed how youth filter through copious amounts of information and data even far beyond their own Information

Worlds to function as more effective ICT wayfarers within and across those worlds. Despite immigrant youth lacking language skills (especially English), sometimes being semi-illiterate, lacking technology skills, or having poor research skills, they learned the Design Thinking process and demonstrated its use by creating low fidelity prototypes and related solutions even though they had a very short exposure to the process. Therefore, the barriers faced by immigrant youth needing to function in two or more cultures did not deter the youth from being able to effectively understand and practice Design Thinking.

From all the participants who were part of the TDD workshops, two participants Information World diagrams highlight well how youth function as information mediaries. Each immigrant youth used and developed complex communication nodes to function as effective information communicators. Gaboose's and Naresh's Information World diagrams (Fig. 4.9, 4.10) demonstrate well the attributes of ICT wayfarers and Positive Deviants while also being able to practice Design Thinking. Each immigrant youth used a diverse set of information types and information tasks, information grounds, beneficiaries, and social media to interact with their peers and other members of their ethnic communities as shown in Figures 4.9 and 4.10. Each showed multiple social aspects of their Information World that included the infomediary attributes listed in Table 2.1. During the workshop, each expressed or described activities of the three functions (Share Information; Help Users and Build Relationships) that characterize ICT wayfarers. Both individuals also used an effective series of communication modes to function as ICT wayfarers while using their communication nodes to be effective Positive Deviants. Gaboose's Information World diagram had over 40 separate communication nodes.

In Figures 4.9 and 4.10, both Gaboose and Naresh acquired large amounts of information while searching for the knowledge relevant to solve a problem and eventually communicating

the solution to the problems to their family and community. Within his Information World sketch, Gaboose created an annotation to represent three of the social elements of an Information World (information value, information behavior and information boundaries) to describe his information exchanges (Fig. 4.10). Also, Gaboose included the use of social media technology (e.g., Twitter and Facebook) when performing his ICT wayfarer exchanges with a given beneficiary.

What these Information World diagrams show are the complex and interconnected information pathways practiced by one immigrant youth. It shows how the social elements of these Information Worlds are an integral part of their behavior even if they do not know that they are performing such functions. Despite the participants practicing and functioning in the Information Worlds based on its social elements, this still not address how the youth solve complex problems facing their parents or communities. Each participant demonstrated an ability to track multiple nodes of information and an ability to assign different qualifiers to knowledge but not whether they are critical thinkers or not. These social behavior patterns suggest that they should be able to use the same process used for Design Thinking to solve more complex problems and to weigh the value of multiple forms of knowledge.

Immigrant youth like Naresh and Gaboose are ideally suited to function as ICT wayfarers, Design Thinkers, and Positive Deviants since they appear to be able to balance their cultural conflicts to function and communicate between two or more cultures. They provide everyday tasks an ICT wayfarer and successfully broker information to their families and ethnic communities that is place- or business-specific, e.g., schools, workplaces, medical and social service centers, as well as in the home. (Katz, 2011) Immigrant youth are functioning as an

intermediary for a diversity of brokering activities, e.g., cultural, language, technology, and informational.

During the Design Thinking workshops, all the immigrant youth were able to practice Design Thinking by filtering through information in a variety of topics and then translating this information to produce prototype solutions for problems that their parents and community face. This is not a thinking process that the youth will learn by attending school but is something that they will have to engage in outside of that Information World. Immigrant youth will not learn how to become critical thinkers by attending K-12 classes in the U.S. Mostly, because the U.S. public educational system is not designed to educate K-12<sup>th</sup> grade students to think critically to make decisions (Harvard GSE, 2016). Historically, Western science and education has been designed to use a specialized, de-contextualized and standardized approach to teaching in the classroom. This teaching approach unfortunately does not educate youth to become deep learners. According to Harvard GSE (2016), this is a systematic problem for ~80% of U.S. high schools where no instruction on deep learning occurs; these findings contrasts private schools or schools in affluent neighborhoods where critical thinking is taught (Harvard GSE, 2016). The students learn basic knowledge but as they progress in school they find themselves caught in an educational system designed for American youth not necessarily immigrant youth. Therefore, alternative approaches are needed to expose youth to the Design Thinking process, e.g., perhaps similar to the TDD workshops.

By identifying who are the Positive Deviants in a given society, it is possible to understand what makes a person a successful ICT wayfarer or not. The focus of this research was not to study Positive Deviants and how they function in society but to identify why some people may successfully function as information and communication technology communicators. Positive Deviants are identified as a subset of society who ‘think out of the box’ and can use design-thinking approaches and other strategies to produce solutions to tricky problems. They are also

able to critically think through problems and search for solutions grounded in their ethnic heritage and host country cultures. Ideally, ICT wayfarers should all function as Positive Deviants when addressing problems facing their ethnic communities.

Once this practice becomes a generalized thinking approach in the community, immigrant youth would no longer be called positive deviants. If this were to occur, a greater proportion of an immigrant community would be capable of participating and functioning in their new environment. The community, and not just a subset, would be better problem solvers and better adapted to their host country. The characteristics of Positive Deviants were found in the ICT wayfarers taking part in the Teen Design Day workshops during this study. These characteristics can be summarized as (<http://www.positivedeviance.org>):

- The community must own the entire process
- The community discovers existing uncommon successful behaviors and strategies
- The community reflects on these existing solutions and adapts them to their circumstances
- The community designs ways to practice and amplify successful behaviors and strategies.

The review of the ICT wayfarers, Positive Deviants, and Design Thinking all suggest the need to engage immigrants to work through the process to solve their problems. It also suggests that the youth are ideally suited to become ICT wayfarers because of their comfort in bridging several different cultures. Youth are better at attempting to develop a balance in how to function in a country that vastly differs from what they left when they fled their home country than their adult parents or members of the community are. They also are able to interact with their ethnic community where the community trusts the information they are given. This is especially critical since the immigrants continue to need to address problems that they continually face while adapting to the conditions imposed by a host country. Currently, most immigrant programs focus

on teaching a new language and getting the skills needed to acquire a job. This approach does not address the multiple and diverse challenges an immigrant faces which do not disappear when a family member obtains a job. What appear to be simple activities, e.g., going grocery shopping, getting a doctor's appointment, are challenging when one's language and cultural skills are poor and one does not know where to find much needed information.

Since most immigrant youth were not aware of functioning as ICT wayfarers or Positive Deviants, part of the process for acculturating immigrant youth and their ethnic communities would result from them learning to recognize what makes a person an ICT wayfarer or a Positive Deviant. Since host country financial resources are limited, such an approach would take advantage of the immigrant youth already learning languages and communication technologies in school. This would expand these school-based experiences to where youth can systematically use critical thinking to assess the problems the ethnic community faces and develop solutions that are embedded in the cultural norms of their host country and their heritage culture.

## **Chapter 6**

### **Conclusions**

This research explored whether immigrants would adapt faster to their new environments if they functioned as Information and Communication Technology (ICT) wayfarers between their families, peers, and community, and their new host country. This research had the goal of identifying whether some immigrant youth are already functioning as Positive Deviants within their community. Another aim of this study was to answer the question ‘When Positive Deviants are identified, are they more effective at communicating, e.g., having a higher number and more diverse communication nodes, while using technology to link the cultures and customs of their parents with those of their host country?’ Since migrant youth are required to go to school and learn new knowledge and technologies, is this sufficient to foster the emergence of Positive Deviants in the immigrant community? This research identified that all of the immigrant youth functioned at some level as ICT wayfarers. Further, it also identified some of the immigrant youth who fit the characteristics of someone functioning as positive deviants and very effectively functioning as design thinkers. This research design used the Teen Design Day workshop approach and was able to use this approach to identify immigrant youth capable of becoming effective ICT wayfarers and Positive Deviants. This study also was able to characterize what attributes of immigrant youth would make them effective ICT wayfarers capable of forging a bridge for their parents and friends to their unfamiliar environment and cultures.

The approach used in this study was to focus on male/female immigrant and refugee youth, ages 14-19, who are on their journey to become brokers and experts of language, technology,

media, and culture. The primary method fused in this study was the creation of an evolving participatory framework and youth engagement model called Teen Design Days (TDD). This study showed that using a unique participatory framework (TDD) does capture the voices of the youth as well as was able to identify Positive Deviants within the youth population. It also showed how combining a strategic use of design thinking and design artifacts was effective in providing insights into the Information Worlds (technology, social, information) of ICT Wayfaring youth and their ethnic communities. This research focused on creating and then evolving the TDD participatory engagement model using a pre-pilot, pilot (TDD I) and two youth participatory/co-design workshops (TDD II, II).

The results of this study show the importance of youth in facilitating their parents' adjustment to their new environments by becoming seekers and sharers of their newly acquired skills and knowledge needed to function in a new country. Without these wayfaring youth, immigrants arriving in the U.S. would face even more critical challenges to adapt to their new environments. Further, ICT wayfaring youth should increase their effectiveness as bridges for their community since they are constantly gaining new knowledge as their language skills improve. This research showed how each wayfaring youth had a different model for how they contributed to information sharing and how they facilitated their parents to become comfortable with their new surroundings. Immigrant youth need to balance adapting to a new culture but also retain many of their home country traditions if they are going to be effective ICT wayfarers.

During these field studies, it became apparent that immigrant and refugee ICT wayfaring youth were not self-aware of performing wayfaring duties. This suggests the need for future workshops to teach a greater proportion of the immigrant youth to function as effective ICT wayfarers and to function as Positive Deviants. This study found that immigrant and refugee

youth within their ethnic communities had a near unlimited capacity and willingness to help family, peers, community members to overcome many types of technical, cultural, and social barriers. They also had the capability to design and find unique solutions for the many beneficiaries they serve each day.

As the number of immigrants coming to the U.S. from a diversity of countries with different cultures and traditions, there is a greater need for immigrants to have tools to function and manage large volumes of information on daily life activities. Immigrants need to be able to have the skills to seek data, collect it and to share and to understand the usefulness of the data or knowledge they acquired. Immigrants face many challenges to transitioning into and to be able to share knowledge or data in their new environments. Many researchers have focused on seeking and sharing information or data from the immigrants that is contextualized and identifies the network sources of information (Savolainen, 2009; Greyson et. al., 2017; Fisher and Naumer, 2006). This research supports the network theory of social capital as a process of seeking and sharing knowledge. It further supports the idea that immigrants today are less able to remain in the “Small world” (Chatman, 1991) where they have little contact with people outside of their social and cultural groups.

In the past, the ‘small world’ concept was relevant as most of the immigrants were from Europe and formed their ‘small world’ where they settled – this did not require them to interact with the rest of society since they were protected within their own communities with the common language and culture from their country of origin. New York City is a classic example of this ‘small world’ concept playing out since it was common to find German town, Finn town, etc. that allowed immigrants to adapt to a new culture while retaining a foot in their heritage cultures.

Today seeking and sharing information is more complex because many immigrants are from non-European countries. This research supports that the adult immigrants are still in the “small word” approach to adapting but their children are becoming the information, communication and technology youth wayfarers who have the skills and tools to link adults to sharing knowledge. This research also highlighted differences between youth coming from origin countries such as Somalia, Nepal, Ethiopia, and Burma (Myanmar).

This study used a unique participatory framework that allowed youth to develop their own solutions to the problems their community face. Such an approach allowed youth to share knowledge across cultural boundaries with adults from their ethnic world. Such an approach to new immigrants is needed to accelerate the rate at which non-European adults can transition into becoming functional members of a new culture.

The challenge for immigrants who need to seek and share knowledge is that youth are coming from countries where it is not the norm for them to share knowledge and to make decisions for adults. The social power structures are more set. For youth to become ICT wayfarers, there has been a role reversal. This research showed how parents were dependent on the youth in the families to seek information and to communicate to service providers what they needed. Since youth are more facile with technology, they are more readily adopting technology tools to make decisions. Youth are taking their parents to get their drivers licenses, go to the doctor’s office for appointments or even going shopping for food. The adults are in the ‘small world’ mode but need to become information wayfarers to fully adapt to their pristine environment. This approach of having youth seeking knowledge and sharing it in the context of traditional culture is a promising approach to accelerate immigrants adapting and sharing information in social networks.

This research work and research method are unique because they give a marginalized and hidden population of recently arrived immigrant youth the opportunity to use their local knowledge and experience to tell their own story, with their own voice, in their own words. This work and method also has an evolving aspect, as it helps ICT wayfarers develop confidence in their own skills as they cultivate future solutions for their own context as ICT wayfarers. The results have ramifications for optimizing youth engagement and development for immigrant and refugee youth, social innovation, as well as technology creation for this target population of Generation Z, ICT Wayfaring youth.

For this study, Teen Design Day workshops were used to determine whether identified ICT wayfarers, among the immigrant youth participants, could apply Design Thinking methodologies and become Positive Deviants. Positive Deviants in this study had a higher number and more diverse communication nodes to solve complex problems facing their ethnic communities. This research identified several immigrant youths already functioning as Positive Deviants within their community. It was critical to determine whether their practices can be taught to other immigrant youth using the Teen Design Days workshop approach.

Summary conclusions or insights from this research are:

- The Teen Design Days (TDD) methodology is unique in contrast to most of the current research studies. In most research studies of youth, the researchers only observe youth as actors taking part in an arm's length observation vs. engaging immigrant and refugee youth directly.
- The TDD participatory approach turns the typical top-down approach of most policy and academic work a complete 180 degrees, and puts the solutions to the problem in the

hands of those who are closest to the problem space, e.g., the immigrant youth and the ethnic community.

- The multidisciplinary approach used to gather data was grounded in prior research work, however, the application to these immigrant communities is an experimental approach that brings in the perspectives of computer science, information science, design, and information behavior.
- This study asserts that the individual information, social, and technology lives and worlds of immigrants and immigrant youth, including youth in general, are not well understood, despite an abundance of funded research activity worldwide.
- Most of the funded studies with youth most often use research tools that are optimized for gathering data. In contrast, our participatory approach places youth workshop participants in position of equal power and contribution to the researcher. Thus, youth are active participants and generators of data that they can practice in functioning as ICT wayfarers and Positive Deviants in their ethnic community.
- The study contributes to the academic fields of Information Science and Human Computer Interface and Human Computer Design and Engineering (HDCE). It also contributes to the HCI field of Participatory Design (PD) as well as demonstrates the use of design as social inquiry, social innovation, and social research tool and reinforces the idea that there are “designerly ways of knowing”. (e.g., Cross, 2007; 2011) even for non-professional designers.
- The use of digital video capture though not unique, has not often been applied to the domain of immigrant youth. Digital video capture was used to capture the design artifacts

and skits created by the youth TDD workshop participants which increased the overall trustworthiness of the study.

### **6.1. Limitations of the Study**

There are limitations to this study that should be considered when the reader reads the results of this study. These can be summarized as:

- The data captured for this study was created by the immigrant youth participants themselves. It is unknown and not confirmed whether the ICT wayfarer artifacts captured in this study occurred or were just part of the youth participant's imagination. However, since the youth presented their artifacts in a consistent and in a variety of ways (skits, scenario presentations, individual presentations of design solutions, and prototypes) were consistent with their original documented narrative work and therefore had some basis for cross-validation.
- Though there has been recent academic work on immigrants and immigrant refugees of all ages and greater exposure by popular media the focus of this study is not about the plight or challenge of immigrants or refugees across the world, nor their acculturation into process after entering the United States.
- The scope of the Positive Deviance community development methodology is much broader than we offered and applied here. However, it does provide a framework for using the Teen Design Days workshop to identify Positive Deviants in an ethnic acting in a role as an ICT wayfarer.

- The feasibility of the designs and prototypes of the TDD workshop participants is unknown. More than likely a venture capitalist would not invest in the scenarios in their exact form that the youth described and presented without further refinement, but their very creation by the immigrant youth is a very positive sign that the youth are quick learners and have the capability of design and prototyping solutions for their community.
- The design thinking adaptation used with the immigrant youth ICT wayfarer participant scenarios and prototypes was limited to just a few iterations. A commercial design process using design thinking and designers might use hundreds of iterative cycles.
- A longitudinal study with multiple post-workshop participant interviews over a 5-10-year period was unrealistic to conduct for this research. However, this study might have helped us understand how the workshop affected each participant in the longer run, as well as the participant group and is a possible future alternative.

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## **APPENDIX 1**

### **CODEBOOK 1: ICT Wayfarer Narratives**

## 1.0 Codes For Narrative Description Sources

<b>1.1</b>	<b><i>Comparative age between the ICT Wayfarer and the Beneficiary</i></b>		
	<b>Code</b>	<b>Code Name</b>	<b>Code Description</b>
	1.11	ITC Way same age	The ICT wayfarer is approximately the same age as the Beneficiary and is a peer
	1.12	Older than the Beneficiary	The ICT Wayfarer is Older than the Beneficiary
	1.13	Younger than the Beneficiary	The ICT Wayfarer is Younger than the Beneficiary

<b>1.2</b>	<b><i>ICT Wayfarer Relationship to Beneficiary</i></b>		
	<b>Code</b>	<b>Code Name</b>	<b>Code Description</b>
	1.21	Family	The ICT Wayfarer knew the Beneficiary before the ICT Wayfarer-Beneficiary Exchange (IBE) and called him/her a “family member” in the narrative source. This includes named roles such as “Cousin”, “Aunt”, “Mother”, “Father”, “Brother”, “Sister”.
	1.22	Friend	The ICT Wayfarer knew the Beneficiary before the IBE and called him/her a “friend”, or a “good friend” in the narrative source. This includes named roles such as “Best Friend”, etc.
	1.23	Teacher/Coach/ School Counselor	The ICT Wayfarer Knew the Beneficiary before the IBE and called him/her a “Teacher, Coach, or School Counselor”, as named roles in the narrative source

1.24	Stranger(s)	The ICT Wayfarer <u>DID NOT</u> Know the Beneficiary before the IBE and in some cases called him/her a “stranger” in the narrative source
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<b>1.3</b>	<b><i>ICT Wayfarer Engagement with the Beneficiary</i></b>		
	<b>Code</b>	<b>Code Name</b>	<b>Code Description</b>
	1.31	In Person	The ICT Wayfarer engaged the Beneficiary Face to Face as called out in the narrative source.
	1.32	Virtual	The ICT Wayfarer engaged the Beneficiary virtually using some of form of computer or communication technology such as a social media application or a cell phone as called out in the narrative source.
	1.33	Hybrid	The ICT Wayfarer engaged the Beneficiary both Face to Face/in-person <u>and</u> virtually using some of form of computer or communication technology such as a social media application or a cell phone as called out in the narrative source.

<b>1.4</b>	<b><i>Scalability of the ICT Way Relationship to the Beneficiary (s)</i></b>		
	<b>Code</b>	<b>Code Name</b>	<b>Code Description</b>
	1.41	One to One	The ICT Wayfarer Beneficiary Exchange (IBE) was a one ICT Wayfarer to one Beneficiary relationship as called out in the narrative source.
	1.42	One to Many	The ICT Wayfarer Beneficiary Exchange (IBE) was one ICT Wayfarer to many beneficiaries as called out in the narrative source.
	1.43	Hybrid	The ICT Wayfarer Beneficiary Exchange (IBE) shifted during the exchange. It began as a one

		ICT Wayfarer to one Beneficiary relationship or a one to Many Beneficiary Relationship <u>and</u> shifted to a one to one or one to many exchange relationship as called out in the narrative source.
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<b>1.5</b>	<b><i>General Task Type that the ICT Way performed for the Beneficiary (s)</i></b>		
	<b>Code</b>	<b>Code Name</b>	<b>Code Description</b>
	1.51	Translation	The ICT Wayfarer translated from a common source language or common language of origin for the Beneficiary to English and back again during an ICT wayfarer-beneficiary (IBE) These types of IBE’s typically involve translation and interpreting between the ICT Wayfarer, the primary beneficiary who <u>does not</u> speak or read English well or at all, and a secondary beneficiary (for example, a school teacher, medical doctor) who <u>only</u> speaks English. The translation activity occurs in a variety of situations and contexts. It typically is called out in the narrative source by the ICT Wayfarer stating that the primary beneficiary (s) “do not know how to speak and/or read English”. Translation also involves “interpretation” which requires and understanding the context, the culture, the vocabulary, the situation that the IBE is occurring in.
	1.52	Directions To/From a Location	The Beneficiary asks or the ICT Wayfarer offers advice typically in the form of directions, maps, or bus numbers, schedules etc. on how to get TO/FROM a location that might include a shopping mall, shopping

		center, bus stop, train stop, school classroom, or a community asset such as a foodbank, etc. This could include directions to a location, such as a school room, a grocery store or a beneficiary may have been called out as “ <u>lost</u> ” by the ICT Wayfarer in the source narrative.
1.53	Helped with Homework	The ICT Wayfarer had the expertise, willingness, and availability to help the Beneficiary with a wide variety of homework assignments. These may include school related assignments in Math, English, writing an essay, using technology to create a PowerPoint presentation for a class and other homework related tasks. In some cases, the ICT Wayfarer may become a beneficiary by trading his or her expertise in math for example, with someone who is good at video editing or some other area of expertise, based on the school assignment requirements. These types of exchanges are called out in the narrative source.
1.54	Helped the Beneficiary purchase something	The ICT Wayfarer helped the beneficiary purchase something at a store, shopping mall, or shopping center. It may involve translation, providing or securing transportation so that the beneficiary can get to the store purchases specific item, or guidance on how to purchase something at a virtual store such as Amazon, or eBay. These types of exchanges are called out in the narrative source.
1.55	Helped with Technology Use	The ICT Wayfarer helped the beneficiary solve a problem using technology. This could be as simple as setting up an account on a social media application like Twitter or Facebook,

		setting up an email account, teaching the beneficiary how to answer and respond to email, cell phone use, completing electronic forms, or a variety of other tasks using some electronic means or Information and Communication technology. These types of exchanges are called out in the narrative source.
1.56	Sports related	The ICT Wayfarer helped the Beneficiary learn how to play a sport, such as basketball or tennis, ride a bicycle, or, provided information about a sports team, or, showed the Beneficiary how to find information about their favorite team or sports activity. These types of exchanges are called out in the narrative source.
1.57	Activities of Daily Life	The ICT Wayfarer helped the Beneficiary obtain information that may have helped in their daily lives such as how to find a food bank, a store, the mall, and other information for daily living but more casual than providing General Information. Or, the ICT Wayfarer-Beneficiary Exchange explicitly mentioned as “things about life” or some “personal things”.
1.58	General Information	The ICT Wayfarer helped the Beneficiary obtain general information about the community, the weather forecast, temperature, time of day, community calendars, school calendars and events, and other general information that maybe beyond everyday daily life issues. Also, with General Information there is often a second step during the during the exchange where the ICT Wayfarer may

		find the information themselves and then show the Beneficiary, or show the Beneficiary how to use technology such as the Internet, cell phones, laptops, iPads, etc. to find general information on their own at a future date. These types of exchanges and the general information requested, are called out in the narrative source.
1.59	Other	The ICT Wayfarer helped the Beneficiary obtain information not covered by the categories or contexts above, for example, teaching your mother how to drive a car, or helping them find a job, or helping them interview for the job typically by translating. These types of exchanges in the general information asked, are called out in the narrative source.

<b>1.6</b>	<b><i>Motivation of ICT Wayfarer Engagement to help the Beneficiary (s) during the ICT Wayfarer-Beneficiary Exchange (IBE)</i></b>	
	<b>Code</b>	<b>Code Name</b>
		<b>Code Description</b>
1.60	The ICT Wayfarer asked the Beneficiary	The ICT Wayfarer observed or sensed an information gap and asked the Beneficiary if they needed help. This interaction began which began the ICT Wayfarer – Beneficiary exchange, or IBE. For ICT Wayfarer to ask the Beneficiary if they needed help they both had to have a have a common language to be able to communicate to the ICT wayfarer with.

		<p>This could be one of the language of origin by both the beneficiary and the ICT wayfarer or, it could be English. These types of exchanges are called out in the narrative source.</p>
1.61	Beneficiary asked ICT Wayfarer	<p>The Beneficiary asked the ICT Wayfarer for help enclosed information gap for the Beneficiary, which began the ICT Wayfarer – Beneficiary exchange, or IBE. For the beneficiary to ask for help he/she had to have a common language to be able to communicate to the ICT wayfarer with. This could be one of the language of origin by both the beneficiary and the ICT wayfarer or, it could be English. Also, the ICT Wayfarer maybe asked by a 3<sup>rd</sup> party counselor/teacher or another ICT Wayfarer, to help the beneficiary before asking him/her individually. These types of exchanges are called out in the narrative source.</p>
1.62	Felt Empathy/Felt Sorry For	<p>The ICT Wayfarer showed empathy towards, or felt sorry for the Beneficiary before engaging in the IBE with them. For example, the ICT Wayfarer may recall their first day in school in the United States, and the fear they remember feeling because they could not speak English, nor understand the language the teachers were speaking, nor the language that the lessons were being taught in, nor read the language the text books were printed in. In some cases, the ICT Wayfarer may have mentioned a “feeling” that the Beneficiary needed help of some kind. These types of</p>

		exchanges are called out in the narrative source.
1.63	Trust	The ICT Wayfarer and the Beneficiary “trusted” each other , or are “very close” with each other as explicitly called out in the narrative source. In some cases, the narrative source may have called out that the Beneficiary as being “trusted” by the ICT Wayfarer, or that the ICT Wayfarer was “trusted” by the Beneficiary.
1.64	Reciprocation/ Payback/Info. Sharing/ Role Switching	The ICT Wayfarer helped the Beneficiary with the expectation that the Beneficiary would return something to them either in the form of further knowledge, or cooking lessons, or other forms of knowledge or information. In some cases, this could be viewed as a form of “social capital” (reference?) where information is exchanged for other equivalencies for additional information itself. In some cases, the ICT Wayfarer and the Beneficiary switched roles during the ICT Wayfarer – Beneficiary Exchange and in some cases, may give the same type of information back or a different type of information. In other cases, the ICT Wayfarer mentions “sharing” information back and forth.
1.65	Family Obligation	The ICT Wayfarer knew the Beneficiary before the ICT Wayfarer-Beneficiary Exchange (IBE) and called him/her a “family member” in the narrative source. In the narrative source, the ICT Wayfarer appears to focus on helping the Beneficiary because of their family relationship.

1.66	Learning Opportunity	The ICT Wayfarer helped the Beneficiary with the expectation that he would learn something new from the exchange with the Beneficiary. For example, the ICT Wayfarer might learn more about their native language, better English vocabulary, a new topic in school, learning about a new career such as working with children, learning how to cook, how to interpret, or even learning how to garden,
1.67	Gain Experience	The ICT Wayfarer helped the Beneficiary with the expectation that he would gain some skill set or work experience from the exchange with the Beneficiary. For example, the ICT Wayfarer gain future <u>work experience</u> in developing a new career such as working with children, or learning how to cook, or even how to garden.
1.68	Helping People in the Community	The ICT Wayfarer helped the Beneficiary because they have wanted to help and give back to the community in some way. In this case, the narrative source calls out explicitly that the ITC Wayfarer’s motivation is to help in the community.
1.69	Other	The ICT Wayfarer and the Beneficiary called out a motivation that in the narrative source that is not captured elsewhere or has the same context as other narrative sources.

<b>1.7</b>	<b><i>Information Grounds for the ICT Wayfarer - Beneficiary</i></b>		
	<b>Code</b>	<b>Code Name</b>	<b>Code Description</b>
	1.71	Home	The location of the ICT Wayfarer-Beneficiary Exchange (IBE) was called in the narrative source as being in the <u>Home</u> of the ICT Wayfarer or the Beneficiary.
	1.72	School	The location of the ICT Wayfarer-Beneficiary Exchange (IBE) was called in the narrative source as being <u>at school</u> , including the classroom, the cafeteria, or somewhere on the school grounds either of the ICT Wayfarer or the Beneficiary but does not include Sports Field or Sports Court located on school grounds.
	1.73	Sports Field or Sports Court	The location of the ICT Wayfarer-Beneficiary Exchange (IBE) was called in the narrative source as being on a Sports Field, such as a soccer field or at a Sports Court, such as a Tennis Court. The location may or may not at a school.
	1.74	Store or Market	The location of the ICT Wayfarer-Beneficiary Exchange (IBE) was called in the narrative source as being at Store, Mall, or Market of the ICT Wayfarer or the Beneficiary. Typically, the stores mentioned in the narrative source are located in the community, however some may be in the ICT Wayfarers or Beneficiaries country of origin.

1.75	Bus Stop, Train Station, Airport	The location of the ICT Wayfarer-Beneficiary Exchange (IBE) was called out in the narrative source as being a <u>Bus Stop</u> , <u>Train Station</u> , <u>Airport</u> , <u>Gas Station</u> , similar location.
1.76	Community Center, Food Bank, Clothes .... Bank, Library, or Church.	The location of the ICT Wayfarer-Beneficiary Exchange (IBE) was called out in the narrative source as being a <u>Community Center</u> , <u>Food Bank</u> , <u>Clothes Bank</u> , <u>Library</u> , or <u>Church</u> . In some cases, a Library or Church may serve as a Food Bank, Community Center, or Clothes Bank for the Community.
1.77	Hospital/Medical Center/Clinic	The location of the ICT Wayfarer-Beneficiary Exchange (IBE) was called out in the narrative source as being at a Hospital/Medical Center/Emergency Room, or Dental Clinic.
1.78	Another State or Country	The location of the ICT Wayfarer-Beneficiary Exchange (IBE) was called out in the narrative source as being in <u>another state</u> or <u>another country</u> .
1.79	Other	The location of the ICT Wayfarer-Beneficiary Exchange (IBE) was called out in the narrative source as being in a location or context other than the categories mentioned above. In some narratives, the location of the ICT Wayfarer-Beneficiary Exchange (IBE) may not be called out at all in the narrative source.

<b>1.8</b>	<b><i>Post IBE - How the ICT Wayfarer felt after the ICT Way-Beneficiary Exchange</i></b>		
	<b>Code</b>	<b>Code Name</b>	<b>Code Description</b>
	1.81	Beneficiary Happy	The Beneficiary (s) was <u>Happy</u> with the ICT Wayfarer- Beneficiary Exchange as called out in the narrative source.
	1.82	Beneficiary Not Happy	The Beneficiary (s) was <u>NOT Happy</u> with the ICT Wayfarer-Beneficiary Exchange as called out in the narrative source.
	1.83	ICT Wayfarer Happy	The ICT Wayfarer Was <u>Happy</u> with the ICT Wayfarer-Beneficiary Exchange as called out in the narrative source.
	1.84	ITC Wayfarer Not Happy	The ICT Wayfarer Was <u>Not Happy</u> with the ICT Wayfarer-Beneficiary Exchange as called out in the narrative source.
	1.85	Task Completed	The ICT Wayfarer-Beneficiary Exchange (IBE) resulted in the Beneficiary getting their task complete.
	1.86	Task Not Completed	The ICT Wayfarer-Beneficiary Exchange (IBE) <u>Did Not result</u> in the Beneficiary getting their task complete.
	1.87	Did not enjoy helping	During the ICT Wayfarer-Beneficiary Exchange (IBE) the Beneficiary did enjoy being helped by the ICT Wayfarer nor did the ICT Wayfarer like helping the Beneficiary.
	1.88	Other	How the ICT Wayfarer or the Beneficiary felt after the ICT Wayfarer-Beneficiary Exchange (IBE). exchange <u>was not</u> explicitly mentioned in the narrative source.

1.89	Open	
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## **APPENDIX 2**

### **Sample Analysis of an Information World Diagram**

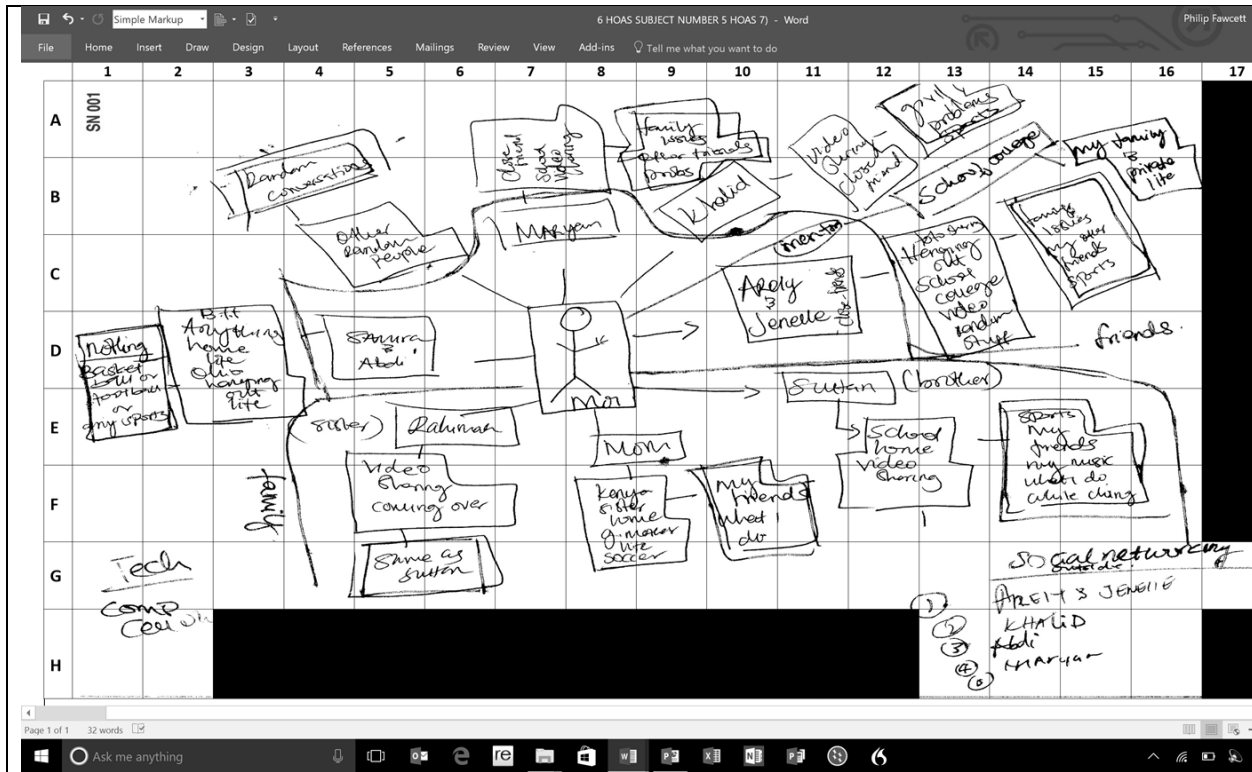


Figure 1 Appendix 2 – Hufan’s Information World Diagram

### Hufan’s Information World Interpretive Description:

Hufan (not his real name as noted elsewhere) describes his Information World Diagram ((Reference Subject Number 007) starting with “Me” at the near center of the diagram, located at reference points D/E 7-8 the diagram above. The use of “Me” in the center, is representational of a first person self-generated egocentric diagram.

The diagram itself is complex and it was created in a very expressive and descriptive manner. It is hand drawn and annotated with different line thicknesses, arrows, and hand drawn diagrams. Hufan’s Information World diagram itself has

30 separate Square nodes, though typically social networking nodes are most often round and are used for most note self-generated networking diagrams.

These nodes represent various types of information and information tasks, Information Grounds, beneficiaries, and their relationship roles, and who are being served by Hufan, as the main ICT wayfarer within her very large Information World. The Information World diagram flows with single arrows, squared boxed notes with labels inside some variance in line thicknesses, which are all represented by squares across the Information World diagram and are further described in detail below. The main nodes in Hufan's diagram are nodes labeled with names of people who are acting as beneficiaries for Hufan, who is the main ICT wayfarer for them as well as those with the greatest number of nodes going into and out of them.

In some cases, the diagram also has labels that call out an Information World based social role and type across most of Hufan's Information World, such as "Mom" at reference location E7/E8, and "family" found in reference point F3. Another example of a role label is "brother" located in reference point D12/13, "mentor" located at reference points B/C 10-11. "Sister" found in reference points E4/5 as "Close friends" found in C10/C11. These labels indicate not only a relationship that Hufan has with them, but also indicates in some instances the type

of information source or use across Hufan Information World. Each of these social types and roles are labelled at various locations across the diagram.

Starting at the bottom of the diagram with his family, Hufan highlights his first beneficiary in a node labeled “Mom” located at reference points E8 and E9 and come out of a vertical line straight down from the center node labeled “Me”.

Directly below the Mom diagram node are 2 central box nodes, one of which describes “my friends” and “what I do” in the same box, and is located at reference point F10. It has some details about what Hufan does and is located at D8, and is connected to the “My Friends” and “What I do” and a written list of things connected to “Mom” at E8 and holds the following references: “Kenya, Sister, Home, Geometry, Life, Soccer”, that Hufan describes as something he does, follows or connects with.

Going left to right the next main node is labeled with the name “Sultan”, located at reference points D/E 11 and D10 who is also role identified as Hufan’s “brother”. Directly down from “Sultan” is another descriptive list with labels of how and where Hufan connects with his brother located at reference point E/F 12/13 with the “where” as “School”, “Home” and with “Video Sharing”.

Continuing left to right with slight space, a line, and square, dual lined node labeled: sports, my friends, my music, and what do while Ching. This node is located at the reference location F/G 14 and 15. Below this node is a label

connected to the Center “Me” and labeled “Social Networking” is a list of 4 names of friends: “Ariet and Jenette, Khalid, Heidi, and Maryan”. This labeled list is located at the lower right-hand corner of Hufman’s Information World Diagram located at reference point G/H14-16. Above the social networking label is a label called “friends” located at D15/16 and is connected via a line directly out of the center node “Me”.

Continuing left from the friend label up to the center node “Me” and then proceeding from left to right, the next main node is labeled “Arely and Jenette” located at reference points C/D 10-12 and who are identified as “close friends” of Hufan. Going slightly up from the Arely and Jenette main node is one of the only circular nodes on the diagram and labeled “Mentor” found at C10-11 and is connected to another circular node labelled related tin an information ground of Hufan labeled “school-college” found at the reference points B12-14 an A14.

Directly below “school-college” Information grounds are a list of actions that Hufan does in a square node and connected to the Arley and Jenette node and found at C/D 14, lists of a number of things that Hufan does with these beneficiaries such as hanging out, “School, College, Video” and random stuff. Connected to this list node is also a list of things that are associated but not connected with a node at the far right of the diagram labeled “my family and private life”.

From this node, the list of things connected to Arley and Jennette, hanging out... list offers some insight into Hufan the activities of Hufan private and family life and has the labels: Family Issues, my sister, friends, and sports and is located at B14/15 through C15/16.

Directly above the “school-college” information grounds node and to left is a node with the label “Khalid” relationship not specified (mentor) that is found at B9/10. To the right of this node and connected via a node line to Khalid are two descriptive nodes located in A11-B11/12 and are labeled “video”, “clearing” (?), and “closed minded” showing some descriptive attributes of Khalid and his information and relationship to Hufan.

To the right of these descriptions and at the top of the Information World diagram is another descriptive node with the labels “general problems” and “Sports” found at reference points A12/13 are types of information that Hufan exchanges with these Beneficiaries. This node is located at A/B 15/16 and is the node at the farthest top/right side of the Hufan’s Information World diagram.

Directly to the left of Khalid, is another main node connected to the center node “Me” and labeled “Maryan”. It is located at reference points B7-B8 and though is not labeled from a relationship perspective. Out of the MaryAn node are two descriptive nodes that are touching the node labeled “Khalid”.

One of the descriptive nodes is located at A/B 6-8 and contains the labels “Closed Mind”, just like Khalid, as well as “good video viewing (?)”. The second descriptive nodes are located from left to right in location A8-A19 and contains the labels “family issues”, “offer tutorials (?)” and no readable label”, indicating that Maryan talks with Hufan about family issues and gets some type of tutorial from her.

Directly left of Maryan is a node directly out of the center node “me” and is labeled “Other Random People’ at location B/C4-5. It is linked graphically to another descriptive node labeled “Random Conversations” located at B3/4 thru A4.

Moving directly down in the diagram to another main node that come out of the center node “Me” and has two labeled names in it “Samra and Aboli”. This main node is found at D4-6. Going from right to left, the next two node labels are descriptive labels about Samura and Aboli. The first node contains the descriptive labels ‘Bitit ?”, “Annoying”, “Home”, “life”, “Olivo” {?}, “Hanging Out”, and “Life” and is located at D2/3 E 3. It not only describes the location but “how” the information topics that Hufan provides. The next descriptive node is found at D1 and E1, and is linked to Samra and Aboli from right to left and contains the descriptive labels “nothing”, “Basketball”, “football” or “any sports”, all contain the types of information that are exchanged with Hufman.

Going down from the Samura and Aboli node is a main node label directly out of “Me” and labeled with the name “Rahinaer” located at E5/6 and is connected to the role label “sister” at E4 thru E5, and to the group label “Family” found at F3. The Rahinaer labeled node has two descriptive label nodes connected to it. One is located at F5-F6 and contains the labels “Video Sharing”, “Planning”, and “coming over” and the other description label adds that this is the same as Sultan and has a descriptive node locate at G5-6.

There is one added label associated with Hufan’s Information World diagram and that is in G1/2 and H1/2 labeled “Tech”, “Comp.” and “Cell Phone”, though this label is not connected to any other label on Hufan’s Information World diagram.

## **APPENDIX 3**

### **Sample Analysis of Information World Diagrams with Cross Correlation of a Narrative Descriptions**

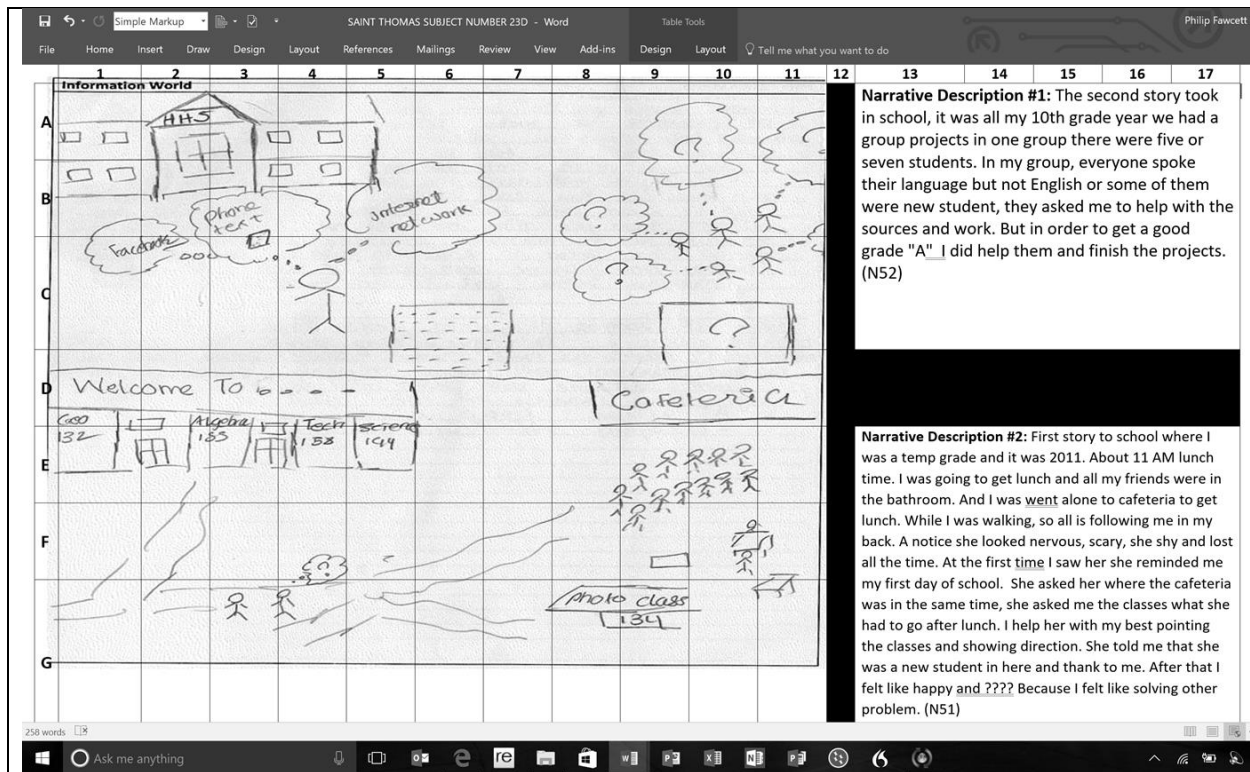


Figure 1 Appendix 3 – Theingi’s information World Diagram and corresponding narrative description

## Theingi’s Information World and Narrative Interpretive Descriptions:

### Information World diagram: Theingi Information World diagram

corresponds to Narrative Description #1 (top half) and Narrative Description #2 (bottom half). Narrative Description #1 highlights the ICT wayfarer and beneficiary relationship that happened at Theingi’s school on one of his school project. In this instance where the team members all spoke a different language but not English, and all were assigned to the same school project team. Narrative Description #2, is about a scenario where Theingi helped a new student at her school but has just arrived from out of the country.

The top half of the diagram found at A/1-10 to C/1-12 shows a high school building at the top of the diagram at A/B 1-5. The school is also an information grounds. The narrative then shows Theingi with several idea bubbles and various technologies within them such as “Facebook”, “Phone Text”, “Internet Networks”. These are found at B/C 1-6 on the diagram and are connected to a large question mark annotation found at C/9-11. Above the question mark are several stick figures all with the idea bubbles, each containing a question mark in them and all associated with the language confusion in Thenigi’s school project groups and are found at B/C 10-12.

**Narrative Description #1** - Theingi describes a one (ICT Way) to many beneficiaries during their ICT wayfarer-beneficiary exchange. Theingi was part of a student project team with 5-7 students but had the problem what everyone spoke a different language but not English. Some of them were new students, they asked me to help them with the sources and work. Theingi did help the group and did help them finish their project and get an A grade.

**Narrative Description #2-** Theingi describes his peer beneficiary Aung and their ICT wayfarer-beneficiary exchange or IBE. The beneficiary and the ICT wayfarer are not related to each other, and did not know each other before their IBE encounter, they are peers who are close in age. On her way to lunch Theingi stopped in the restroom and noticed that someone is following her back in the

bathroom to cafeteria. As Theingi indicates, the closer the person following her was Aung, she looked very nervous, afraid, shy, and lost. Looking at Aung reminded Thengi over first day of school and that she felt the same as Aung did. As Aung passed Thengi by, she asked where the cafeteria was and asked me where specific work classes were after lunch, because she did not know where to go for next class. Aung told Thengi that she was a new student at Theingi's school and thanked her for her help.

Theingi felt happy about being able to help someone.

### **Sample Application of Coding scheme applied to Theingi's Information World diagram and Narratives**

#### **Codes:**

<b>Narr #1</b>	<b>Code Name</b>	<b>Narr #2</b>	<b>Code Name</b>	<b>Code Descriptor</b>
<b>Code</b>		<b>Code</b>		
1.11	ITC Way same age	1.11	ITC Way same age	Comparative age between the ICT Wayfarer and the Beneficiary
1.24	Stranger(s)	1.24	Stranger(s)	ICT Wayfarer Relationship to Beneficiary
1.31	In Person	1.31	In Person	ICT Wayfarer Engagement with the Beneficiary
1.42	One to Many	1.41	One to One	Scalability of the ICT Way Relationship to the Beneficiary (s)
1.53	Helped with Homework	1.51	Translation	General Task Type that the ICT Wayfarer performed for the Beneficiary (s)

1.51	Translation	1.52	Directions To/From a Location	General Task Type that the ICT Wayfarer performed for the Beneficiary (s)
1.66	Learning Opportunity	1.62	Felt Empathy/Felt Sorry For	Motivation of ICT Wayfarer Engagement to help the Beneficiary during the ICT Wayfarer-Beneficiary Exchange (IBE)
		1.61	Beneficiary asked ICT Wayfarer	Motivation of ICT Wayfarer Engagement to help the Beneficiary during the ICT Wayfarer-Beneficiary Exchange (IBE)
1.72	School	1.72	School	Information Grounds for the ICT Wayfarer – Beneficiary Exchange (IBE)
1.88	Other	1.83	ICT Wayfarer Happy	Post IBE - How the ICT Wayfarer felt after the ICT Way-Beneficiary Exchange (IBE)