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ICT Support for Refugees and Undocumented Immigrants

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Abstract:

Immigrant integration has become a primary political concern for leaders in Germany and the United States. The information systems (IS) community has begun to research how information and communications technologies can assist immigrants and refugees, such as by examining how countries can facilitate social-inclusion processes. Migrants face the challenge of joining closed communities that cannot integrate or fear doing so. We conducted a panel discussion at the 2019 Americas Conference on Information Systems (AMCIS) in Cancun, Mexico, to introduce multiple viewpoints on immigration. In particular, the panel discussed how technology can both support and prevent immigrants from succeeding in their quest. We conducted the panel to stimulate a thoughtful and dynamic discussion on best practices and recommendations to enhance the discipline's impact on alleviating the challenges that occur for immigrants in their host countries. In this panel report, we introduce the topic of using ICT to help immigrants integrate and identify differences between North/Central America and Europe. We also discuss how immigrants (particularly refugees) use ICT to connect with others, feel that they belong, and maintain their identity. We also uncover the dark and bright sides of how governments use ICT to deter illegal immigration. Finally, we present recommendations for researchers and practitioners on how to best use ICT to assist with immigration.

Keywords: Refugees, Immigration, Social Inclusion, Deterrence, ICT, Bright Side, Dark Side.

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1 Introduction

Recent waves of mass immigration have occurred in several areas across the world, which has displaced millions of people from their home countries. In June, 2019, the world had close to 71 million displaced people. Of that number, about 26 million constitute refugees. An estimated 37,000 people escape from their countries each day due to violence or persecution (UN Refugee Agency, 2019). Many displaced people, especially refugees, leave their homes with few possessions and without visas to legally relocate. As a result, some become undocumented immigrants in their new homeland. We distinguish the terms that describe individuals who leave their home country for various reasons in Table 1. No matter why migrants—whether refugees, undocumented immigrants, or asylum seekers—risk their lives and abandon their home country, they can all benefit from information and communications technology (ICT) when traveling and adjusting to a new country. We use the various terms to illustrate how ICT can benefit or harm different types of migrants.

Table 1. Terms in this Paper¹

An umbrella term that lacks a definition under international law, **migrant** reflects the common term to describe people who move away from the usual place they live in (whether in a country or across an international border, temporarily or permanently, and for whatever reason). The term includes various well-defined legal categories of people, such as migrant workers, persons whose means of movement international law defines (e.g., smuggled migrants), and persons whose status or means of movement international law does not specifically define (e.g., international students).

Immigrants refer to persons born abroad who have come to settle in a country regardless of their legal immigration status or whether they have become citizens of that country.

Unauthorized immigrants, also called **undocumented immigrants**, refer to persons who reside in a country without legal immigration status, which includes individuals who entered without lawful status or who entered with a legal visa that no longer remains valid.

A **refugee** refers to individuals who have been forced to flee their country due to persecution, war, or violence. A refugee has a well-founded fear of persecution based on race, religion, nationality, political opinion, or membership in a particular social group.

Asylum seeker describes individuals who have applied for protection as a refugee and are waiting for the relevant authority to determine their status. Asylum seekers can become refugees if the local immigration or refugee authority deems them as fitting the international definition of a refugee.

In this paper, we report on a conference panel on immigrant ICT use with a special focus on refugees. We presented the panel at the Americas Conference on Information Systems in Cancun, Mexico, in August, 2019. We consider two different perspectives on ICT use: one reflects how immigrant-focused ICT has developed, and the other describes the experience of the individuals who use and are affected by technology (Trauth, 2017). We primarily focus on documenting how and recommending that immigrants use technology to gain opportunities for social inclusion and on the efforts that different stakeholders can take to create ICT solutions that foster the social-inclusion process. However, we recognize that multiple viewpoints on immigration exist. Citizens may welcome or reject the notion of open borders or work visas. Technology can help countries monitor borders and process visa applications. For instance, the United States (US) has recently experienced increased numbers of immigrants seeking asylum and work visas; at the same time, the number of illegal immigrants has increased. Technology now helps countries process asylum and legal entry applications (e.g., using facial recognition, GPS, and AI) and identify illegal immigrants (Nunamaker et al., 2012). Therefore, we present both perspectives in the sections that follow and, in particular, focus on showing how ICT can both support and prevent immigrants from succeeding in their quest.

Against this background, we explore the following key points:

- How immigrants in Germany and the US use ICT
- The role that technology plays in socially including immigrants and refugees
- Using ICT to assist with immigration in the US
- Using ICT to diminish illegal entry and detect unwelcome applicants

¹ Adapted from <https://disasterphilanthropy.org/disaster/southern-border-humanitarian-crisis/>

- ICT as a critical tool for accessing information and resources, and
- Practical implications for different stakeholders on how to integrate immigrants via technology-driven means.

We illustrate the immigration situation by targeting two destination countries: the US and Germany. We focus on these two countries in particular due to the number of immigrants they both have. In the 2014 to 2018 period, the US accepted the highest number of refugees (1.4 million) and asylum seekers (2.2 million) in North America (UNHCR, 2020). During the same period, Germany hosted the highest number of refugees (3.2 million) and asylum seekers (2 million) in Europe (UNHCR, 2020). We discuss how these two countries have managed immigration, the challenges that refugees and asylum seekers have encountered, and how ICT can help to overcome these challenges.

We believe that highlighting the beneficial ways in which one can use mobile applications, social media, and other ICTs represents an important step toward integrating refugees both economically and socially. Our conclusions can advise governments, businesses, locals, and other stakeholders in their efforts towards finding new ways to socially include successful migrants.

This paper proceeds as follows: in Section 2, we discuss background information on forced immigration, refugees, and social inclusion; ICT use and immigrants in Germany and the US; and ICT research on refugee assimilation. In Section 3, we introduce the panel. In Section 4, we summarize the panelists' views. In Section 5, we highlight implications for relevant stakeholders. Finally, in Section 6, we conclude the paper.

2 Background

2.1 Forced Immigration, Refugees, and Social Inclusion

Over the past decade, the number of people forcibly displaced in the world due to conflicts and persecutions grew substantially from 43.3 million in 2009 to 70.8 million in 2018, a record high. In 2019, every minute, 30 people had to flee compared to six people a decade earlier (UNHCR, 2020). Recently, the number of refugees worldwide increased dramatically, especially since 2014, mainly due to conflicts in the Middle East. As the World Bank (2020) has reported, low- and middle-income countries hosted the largest share of refugees in the years from 2014 to 2018 because refugees tend to immigrate to neighboring countries and hope to return when they can safely do so.

Despite this overall trend, high-income countries such as the US and Germany saw a surge in the number of refugees and asylum seekers from 2014 to 2018 (over 3.6 million and over 5.2 million, respectively) (UNHCR, 2020). To understand refugees' cultural integration needs, we examined the countries they originated from during the 2014 to 2018 period. As Figure 1 shows, refugees in the US commonly came from China, Haiti, and El Salvador, while refugees in Germany commonly came from countries such as Syria, Iraq, and Afghanistan. By accommodating newcomers' personal cultural and social needs, countries can help them integrate into society and better identify and design effective ICT-enabled support mechanisms.

Social inclusion constitutes a critical component of any democratic and equitable society. It involves connecting with others in a host society in various ways, such as finding a job, engaging in education, learning the language, and understanding the host culture. Wilson and Secker (2015) define social inclusion as "having the opportunities and resources to participate fully in economic, social and cultural life" (p. 52). Researchers have linked social inclusion to improvements in mental and physical health on a personal level and to greater levels of coherence on the societal level (Waddell & Burton, 2006).

In the refugee context, social inclusion means granting refugees opportunities to settle in and integrate into a host community. In order to guarantee that refugees can successfully integrate, the host society, as individuals and governments, should assist with assimilating them and have the necessary means to provide them with the space and opportunity to do so. Trauth and Howcroft (2006) argue that ICT can provide tools to bridge gaps in social inclusion in the refugee context. AbuJarour, Bergert, Gundlach, Köster, and Krasnova (2019) show that contemporary ICTs, such as smartphones and social media, can promote integration, enhance the refugees' wellbeing, and increase their individual sense of agency. In Sections 2.2 and 2.3, we describe some specific ICT challenges, opportunities, and solutions that refugees use.

Year	Number of Refugees and Country of Origin (U.S. vs. Germany)			
	USA		Germany	
2018	China	77710	Syrian Arab Rep.	532065
	El Salvador	22152	Iraq	136463
	Guatemala	17610	Afghanistan	126018
2017	China	74476	Syrian Arab Rep.	496674
	El Salvador	18763	Iraq	130640
	Haiti	17055	Afghanistan	104385
2016	China	72507	Syrian Arab Rep.	375122
	Haiti	18484	Iraq	86045
	El Salvador	14331	Afghanistan	46292
2015	China	74020	Syrian Arab Rep.	115604
	Haiti	21508	Iraq	51396
	El Salvador	11273	Afghanistan	30026
2014	China	71902	Iraq	41167
	Haiti	24170	Syrian Arab Rep.	40994
	Colombia	10552	Turkey	22242

Figure 1. Number of Refugees Based on their Country of Origin²

2.2 ICT Use and Immigration

The high ongoing displacement rate has spurred organizations and individuals to rapidly develop creative technology and social media applications to offset the perils of travel and to assist in integrating immigrants into host countries (Alencar, 2017). Marlowe (2019) found that refugee-resettlement programs on a national level constitute a key element of immigrant integration. Immigrants in these programs use ICT to both communicate with family and friends back home and to learn about their host country. They depend on many different smartphone applications and online platforms, such as the social media applications that refugees rely on as they relocate to a new country (Köster, Bergert, & Gundlach, 2018).

2.2.1 ICT Use and Immigrants in Germany

In Germany, refugees' Internet traffic exceeds that of major airports (Welt, 2016). Most refugees use smartphones to access the Internet (Fitch, 2016) such that the smartphone penetration rate among refugees reaches as high as 90 percent (Maitland & Xu, 2015). These refugees represent the "most tech-savvy population of migrants in history" (Rutkin, 2016). Thirty years ago, waves of Turkish and Lebanese refugees entered Germany and found it difficult to assimilate into German society mainly due to language barriers. This challenge created parallel societies that prevented them from integrating into the country. Now, despite their lack of German language skills, asylum seekers and refugees can use ICT to communicate with Germans and navigate local processes, which often functions as a first step toward helping refugees integrate into a host society.

Asylum seekers interact with the German Government and agencies directly after their arrival to the country to register and follow the formal asylum process. The asylum process involves multiple governmental institutions at the local, provincial, and federal levels, which leads to a high degree of bureaucracy (AbuJarour et al., 2019). Unfortunately, the government does not effectively use ICT to support this process. Consequently, refugees struggle to follow the asylum process and often need to rely on asylum counselors. Moreover, insufficient German proficiency, typically the only language on official forms, hinders refugees from directly interacting with government agencies.

The German government could better facilitate the asylum-seeking process and help integrate refugees into society by providing ICT solutions. However, systems that governments initiate often take a

² According to (UNHCR, 2020) http://popstats.unhcr.org/en/persons_of_concern

substantial amount of time to implement in contrast with non-government organizations' initiatives, which provide more readily available bridging technologies. For instance, a mobile application called "BureauCrazy³" that Syrian refugees designed helps refugees to cope with German bureaucracy. These apps can consolidate information and manage data across different government levels to ease the complex bureaucratic process or provide e-services that allow asylum seekers to digitally fill out forms or book appointments at governmental offices.

2.2.2 ICT Use by Immigrants to the US

The situation in Central America differs from the Middle East in that the former has no governmental warring factions that force citizens to abandon their homeland. Rather, mass migration in Central America results from widespread poverty, gang conflict, and frequent kidnappings. Refugees arriving at the United States' southern border from Honduras, Guatemala, and El Salvador have outnumbered Mexicans in recent years as unrest in those countries continues to grow (Center for Disaster Philanthropy, 2020). Migrants from these countries (and others) attempt to enter the US via its border with Mexico.

As we note in Section 2.2.1, refugees who attempt to cross into the US use smartphones more than any other technology platform (Newell & Gomez, 2015). They use smartphones to keep in contact with family and friends or to contact a coyote (slang for the smuggler paid to move people across the US border). This reliance on smartphones has a dark side: it makes migrants more vulnerable to extortion and abuse. For instance, some people attempt to steal migrants' phones to look up details about their family and friends and demand a ransom from them, which puts these family members in danger or financial distress.

Once inside the US, immigrants without visas may lack documentation and legal status to obtain employment, or they may register as an asylum-seeking refugee. The asylum process is extremely thorough and time consuming, and it requires local knowledge and language proficiency at a level that exceeds what typical asylum seekers possess. Accordingly, systems that manage the application process can assist refugees in this regard.

With this background, in Section 2.3, we summarize research findings that identify and explain several defining aspects of ICT use by and for immigrants.

2.3 ICT Research into Refugee Assimilation

ICT boasts many advantages, such as information dissemination, knowledge accumulation, and communication (Ojokoh, Zhang, Oluwadare, & Akintola, 2013). These advantages provide users with the opportunity to mitigate problems associated with time, cost, distance, and, most importantly for refugees, information acquisition (Ojokoh et al., 2013). Refugees frequently face complex informational and communication challenges. They need timely information to resolve everyday problems, to follow laws and regulations, and to adapt to new cultures and societies. ICT benefits refugees in that it supplements traditional information channels such as word of mouth and allows people to transcend geographical borders to create a space of shared experiences and identities (Hamel, 2009). Additionally, research has shown that using the Internet can help refugees apply for jobs, get an education, and obtain access to social networks (Alam & Imran, 2015). Without this information, refugees may be pushed to the margins of society (Diaz Andrade & Doolin, 2016).

Different social groups adopt new technologies in different ways due to their specific preferences and needs (Vancea & Boso, 2015). Host populations and governments often mute refugees and treat them generically (Wilding, 2012). Nonetheless, refugees clearly adopt technologies differently than others, which inspires the need for more research. In studying youth refugees, Wilding (2012) found them open to exploring and embracing new technologies in keeping with the widely held view that youth generally favor technological more than older individuals. The various virtual interactions that young refugees engaged in demonstrated their efforts to preserve the community and culture they had in the past but also a clear link to the present and future as they connected with peers in their new country (Wilding, 2012). This promising research suggests that young people can transform themselves while remaining connected to local and transnational opportunities both online and offline (Wilding, 2012).

³ www.bureaucrazy.de

Much research has investigated the relationship between technology and users as technology becomes an integral part of everyone's lives. People construct their identity as they interact with the world around them (Carter, Grover, & Thatcher, 2013). Therefore, as technology continues to pervade nearly every part of people's daily experience, they develop an ICT identity—a relationship with technological devices. Some argue that technology is fundamental to how a person sees themselves, what they do in their lives, and how they achieve their goals (Carter et al., 2013). Individuals require an identity in their everyday life because an identity acts as a standard that directs and guides their behavior, emotions, and actions (Stets & Burke, 2000). Some researchers have examined the relationship between technology and identity as if that technology extends the self to support more social interactions and emphasize one's identity (Stets & Burke, 2000), while others have viewed this relationship as an internal bond that impacts one's roles in other parts of one's life (D'Mello & Sahay, 2007). For refugees, the relationship they have with their technological devices helps them build social capital and transition into their new surroundings.

Social capital bonds created using technologies such as WhatsApp and Facebook provide broader information and opportunities as they more frequently interact with community members with diverse backgrounds (Ellison, Steinfield, & Lampe, 2007). This interaction lends itself to the central idea of adaptability (i.e., how one learns new knowledge and behaviors in new contexts) (Burke, Pierce, & Salas, 2006). In the refugee context, ICTs help them to assimilate into their host communities. This population places the utmost importance in ICTs and an Internet connection. Refugees primarily use their smartphones for communication and information access. Moreover, Facebook, WhatsApp, text messages, video calls, and phone calls represent critical tools that refugees use to communicate with people in their local communities and people in their country of origin (AbuJarour et al., 2019; Alencar, 2017). The literature distinguishes among different forms of social connection: social bonds (with family and co-ethnic, co-national, co-religious, or other groups) and social bridges (with other communities) (Ager & Strang, 2008). The way in which individuals perceive social connectedness can reduce the negative effects that stressful life events have on them and contribute positively to their wellbeing due to, among other things, feeling connected and as though they belong. Individuals with a greater sense of social connectedness are more likely to cope with emotions through their ability to adjust to social environments (Bourgeois, Bower, & Carroll, 2014). In conducting a quantitative survey, AbuJarour, Krasnova, and Hoffmeier (2018) found that, for the refugee cohort they studied, involvement with their own family (bonding capital) influenced their wellbeing. On the one hand, studies have found being connected to family and friends back home has a positive influence on refugees' social and health outcomes (Beirens, Hughes, Hek, & Spicer, 2007; Fozdar & Hartley, 2013). For example, Beiser (1993, p. 221) reports that "research has demonstrated that refugees who do not have a like-ethnic community available to them may suffer a risk of depression three to four times as high as others who have access to this resource". On the other hand, studies have found being connected to local friends and participating in the local community to be associated with a sense of belonging and identity (Beiser, Goodwill, Albanese, McShane, & Kanthasamy, 2015; Flanagan, Garry, & Jason, 2006). Therefore, local governments should focus on ensuring that they provide refugees with access to these ICT-enabled resources and use them to distribute information to this community.

3 The Panel

The panel occurred at the 25th Americas Conference on Information Systems (AMCIS) in August, 2019, in Cancun, Mexico, and tackled the topic: "Turning the Dark Side of Social Media Bright! The Case of Immigration in the USA and Germany". Accordingly, the panel focused on discussing the challenges of integrating immigrants by seeking to better understand how different stakeholders such as refugees, volunteers, governments, industries, non-governmental organizations (NGOs), and so on use ICT to facilitate social inclusion processes. The panel provided multiple viewpoints on how immigrants use technology and showed how technology can both support and prevent immigrants from succeeding in their quest.

We held the panel in an interactive format in which both panelists and the audience engaged in an open dialogue. Safa'a AbuJarour from the University of Potsdam, Germany, served as the moderator, and Haya Ajjan, Jane Fedorowicz, and Antonia Köster participated as panelists in the discussion. The panel lasted for 90 minutes. The moderator began by introducing the panelists before outlining the topic for discussion and the panel's goals. The panelists then presented their perspectives on the topic in turn. Subsequently, the moderator invited the audience to interact with the panelists by asking questions and/or sharing their

views on the points that the panelists raised. Finally, the moderator summarized the core findings that emerged from the panel discussion.

We audio-recorded and transcribed the panel. We read through the transcripts to structurally summarize outcome topics. The derived topics included 1) ICT solutions for social inclusion of refugees, 2) using ICT to assist with immigration to the US, 3) using ICT to deter immigration to the US, and 4) using ICT to acquire information. We elaborate on each topic in Section 4.

4 Panelists' Views

In this section, we summarize our views on the negative and positive aspects associated with refugees using ICT in the integration process.

4.1 ICT Solutions for Socially Including Refugees

The sudden and vast refugee wave that arrived in Europe in late 2015 foreshadowed the need to study how to welcome refugees in their host country and to integrate them into society. AbuJarour and Krasnova (2017) have noted that refugees heavily rely on the Internet and ICT-based tools. Accordingly, they investigated how this usage could contribute to their social inclusion in a host country. They began by asking refugees what social inclusion means to them and what could contribute to helping them feel integrated. They found that participating in the community, learning the local language, entering the job market, being connected to locals and family back home, engaging in the education system, understanding the host culture, and being able to navigate through the bureaucratic system as refugees' main social bridge drivers. ICT helps refugees to achieve social inclusion by providing the means to practice local cultural or social activities. For instance, online platforms can help them learn the host country's language, especially when they cannot visit place-based language schools either because the system does not allow it (as in Germany) or because they lack the financial support to do so (as in the US). Germany does not allow refugees to attend language schools until they successfully complete the asylum process, which might take up to two years. The US restricts financial aid. As a result, refugees begin learning the host language via free, accessible, and easy-to-use technology.

Refugees also use ICT to escape social exclusion (i.e., the opposite of social inclusion). Host countries typically socially exclude refugees in shelters and camps when they arrive. They are often alone and unable to communicate with their local community. Walls (whether physical or psychological) surround them, which means they cannot express themselves or live their lives normally. This environment constitutes a harsh initiation to host countries given that have often survived war and a risky journey. Therefore, we face a pressing need to investigate social exclusion's characteristics in host countries so that we, as researchers, can help local populaces accept refugees. To do so, researchers suggest that countries engage in cross-border cooperation to create social bridges (Bade & Anderson, 1994). Refugee researchers and professionals working with immigrants (e.g., governmental immigration agencies, churches, welfare institutions, unions) frequently warn about the dangers associated with political avoidance and defensive domestic social policies in the host country. Researchers can help identify and address the reasons for why and patterns in how countries socially exclude refugees and recommend ways to achieve a more inclusive society that integrates all its members.

ICT help achieve social inclusion in various ways. As a prime example, in August, 2015, early into the refugee crisis in Germany, researchers tied a five-fold increase in the number of translations from Arabic to German in Google Translate to refugee communication challenges (Lewis-Kraus, 2016). This finding illustrates what refugees require from social inclusion-related applications and suggests that a successful translation tool needs to possess accuracy, synchronicity, user friendliness, and reliability. The success that translation tools have seen illustrates the need to address tool design simultaneously from two perspectives: 1) from refugees' perspective (i.e., how they use the technology) and 2) from ICT developers' perspectives (i.e., how can they create the right technology based on refugees' needs). To date, more ICT-related research has attended to the refugee perspective than the developer perspective. We have encountered numerous applications that purport to target refugees' requirements but refugees do not use because they do not meet their true needs since developers designed the applications without consulting them. Like in any other successful software project, developers should conduct workshops and focus groups that include refugees to investigate their needs and requirements before developing an application.

Another challenge concerns e-government systems. Few countries have e-government systems that register and process asylum applications. Other countries rely only on paper-based processes. E-government services can facilitate the application process, eliminate human errors, and ease the lives of both the applicants and government officials. In Germany, the asylum-seeking process is slow and extremely complicated, and it involves little automation. As a result, asylum decisions can appear capricious in that an official can decide to allow one person to search for a job but not another even though they hold similar qualifications. Australia provides a best practice example: its fast and efficient system applies pre-defined qualifications and requirements for refugees. An automated process would help governments administer their current paper-intensive processes and applications by saving time and effort and assuring the accuracy in processing the applications. Moreover, it helps the applicants by providing clear requirements and feedback on their applications.

Note that, like most ICT users, refugees rely heavily on the Internet. However, unlike most users, refugees, especially those who live in camps and shelters, often cannot obtain an Internet connection. Therefore, refugees in many countries continue to demand for robust and reliable Wi-Fi hot spots to support communication and to enable access to governmental and social systems that can lead to social inclusion. In 2015, only 15 percent of refugee shelters had Wi-Fi hotspots. As a result, refugees often had to sneak connections to the Internet through free Wi-Fi networks in shopping malls and restaurants. As the number of refugees proliferated in Germany, calls to provide Wi-Fi hot spots in refugee shelters rose. Internet access, which the Human Rights Watch (2016) already considers a human right, constitutes a necessity for refugees.

In Section 4.2, we contrast the German and United States situations.

4.2 Using ICT to Assist with Immigration in the US

The second author reported on her research on the life of refugees who succeed in their quest for asylum in the US. When refugees arrive in the United States, a representative from the local refugee resettlement agency welcomes them at the airport. This representative often then collaborates with local volunteers to bring refugees to their new home, which the resettlement agency typically pays for. One Syrian family resettled in North Carolina shared a story about how, when they arrived at the airport, the first item they asked the resettlement agency volunteers to help them purchase was a smart mobile phone with Internet access. Moreover, they made their first phone call to their families in their country of origin. One concern that refugees often bring up concerns their feeling that their host countries leave them to figure things out on their own. While describing an event that took place in his first few weeks in the United States, a male refugee said:

My family [wife and five kids] and I had to figure out the bus system on our own. We took the bus wanting to go to the grocery store and ended up on the wrong street. We couldn't even ask anyone since we couldn't speak English, and we stood on the side of the street crying and wondering how we will get back to the house.

Refugees also often cite the lack of access to their own vehicles as a barrier to coping the new environment in their host country. In fact, they often describe the automated Department of Motor Vehicle (DMV) driving test that requires language skills as among the biggest stressors that they face. In one interview, one female refugee mentioned that she took the exam 15 times and still needed to retake it. These examples show how ICT language acquisition or translation assistance could impact social inclusion by increasing refugees' ability to work or make connections in their communities.

Smartphone applications and the Internet can bridge the difference between social inclusion and exclusion. During their resettlement programming, refugees often register to take English classes. However, since they lack their own vehicle and since they need work to buy their basic needs, many find it hard to commit to attending the classes. One mother of two young children said that she used "DuoLingo App"⁴ to teach herself English since she could not leave the house with her two young kids. Note here that many refugees we interviewed had completed some high school. In fact, few refugees we interviewed could not read. We may attribute the illiteracy in the remaining refugees to the disruption in education in their home country or their socioeconomic status. However, the author reported on how illiterate refugees could still operate their smartphones by using voice commands and voice messages.

⁴ www.duolingo.com/

While the US Government provides support services to assist refugees it has granted asylum status to, many refugees attempt to enter the country illegally or plan to apply for asylum after sneaking into the country. In Section 3, we describe the myriad technologies that the US Government employs to deter them.

4.3 Using ICT to Deter Immigration in the US

The US Government highly regulates immigration. Individuals who seek to escape unlivable conditions in their own country typically try to migrate by seeking asylum at the border or by entering illegally. As a result, many governmental systems focus on detecting illegal immigrants in the United States and returning them to their home country. In this section, we describe some technologies the country employs to assist in their capture and return.

Because many Central Americans attempt to enter the US illegally, one can exploit their smartphones to deter them. Immigration officials may take a migrant's phone at the border and use phone hacking software to identify other undocumented border crossers, which gives them access to families and friends as well (Brewster, 2019). To counter these darker possibilities, some NGOs at the border provide "safe phones" that people in safe houses can use so that they do not put their family and friends in danger by storing their information on a personal smartphone.

For individuals who successfully enter illegally, other challenges emerge related to (among other things) their ability to support themselves by working. The US Citizenship and Immigration Services (USCIS) employs a biometric-based system called E-Verify⁵ to check whether an immigrant has legal status to work or lacks a proper work permit. It can detect if a worker applied under a valid name and social security number and uses photo-matching for facial recognition. Other than its intended purpose to weed out individuals who work without a legal work permit, this system can create problems for both employees and employers (Goldstein & Alonso-Bejarano, 2017). They rely on inadequate databases that can potentially engender a false denial due to inaccurate facial recognition or a misspelled name. Employers also must pay to use this system, which places extra burden on them.

When used as intended, E-Verify affects more people than the workers it monitors. Immigration and Customs Enforcement (ICE) agents recently used the system when raiding chicken processing companies. The agents took 680 workers away, which left children in school or families unaware at home (Carcamo & Jarvie, 2019). After some time, the agents released half of the workers after establishing that they had the proper credentials. They fitted others with ankle bracelets or sent to a detention camp. Remarkably, law enforcement agencies did not arrest the owners or managers of the chicken processing plants for hiring undocumented workers, which demonstrates that the ICE agents conducted the raid to deport individuals without legal status rather than punish companies that employ undocumented workers.

Systems such as E-Verify do more than assist in locating undocumented employees. Beyond the fact that undocumented immigrants typically find it more difficult to find work, they will also likely only find less desirable jobs in which they receive poor pay and have no benefits or no job security. In this way, we can see how ICT increases social exclusion. If an employer decides not to pay refugees, they have no recourse or legal reporting options. If they suffer an injury on the job, they likely have no health insurance or paid time off to obtain medical treatment and recover. As such, ICT systems that locate and identify illegal immigrants have far-reaching implications for these individuals to achieve social inclusion.

To control the border between them, Canada and the US use another system that shares immigration data. The system helps the countries expeditiously process visa or passport holders crossing their border (Bronskill, 2018). While doing so, it monitors travelers to prevent fugitives, terrorists, sex offenders, smugglers, or individuals who transport missing children from crossing the border. It also can detect whether an immigrant has overstayed a visa or is subject to an immigrant warrants. As such, once an immigrant enters the US illegally, the immigrant cannot enter Canada, which constraints them in the former. Additionally, if an immigrant is entitled to social benefits as a legal immigrant, the entitlement disappears when the immigrant crosses the border. Thus, we can see that ICT exhibits both benefits and drawbacks in terms of how the US/Canada system could help with immigrants' social inclusion.

The US has developed many and various technologies to deter migrants from crossing its border. Some technologies have succeeded more than others, but they all raise concerns from a travel safety or

⁵ Consult www.e-verify.gov for more information on this system.

individual privacy perspective. An early venture involved a virtual fence called Security Border Initiative Network, or SBInet, an ICT-based system intended to locate and deter people from crossing the border in areas where individuals could not officially cross the border. The government spent five years and a billion dollars to develop SBInet but eventually abandoned the project (Chen, 2019). More recently, President Trump authorized a tall physical fence along sections of the border.

The US and Mexican Governments currently employ various types of technology along their border. Some have been in place for a while, while some have been implemented relatively recently. The countries use these ICT for two main purposes: 1) to locate individuals who try to enter their borders illegally and 2) to provide guidance about where to deploy agents, fences, or designs for future deterrence measures. Table 2 lists some deterrence technologies from simple and commonly used ones (e.g., smartphones and analytics) to expensive and complex systems (e.g., satellites or holograms and AI for facial recognition) (Hoffman, 2016). For poor, weary immigrants who travel with no money, few possessions, and often not even a phone, going up against this kind of technology shows that they face tough odds to successfully illegally cross the border.

Strategic awareness systems identify border locations where past migrants gained illegal entry into the country. Authorities then erects physical fences in those popular places, which forces individuals who try to illegally enter the country to try a different (often more dangerous) location. As much of the US/Mexico border follows a river called the Rio Grande, an unfortunate result occurs when individuals crossing the river get swept away. Authorities deem these systems successful in deterring illegal immigration, but they also contribute to increasing the death rate of people who attempt to cross the border.

Table 2. ICT in Use at the US/Mexican Border

- Mobile communications
- Satellite imagery
- Biometrics
- Big-data analytics
- Drones
- Powerful cameras with thermal (body heat) detection
- Night vision
- Detection devices and sensors with 360-degree radar
- Artificial intelligence looking for faces, body motion, and license plates
- 3D holograms

We do not understand the efficacy of the technologies in Table 2 well due to substandard reliability or inadequate operation. For example, not long ago thermal imaging could not adequately distinguish between human movement and a roaming cat or blowing tumbleweed (Chen, 2019). Newer technology can better identify a moving being with fewer false positives, but the technology's inability to consistently identify human movement remain an impediment to governments that seek to rely on ICT without human oversight to stop illegal immigrants. Similarly, facial recognition software has an unacceptably high false positive identification rate.

Individuals who support border crossing may attempt to disarm the remote parts of ICT on the ground that substitutes for human agents who monitor the lengthy border. For example, individuals have spray-painted or otherwise damaged video monitors, which rendered the technology ineffective. Indeed, this monitoring technology does not distinguish between legal and illegal border crossers—it spies on everyone in its purview. Individuals who live near a border have significant privacy intrusion or civil rights concerns due to this ICT's perpetual spying on citizens who have legitimate reasons to be in the area. In addition, local police departments can often access technologies that border authorities have tested on the border for community surveillance (Herrera, 2019), which again creates a tradeoff between citizens' and noncitizens' privacy.

While borders may be permeable due to governments' inability to patrol them fully, technology improves the likelihood that they will detect illegal immigrants and also act as a deterrent to individuals who wish to cross them. Individuals who try to enter the US have relatively limited access to ICT to assist in their journey, while the governments attempting to secure the border employ vast armies of border patrol agents armed with high-technology deterrents to prevent them from succeeding. The US Government will likely even detect individuals who make it across the border since the country uses ICT to monitor the workforce and control access to social services. As ICT becomes more sophisticated, the path to life in

the US will likely become more difficult and dangerous for individuals escaping violence and poverty in their native homes.

4.4 Using ICT for Information Acquisition

During their journey and in the new host country, refugees encounter a new culture, language barriers, and complex bureaucratic processes (Schreieck, Wiesche, & Krcmar, 2017a). For example, in order to build a life in a host country, refugees need practical information related to asylum registration and government requirements, contact points, language, healthcare, education, work, family, and daily life. Therefore, they absolutely require access to information, which makes social inclusion possible (Caidi, Allard, & Quirke, 2010). Consequently, research has identified information acquisition as the crucial first step for social inclusion (Schreieck, Zitzelsberger, Siepe, Wiesche, & Krcmar, 2017b). New immigrants especially suffer from what Chatman (1996, p. 197) calls “information poverty” as they have not had the opportunity yet to form a supportive social network in their host country (Caidi et al., 2010).

Numerous information sources provide refugees with information on integration issues. In Germany, the government, NGOs, local initiatives, and volunteers offer a rich variety of digital solutions, such as websites, applications, and other tools to provide this information to refugees. However, many such platforms do not reach a significant number of users in their target audience. Recognizing the critical importance of information for sustainable social inclusion, one panelist reported on research findings that had been part of a qualitative study to illustrate the processes that refugees follow to detect, judge, and process information using ICT. The research focused on identifying where refugees get the information they need for legal, immigration, asylum, or family reunification topics. We present several interview quotes below from a larger study showcase the experiences of refugees in Germany using ICT to acquire information (Köster, Bergert, & Gundlach, 2018). Notably, refugees in Germany said that they could not understand government websites because they were “a little bit tricky, confusing and not easy to access” or did not present information in their language. Instead, refugees reported that they resorted to social media to get crowdsourced information that other refugees and volunteers provided (AbuJarour & Krasnova, 2017; Diaz Andrade & Doolin, 2016; Gillespie et al., 2016). For example, on Facebook, refugees relied on information that others provide in groups and on pages. Refugees recognized the timeliness of the information that others provide on social media (“I search via Google when I want to search for old laws that cannot be easily accessed on Facebook and sometimes Google leads me to Facebook, but the latest information can be found easily on Facebook”) and the ease with which they could access information and communicate with others (“What I like about Facebook is the speed of access to information and ease of communication, what I do not like about Facebook is addiction at the expense of real communication with people”).

Refugees often use Facebook to gather information about processes that enable them to remain in their host country. One refugee stated that they used Facebook for:

Some simple legal things like making an appointment at the foreigners' affairs office, for example, or the LaGeSo Job center, I can visit Syrian refugee groups on Facebook where people would share their experiences. I ask how I can get an appointment and someone can answer me with a comment, send me a link, email or phone number and then take the necessary steps to make the appointment.

As this example shows, refugees often prefer to use social media to garner information that pertains to their social inclusion from other refugees in a similar situation.

As an information source, social media can also hide its dark side. As recent research and practitioner reports show, information on social media might not always be reliable since anyone can post anything on Facebook despite its accuracy. In fact, the ability for anyone to post anything can have detrimental effects for individuals in a stressful and new situation. One refugee stated:

I feel that I must surf Facebook less because it can cause me tension and problems. A while ago one of my Syrian friends has fainted on the street because of the tension he is experiencing because of the news coming from Syria, although his family is here, but he could not stop following what is happening there, it led to depression and eventually to a nervous breakdown.

As social media can be a prevalent source of information for refugees, they need to recognize the problems associated with fake news and rumors, and governments and other relevant stakeholders need

to provide countermeasures to help refugees and other such vulnerable user groups to recognize these problems and provide trusted and accurate sources of information.

5 Discussion and Implications

5.1 Social Media Leads the Way

An estimated 2.95 billion people use social media worldwide (Statista, 2019). In the refugee context, social media continues to be a key mechanism for reducing the travel and assimilation challenges associated with the ongoing refugee crisis. Social media sites help refugees access and share information—especially information about complex topics such as asylum-seeking processes, laws, and regulations in their host country; dealing with local culture; and locating living assistance. To ensure that refugees get reliable information, they need to be able to identify trusted sources. For instance, refugees value the German Government's social media websites: "when the government has pages on Facebook, we will get the right information from a reliable source" (Köster et al., 2018). The German Government assists via social media in two ways: 1) it moderates fake news and invalidates it before others pick it up and 2) it owns pages or groups that provide valuable and reliable information. Indeed, one refugee validated the significance of the government's disseminating information via social media as follows: "If [the] German Government can launch a service via Facebook, it will be much faster, more legal and the information will be more reliable and accessible" (Köster et al., 2018).

Refugees with experience in a locale can also supply a social media-based resource. Refugees unused to local customs or with little physical contact with others from their homeland will not likely turn to ICT for comfort and inclusion. For example, an 11,000-member women-only Facebook group helps refugees and immigrants from Syria to maintain social bonds by sharing humor, personal stories, recipes, and more. One of their most recent posts discussed racism and its multifaceted dimensions, and another post encouraged all members to vote in their local precinct.

Authorities in the US have also used social media to monitor and surveil individuals applying for a visa. The US Department of Homeland Security uses automated algorithms to search and flag refugees' and asylum seekers' social media accounts (Patel, 2019). The US Government awarded multi-million-dollar contracts to private analytics companies to complete such monitoring (Harwell & Miroff, 2018). If the authorities flag a person's profile on Facebook, Instagram, or Twitter, they can mark the individual as a security threat and deny them entry to the US. Even though a pilot governmental study that examined refugees' social media accounts did not yield clear results as to whether such practices could identify national security threats (Homeland Security, 2017), the US Government continues to expand the extent to which it uses them (Cimpanu, 2019).

No matter the roles that the bright and darker sides of social media play in the refugee issues among different countries, many stakeholders have access to social media that can assist both immigrants and governments in aiding or diverting migration. Individuals who work with refugees should consider the intended and unintended consequences that may arise from how refugees use social media.

5.2 Practical Implications and Recommendations for Relevant Stakeholders

Our discussion reveals useful implications for several target audiences, such as

- 1) Academics, especially information systems (IS) researchers with an interest in using ICT for immigration, social inclusion, e-government, and refugee integration
- 2) Assimilation facilitators, such as industry partners, governmental offices, and NGO members
- 3) ICT developers and designers who seek to develop culturally sensitive digital solutions, and
- 4) Fundraisers keen to financially support projects and initiatives to alleviate the current refugee crisis.

Table 3 lists practical implications for relevant stakeholders with an interest in refugee/immigration topics. In Section 5.3, we highlight some common threads in practice and research to help guide these four groups' activity in the future.

Table 3. List of Practical Implications for Relevant Stakeholders

Academic researchers	<ul style="list-style-type: none"> • Conduct more research on topics related to refugees, immigrants, integration, social inclusion, and ICT for development (e.g., Qureshi 2015; Pethig, Noeltner, Cabinakova, & Krönung, 2017). • Initiate tracks, special issues, and academic events on this domain (e.g., <i>Management Information Systems Quarterly's</i> special issue on ICT and societal challenges (Majchrzak, Markus, Wareham, 2016) and the digital inclusion track at the 2020 European Conference on Information Systems (AbuJarour, Diaz Andrade, Elgarah, 2020)). • Promote these topics among young researchers and encourage them to investigate important aspects to help include vulnerable groups and how ICT can help.
Governments and NGOs	<ul style="list-style-type: none"> • Apply and support e-government solutions and provide required training for relevant users when needed. • Educate refugees and locals on possible ways to use ICT to foster the inclusion process. For instance, providing online courses to learn the local language or to teach locals foreign languages⁶. • Provide robust and reliable Wi-Fi hotspots to enable refugees to use the Internet for integration, social-inclusion, and other purposes. • Consider the human life and privacy risks that border deterrence technologies introduce.
Industries and ICT developers	<ul style="list-style-type: none"> • Investigate what refugees require from ICT solutions. • Engage refugees in the development process by conducting workshops and focus groups. • Consider tools to identify fake information and deter its spread on social media.
Fundraisers	<ul style="list-style-type: none"> • Investigate refugees need to use ICT. • Provide financial support to provide refugees with ICT training programs. • Provide financial support for institutions that offer ICT training programs to refugees.

5.3 Research Opportunities

Recent calls to address ICT grand challenges champion our potential to significantly impact both academic research and the broader community in terms of economic development or individual wellbeing (Limayem et al., 2011). In discussing the ICT-enabled integration of immigrants and refugees, we contribute to the call for IS scholars to extend IS research to cover technology's impact on global social challenges (Lee & Fedorowicz, 2018, Sahay, Sein, & Urquhart, 2017) that the AIS Grand Vision project and the Bright ICT Initiative identified (Lee, 2015).

In doing so, we follow Walsham (2012) who offers a unifying vision for the IS field as he suggests more interdisciplinary research to make a better world with ICT. In the specific immigrant and refugee context, we provide support for how ICT enables refugee integration and facilitates their participation in the community. Other IS researchers who recognize the social value of expanding existing research or developing new projects on ICT design and its use in the refugee context have also conducted projects on this topic (AbuJarour et al., 2019; Zimmer & Scheibe, 2020).

Immigrant integration efforts would benefit from research collaboration across borders. Such efforts could aid countries and governments in working together to align their policies and exchange best practices. Immigrants' social exclusion has been a key research topic for over 25 years. Indeed, as Bade and Anderson (1994, pp 37):

Researchers and professionals working with immigrants, the government deputy for immigration, church and welfare institutions, unions, and a variety of other initiatives had repeatedly warned of the dangers of political avoidance and defensive attitudes. The internal side of migration politics falls essentially under the category of domestic social politics.

Thus, we need to urgently learn about and support cross-border collaboration. We urge researchers to join with international and interdisciplinary efforts to collaborate on projects to benefit these people who, through no fault of their own, find themselves needing to escape from their home country (e.g., AbuJarour et al., 2019; Trauth, 2017). Given the increasing role that ICT plays in their journey toward social inclusion in a host country, projects monitoring ICT's role in enabling immigration should be more common.

Other research efforts might focus on the bright versus dark side of the ICT that governments use to protect their borders. As we describe in this paper, ICT somewhat effectively deters illegal immigration.

⁶ <https://www.unhcr.org/news/stories/2020/5/5e6e65b24/want-learn-new-language-refugees-serbia-offer-teach-online.html>

One can identify many justifications for minimizing the number of illegal immigrants in a country, some of which involve fairness or equity for the people who entered legally. However, one can also ask ethical questions about how the means to this end introduces new risks to human life (of those attempting to enter) and privacy (of entrants and residents alike). We encourage researchers to conduct research into the bright versus dark side of ICT that governments use to protect their borders to support appropriate regulation and efforts to monitor their first- and second-order effects. Furthermore, ICTs that refugees use can have downstream consequences in addition to direct benefits. For example, we need more research on user data exploitation (e.g., Guggenmos, Lockl, Rieger, & Fridgen, 2020). In return for access to certain services and applications, users must provide personal data. Research studies might focus on whether and how psychological profiling, targeted advertising, misinformation, and/or algorithmic discrimination affect vulnerable and underrepresented groups such as immigrants and refugees and, subsequently, assess the consequences for social inclusion (e.g., Trauth 2017; Pethig et al., 2017). We encourage researchers to examine the bright versus dark sides of ICT that refugees use to understand how ICT can promote inclusion while fostering exclusion.

We also need more research that observes how immigrants use ICT and to design ICT that support immigrant travel safety, assimilation, and social inclusion. We have seen a recent movement to make immigrants' digital inclusion and refugees more visible in the IS community. A planned special issue in the *Journal of the Association for Information Systems* on "Technology and social inclusion: building a dialectic on the role of technology in inclusion and exclusion from societies, organizations, economies, and academe" exemplifies this effort well (Bailey, Carter, Thatcher, Urquhart, & Windeler, 2020). Moreover, IS conferences now feature tracks that tackle this topic. For example, the 2020 European Conference on Information Systems (ECIS) introduced a track on digital inclusion in education, work, and society that covered topics such as immigration; immigrants' and refugees' digital integration; social inclusion/exclusion; and immigrants at work, in education, and in society (AbuJarour et al., 2020).

While various actors have proposed or implemented many technology innovations to assist with various immigration challenges, not all have a foundation in established research paradigms. Clearly, the specific examples we discuss in this paper show that refugees and other migrants confront unique sociotechnical challenges that, if considered, would increase these applications' value for their intended users and use. In addition, we propose that application product designers adopt the design science research (DSR) paradigm with guidance from Van Aken (2004) to outline knowledge that contributes to designing and evaluating ICT for immigrants (see, e.g., Haj-Bolouri, Chandra-Kruse, Livari, & Flensburg, 2016). The guidance in this paper provides a starting point for using DSR to understand the impact that ICT has on refugees and contributes to new design and evaluation knowledge on how to structure ICT, how to provide enabling processes for immigrants, and how to deliver ICT that serves the desired goals (Baskerville, Baiyere, Gregor, Hevner, & Rossi, 2018). Researchers can couple design science with action research to test out designs for refugee-assisting ICT as is the case in the blockchain-based asylum application that researchers developed for the German Federal Office for Migration and Refugees (Guggenmos et al., 2020). Other researchers could adopt the information economics paradigm to identify and analyze these technologies' first-and second-order effects as one can identify clear asymmetries in the immigrants' personal information that authorities gather and use (Williams & Kind, 2019). We hope that others in the IS community will join in tackling these topics more extensively.

6 Summary and Conclusion

In this paper, we provide several perspectives on refugees' and governments' reliance on ICT. We present multiple viewpoints on immigration and, in particular show how technology can both support and prevent immigrants from succeeding in their quest based on a panel discussion at the 2019 Americas Conference on Information Systems (AMCIS) in Cancun, Mexico. Our collective research activities reveal new and interesting insights about how asylum seekers in Europe and North and Central America use ICT. We also discuss how immigrants use ICT to connect with others, feel that they belong, and maintain their identity. While we predominantly focus on how technology can support immigration in this paper, we also touch on the dark and bright sides of refugees' and governments' ICT use and their effect on the assimilation process.

Facilitating the integration process through ICT gives the IS field an important role in this context. Some IS community members have begun to address this topic in several major venues in order to better understand how to facilitate social inclusion processes.

We provide implications for different stakeholders on how to better help immigrants integrate into host countries with technology. On a practical level, our recommendations offer advice to governments, businesses, locals, and other stakeholders in their efforts towards finding new ways to socially include immigrants. On an academic level, we report on and identify research topics related to ICT adoption by immigrants and refugees. We believe that highlighting beneficial ways to use mobile applications, social media, and other ICT constitutes an important step toward integrating refugees both economically and socially.

As a conclusion, one should consider geographical differences when discussing and investigating efforts to integrate and socially include refugees in any particular country. Each country deals with immigrants and refugees in unique ways depending on their government, people (cultural characteristics and willingness to participate), and industrial and non-profit sectors (offering jobs and social help).

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