

Research Article

Collective Behaviors in Mobile Internet Access: An Exchange-Based Approach

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Abstract

Collective behaviors such as sharing a mobile phone or receiving assistance with a social media account play a significant role in information and communication technology (ICT) access and use, particularly in low-resource environments. Yet to date, few studies provide quantitative comparisons of these behaviors. We establish common ground for such a comparison by viewing collective behaviors as exchanges, using a framework combining social exchange and transaction cost theories. Our research compares sharing and assistance primarily through secondary analyses of survey data collected from Syrian refugees in Jordan. Our results demonstrate the role of both relational dimensions and asset characteristics in explaining collective behaviors. Importantly, we provide quantitative evidence of differences in the effects of sharing and in assistance for men and women. Further, our findings suggest collective behaviors are important for extending women's access and use. We conclude that the exchange perspective provides a helpful framework for deepening our understanding of collective behaviors.

Keywords: collective behavior, exchange theory, asset specificity, mobile phone sharing, assistance, Middle East, gender

While information and communication technology (ICT) use continues to be viewed primarily as an individual activity, many users across the globe rely on collective behaviors such as sharing devices and receiving assistance to access the Internet, manage accounts, or find information (Burrell, 2010; Reddy & Jansen, 2008). Indirectly, these collective behaviors generate social ties and enhance productivity (Best, Kollanyi, & Garg, 2012; Walton, Marsden, HaBreiter, & Allen, 2012) as well as help meet users' diverse needs (Sambasivan & Cutrell, 2012). Directly, they also extend access (Blumenstock & Eagle, 2012). Research also suggests these behaviors may be more common among women and those of lower socioeconomic status (Correa, 2014; Sambasivan, Cutrell, Toyama, & Nardi, 2010), benefiting these traditionally underserved communities.

Theory-oriented studies of collective behaviors explain sharing (Best et al., 2012; Burrell, 2010; Sambasivan & Cutrell, 2012; Walton et al., 2012) and intermediated access (Parikh & Ghosh, 2006; Sambasivan et al., 2010). Using qualitative methods in deeply embedded familial and group contexts, these studies provide important insights into how complex social relationships, together with higher-level social norms, such as those associated with class or gender, influence collective behaviors. However, these highly contextualized approaches are less beneficial for comparing collective behaviors and understanding the relative magnitude of their effects. For instance, while studies demonstrate sharing devices enhances access, the magnitude of this effect relative to that of receiving assistance is unknown. As a result, strategies for potential programs to promote these behaviors are unclear. Also unclear is the extent to which various collective behaviors are related.

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Does borrowing a SIM card make one more likely to provide assistance? If so, aid programs distributing SIM cards, such as those of the World Food Program, might also encourage sharing, with additional benefits derived from those providing assistance.

Our research addresses these questions and explains similarities and differences through a novel theoretical frame combining two theories. The frame enables comparisons by viewing both sharing and assistance as *exchanges*. These exchanges are influenced by general relational elements as well as differences in assets. For example, collective behaviors may involve physical assets, such as handsets or SIM cards, or less tangible assets, such as expertise.

We draw on both social exchange and transaction cost theories in providing explanations for (1) relationships between different types of collective behaviors (e.g., sharing and assistance), (2) these behaviors' effects on forms of ICT use, and (3) the role of gender in both. Our results primarily are derived from secondary analyses of survey data collected in our larger study of Syrian refugees in a Jordanian camp (Maitland & Xu, 2015; Xu & Maitland, 2017). That study, designed in part to meet the needs of organizations aiding refugees, examined general patterns of mobile phone use among camp residents. In both studies, the former as well as here, the emphasis is on general patterns of use as indicated by survey responses, with the arguably significant effects of the complex context left to other analyses (Fisher, Yafi, Maitland, & Xu, 2019).

In the following, we begin with an overview of the ICT collective behavior literature. We then build our theoretical frame through a discussion of social exchange and transaction cost theories. This is followed by sections on methods and findings; it ends with a discussion of the implications of our empirical results for theory and future research.

Literature Review

ICT Collective Behaviors

ICT sharing and assistance are common behaviors for both men and women (Burrell, 2010). A national study found roughly 30% of Rwandans share handsets (Blumenstock & Eagle, 2012). Similarly, more than half of South African youth studied share handsets, with slightly less than half (49%) sharing airtime (Walton et al., 2012).

Sharing of personally owned ICT assets typically occurs among neighbors and friends (Walton et al. 2012) and may involve physical assets or content (Smyth, Kumar, Medni, & Toyama, 2010; Vashistha, Cutrell, Borriello, & Thies, 2015). Observational research has identified granular forms of sharing, including minimal sharing, taking turns, borrowing, and lending (Weilenmann & Larsson, 2002). There are also conspicuous and stealthy forms, such as children borrowing a phone without permission (Stenson & Donner, 2009). In a rare study unpacking and comparing sharing across roughly 20 assets embedded within a mobile phone, Walton et al. (2012) found students were highly likely to share a handset loaned to them, but were least likely to share the handset's pin, their SIM card, and social media password, in that order.

Motivations for and effects of sharing vary. Motivations include a desire to avoid appearing stingy, being disrespectful or secretive (Walton et al., 2012), or simply as social interaction or having fun (Stenson & Donner, 2009). One study found both men and women engaged in coordinated use of mobile handsets and SIM cards (asynchronous sharing). As a result, men had greater overall use, yet women's use was greater at night and during holidays (Mehrotra, Nguyen, Mohan, & Blumenstock, 2012).

Our second form of collective behavior, providing and receiving assistance, may involve finding, operating, or navigating websites; downloading applications; or assisting with a mobile handset. These behaviors are sometimes labeled intermediated interactions or information tasks (Parikh & Ghosh, 2006; Sambasivan et al., 2010). They may occur through formal programs, interpersonal social networks, or simply by happenstance, such as a stranger helping someone obviously struggling with use. In families, youth often provide assistance directly or seek help from external resources (Fisher, Yefimova, & Yafi, 2016). Research in Chilean families found women and those of lower socioeconomic status typically receive and provide assistance, with effects including sustaining reciprocity in their community, bridging the literacy gap, and building skills (Correa, 2014).

Overall, research identifies collective behaviors as commonplace and having broader social impacts as well

as effects on individuals' use. However, less well understood are the relationships between collective behaviors, along with the relative magnitude of their effects. For example, while sharing enhances women's use, it is unclear whether the magnitude of that impact is greater than for men. Also, whether sharing and assistance affect use differently is unclear. Comparing these behaviors requires a common framework. Here we propose they be viewed as *exchanges*.

Social Exchange Theory

Together, social exchange and transaction cost theories provide a foundation for interpreting relationships and assets in social exchanges. In addition, these theories were chosen for their fit with our methods. Having developed largely through relatively decontextualized methods (lab-based experiments and rhetoric in economic history), as compared to ethnography, these theories are appropriate for interpreting results derived from generalized measures collected through survey data. This degree of abstraction is reflected in the following discussion of the theories' basic tenets.

Social exchange theory (SET) developed through years of experimental studies in social psychology and has generated insights on reciprocity, power, and exchange conditions as well as their effects (Blau, 1964; Emerson, 1976; Molm, Collett, & Schaefer, 2007; Molm, Takahashi, & Peterson, 2000). According to SET, social exchanges are fundamental elements of interpersonal relations, both reflective of and contributing to broader social structures (Blau, 1964; Cook & Rice, 2013; Edwards, 1969; Emerson, 1976). The exchanges have value as well as consequences for socially administered rewards and punishments, such as fulfilling norms of reciprocity or withholding resources (Emerson, 1976). Motivations for exchange vary, not all being altruistic (Molm et al., 2000), and they are potentially influenced by a collective sense of fairness (Takahashi, 2000).

Social exchanges can be classified as negotiated, reciprocal, or generalized (Molm et al., 2000; Takahashi, 2000). In a negotiated exchange, the terms, conditions, and benefits are known a priori. In reciprocal exchange, the reward of reciprocity can occur at any time, but comes directly from the other actor. In contrast, in generalized exchange, reciprocation can be received from other members of the community or not at all. Recent research finds these forms have a hierarchy of effects on community solidarity, with generalized exchange having the greatest influence (Molm et al., 2007; Willer, Younggreen, Troyer, & Lovaglia, 2012). For ICT collective behaviors, these different forms can explain exchanges ranging from sharing handsets among intimate partners and families, to providing assistance to a stranger. SET theory studies have also shown exchanges at both individual and community levels generate self-efficacy (Lawler, 2001; Liao, Liu, & Loi, 2010; Walumbwa et al., 2011).

Together, these individual and community, or microlevel, processes of exchange, shape the macrostructures of society and vice versa (Blau & Schwartz, 1986; Cook & Rice, 2013). These micro–macro linkages help to explain gender differences in the exercise of power during an exchange. In a unique SET study of gender, Molm and Hedley's (1992) lab-based experimental research found that at the interpersonal level, women's strategic use of power during an exchange resembles that of power-disadvantaged males. The research used experimental conditions, generating different levels of power among male participants and then compared them with female participants' strategies during simulated exchanges. This microlevel result is explained as an outcome of social macrostructures in which women typically experience power disadvantages (Molm & Hedley, 1992). For studies of ICT collective behaviors, beyond gender effects, macro–micro links could potentially explain the effect of individual ICT collective behaviors on broader societal goals, such as the aforementioned community solidarity.

Transaction Cost Economics

As a complement to social exchange theory, we employ transaction cost economics (TCE) theory (Benkler, 2004; Williamson, 1981) to explain differences in collective behaviors relating to assets. Whether a mobile handset or expertise, TCE differentiates these assets by their "specificity" to the relationship of persons involved in the exchange. For example, a mobile handset configured with a biometric lock is viewed as having a *high level of specificity* as its use is tied to an individual involved in the exchange, compared to a handset without such a lock. The level of specificity is assessed purely on a comparative basis (lock vs. no lock). According to TCE, higher levels of specificity are associated with greater risks in exchange. One reason is the

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specificity can make it harder to transfer an asset, requiring accommodations, such as disabling a handset lock, thereby incurring “costs” (of time) and risks. For ICT collective behaviors, from TCE it follows that exchanges involving “highly specific” assets are less likely than those involving low-specificity assets. Previous research used TCE to analyze ICT sharing as a mode of production in society (Benkler, 2004). In contrast, here we focus on comparison and effects for those engaged in these behaviors.

TCE distinguishes three forms of asset specificity, namely, site, physical, and human. Here we focus on the latter two. The aforementioned biometric lock is an example of *physical* asset specificity, namely, an asset’s physical characteristic making it more or less amenable to exchange. *Human* asset specificity is the degree to which human assets, namely skills and knowledge, are difficult to exchange. For example, tacit knowledge has a high level of human asset specificity compared with more explicit or codified forms of knowledge. Like collective behaviors involving highly specific physical assets (e.g., biometrically locked handset), exchanging highly specific human assets, such as assistance as the exchange of tacit knowledge, is less likely to occur than exchanging codified knowledge. This comparison presumes relational elements of these exchanges are equal.

Middle Eastern ICT Use and Collective Behavior of Refugees

We combine TCE’s concepts of physical and human asset specificity with relational elements from SET to frame our comparative analyses. While this investigation does not engage directly with the Middle Eastern, Jordanian, refugee, or camp cultural and social contexts, we do refer to findings from extant research, augmented by information gathered through informal conversations with the UN High Commissioner for Refugees (UNHCR) staff.

Generally, research finds Middle Eastern ICT use has positive effects on political knowledge, participation, and community development (Jaser & Ahmad, 2012; Wagner & Gainous, 2013; Zhuo, Wellman, & Yu, 2011). Also, across studies, differences in men’s and women’s use depend on location. While minor differences are found in metropolitan areas (Tufekci & Wilson, 2012; Wojcieszak & Smith, 2014), larger differences exist in rural areas (Dodson, Sterling, & Bennett, 2013).

In refugee camps, the extent to which residents’ general collective behaviors are informed by their experience as refugees is unclear. On the one hand, general crisis research finds collective processes are common and aid in recovery and coping (Majchrzak, Jarvenpaa, & Hollingshead, 2007; Vollhardt, 2009). For refugees in particular, similar drivers of general collective behaviors are found (Reed, Fazel, Jones, Panter-Brick, & Stein, 2012). On the other hand, for refugees in Za’atari camp in particular, as reported to us by refugee camp managers, at the time of our data collection the situation was evolving away from crisis into recovery mode.¹ As a result, their ICT use may more closely mimic normal, everyday use, such as coordinating family life, texting with friends about social engagements, and entertainment, as compared to when the camp first opened.

Within this context, we compare sharing and assistance behaviors, examining similarities and differences in their predictors as well as the relative magnitudes of their effects on ICT use. Specifically, we analyze: What are the relationships between sharing and assistance? How do sharing and assistance affect use? Do the magnitudes of their effects differ? Who engages in these behaviors and who benefits? To what extent can these findings be explained by exchange theories?

Methods

We answer these questions using data collected for a broader study of mobile phone use in the Za’atari Syrian Refugee Camp in Jordan, which houses approximately 80,000 residents (UNHCR, 2015). Data were collected during field research in January 2015 (survey) and March 2016 (interviews). Access permission was granted by both the Jordanian government and the UN refugee agency (UNHCR), which manages the camp. The survey was developed in English, translated and back translated to Arabic by Syrian and Jordanian academics, with both versions edited by camp staff. We issued the pen-and-paper survey together with a team of academics, assisted by three Syrian refugee translators. The survey, codebook, method, resulting dataset, and final report

1. For a description of the camp in 2014, a year prior to our data collection, see <https://www.nytimes.com/2014/07/05/world/middleeast/zaatari-refugee-camp-in-jordan-evolves-as-a-do-it-yourself-city.html>

to UNHCR are publicly available.² Also, publications based on these and other data collected from this research site provide deeper insight on the context (Fisher et al., 2019; Maitland & Xu, 2015; Xu & Maitland, 2017).

We recruited most survey respondents from a series of Intact Group samples, identified via convenience sampling from our partners' vocational training centers. The centers provide short-term, gender-segregated training on barbering, tailoring, English language, and IT. We also recruited a smaller comparison person-on-the-street sample from passersby on the main street within the camp (Watt & van den Berg, 1995). As expected, the training center sample (N = 192) was significantly more educated and, due to cultural norms limiting women's mobility, included more women than the street sample (N = 42). However, with no significant difference in mobile phone Internet use, we combined the two samples.

Combined, the 234 respondents averaged 23 years of age, with slightly more women than men (104 vs. 98). Roughly 24% had attended or completed secondary school/vocational training, and 42% had attended or completed university. The mobile phone penetration rate was 91%, with three commercial carriers offering voice and data services. Through predominantly mobile access, the refugees used a variety of information and communication services, including Google, Facebook, YouTube, WhatsApp, and Al Jazeera.

Camp staff organized our group interviews using fortuitous sampling (Watt & van den Berg, 1995), recruiting refugees they know. Separate group interviews for men and women involved one interviewer, one notetaker, and one translator. The first group interview included 17 males (one senior and 16 young adults) in a community center. Limited time and the group's size foreclosed the opportunity to gather individual demographic data and detailed quotations. The second group interview included seven females in a refugee family's caravan. Among them, five were considered youth, which in this context is defined as ranging from 15–24 years old.

Results

Sharing and Assistance Behaviors

Sharing was operationalized as borrowing mobile phone SIM cards. For those lacking a SIM card or airtime/minutes, borrowing enables calling or accessing the Internet. It can also enable cost savings by switching to the carrier with the lowest rate for a specific day or time. *Assistance* was operationalized as both offering and receiving support across a variety of mobile Internet activities (e.g., WhatsApp, Facebook, seeking employment).³ Survey measures, response categories, and means are shown in Table 1.

Among the 234 survey respondents, 85% own SIM cards, 33% own more than one, 91% own a mobile handset, and 80% own both. Despite the high rate of SIM card ownership, 78% borrow them and 76% are both SIM card owners and borrowers. Borrowing handsets is indicated by the 11% (25 of 221) who report accessing the Internet only through someone else's mobile phone. As this number does not include handset borrowing for voice calls, it is likely a low estimate.

In the group interviews, 14 of 17 men owned only one mobile phone and one SIM card (82%), one man owned one mobile phone and three SIM cards (one SIM card for making calls and two for the Internet), and two men owned one mobile phone and two SIM cards. All three participants with multiple SIM cards reported sharing with family and friends. However, due to privacy concerns, they did not share mobile handsets. The others, through head shaking or hand raising, indicated they did not lend. Similarly, for the women, among seven, four owned one mobile phone and one SIM card, and one participant had one mobile phone and three SIM cards. None of the women shared handsets, and only the woman with multiple SIM cards shared.

Concerning assistance, our survey indicates 71% of refugees frequently provide help, while 62% frequently receive help. Further, 47% engage in both behaviors. From our interviews, the majority indicated they engage in providing assistance, for example, creating Facebook accounts, using email, and reading messages for

2. <https://cmaitland.ist.psu.edu/wp-content/uploads/sites/9/2015/01/Penn-State-Zaatari-Survey-Data-Notes-January-28-2015.pdf>; <https://cmaitland.ist.psu.edu/wp-content/uploads/sites/9/2015/01/ZaatariSurveyAnalysis2015November2.pdf>

3. In this context, Internet access is primarily through mobile phones, with over 90% of youth (persons under 25 years of age) reporting "mobile only" access. The camp has limited Internet infrastructure, with the exception of a few community centers hosting computer labs. Internet cafés are not allowed to operate.

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Table 1. Variables, Measures, and Descriptive Statistics.

Variable	Measure	Survey Question Number*	Response	Mean	SD
SIM card own	Single item	14—How many SIM cards do you own?	Any number	1.39	0.63
SIM card borrow	Single item	14—Roughly how many owned by others do you use?	Any number	1.42	0.69
Handset own	Single Item	13—Currently, do you own a mobile phone handset?	Yes/no	Yes = 214/234	NA
ICT use frequency	3 item ($\alpha = 0.84$) (for each item, responses to “do you use it now?” are used	6—In Syria, did you use social media (Facebook, WhatsApp, Twitter, etc.)? Do you use it now?	1–6	4.00	1.69
		7—In Syria, did you watch videos online (YouTube, Arabic-media.com, etc.)? Do your use it now?	1 = never		
		8—In Syria, if you went on-line, what was your favorite source of information on the Internet and how often did you use it? (write the name here) Do you use it now?	6 = multiple times per day		
Future interest	Average of interest across 17 online activities	22—If Internet access was reliable, high speed, and inexpensive or free, which of the following online/ Internet-based activities might you be interested in? (circle all that apply)	1–5 1 = not at all interested 5 = very interested	3.23	1.42
WhatsApp use	Single item	18c—When communicating with friends and relatives in Jordan via any device (mobile, phone shop, computer), which of the following services do you use and how frequently?	1–6 1 = never 6 = multiple times per day	4.71	2.04
Mobile voice use	Single item	18a—[same as above]	[same as above]	4.28	2.09
Offer assistance	Single item	24—Do you ever help others with learning about or using information technology?	Yes/no	Yes = 148/208	NA
Receive assistance	Single item	23—Do other youth ever help you with learning about or using information technology?	Yes/no	Yes = 137/221	NA

*Survey publicly available at <https://cmaitland.ist.psu.edu/wp-content/uploads/sites/9/2015/01/Penn-State-Zaatari-Survey-Data-Notes-January-28-2015.pdf>

illiterate persons. The men explained they feel they are a “good person,” even when offering assistance to strangers as well as motivations such as “exchanging experience,” “learning new skills when helping,” and “making connections.” All seven females reported having engaged in mobile phone– and Internet-related helping behaviors. They said it makes them “happy,” “feeling useful,” and helps in “making friends.” While interviewees will assist to strangers, they are unlikely to share a SIM card, but will do so for friends and family. Even within families, a hierarchy exists, as one male indicated he would share his handset with his wife, but not with other family members.

Participants explained these differences as based on privacy concerns, with mobile phones regarded as private assets, and SIM card(s) as generating fewer privacy concerns, but still costing money. Conversely, offering assistance is free, but perhaps more important, it was explained as “what we do,” as part of Muslim and Syrian culture.

Comparing Sharing and Assistance

We hypothesize that sharing and assisting serve as predictors of one another, and hence are correlated, with additional predictors including SIM card and mobile phone ownership, ICT use frequency as well as age, gender, and education. The ICT use frequency scale ($\alpha = 0.84$; mean = 3.9; SD = 1.6) was designed to be concise and to avoid respondents’ conflation of Internet and social media use. The three items indicate (1) Internet use frequency, (2) social media use frequency, and (3) online video use frequency, using a 6-point Likert-type scale ranging from Never to Multiple Times per Day. The last two variables in our models are interaction terms, further analyzing the role of gender as we found statistically significant differences: In borrowing, men borrow SIM cards more than women ($t = 2.5$; $DF = 131$; $p = .01$); in offering assistance, men are more likely to help than women ($\chi^2 = 14.34$; $DF = 1$; $p < .001$).

Our check for multicollinearity (Table 2) shows higher correlations between the (primarily) dependent variables future interest, WhatsApp, and mobile voice, which are not problematic or are accounted for in our discussion. We first test our models using multiple regression. To accommodate our dichotomous dependent variables, we used logistic regression with each model’s fit indicated by McFadden’s R squared.

Our results show borrowing SIM cards (Table 3, model 1) is predicted only by the number of SIM cards owned. Surprisingly, by the odds ratio (Agresti, 2012), every additional SIM card owned increases the likelihood of borrowing by 25%. Offering assistance (Table 3, model 2) is predicted by ICT use frequency, receiving assistance, and the gender x borrowing interaction term.⁴ Receiving assistance (Table 3, model 3), in contrast, is predicted only by offering assistance.

To decompose the interaction effect on offering assistance, we plotted the result (Figure 1a). As indicated by the negative coefficient, women who borrow more SIM cards are *slightly less likely* to offer assistance, while men are *more likely* to help.

In conclusion, these findings indicate SIM card borrowing and assistance offering and receiving occur frequently, compared to handset sharing. Also, while they are interrelated, they do not share predictors.

Effects of Sharing and Assistance Behaviors

Next, we examine collective behavior effects on mobile communication services, general ICT use, and behavioral intentions toward future Internet use. We found among communication services (mobile voice, SMS, WhatsApp, Viber, Skype, and email), mobile voice and WhatsApp are the two most frequently used and the only ones significantly correlated with SIM card borrowing and offering assistance. WhatsApp was also significantly correlated with receiving assistance.

We differentiate these more basic communication services from our aforementioned ICT Use Frequency scale. WhatsApp is specifically designed for low bandwidth use and, in contrast, our ICT Use Frequency scale reflects relatively high bandwidth use. The discriminant validity between ICT Use Frequency and the WhatsApp and mobile voice communication services is statistically confirmed by exploratory factor analysis, generating two separate factors ($\chi^2 = 10.44$; $DF = 1$; $p < .001$).

4. Interaction effects for age and education for all collective behaviors as well as use effects did not generate significant results.

Table 2. Correlation Matrix for Selected Variables.

	1	2	3	4	5	6	7	8	9	10	11
1—Age											
2—Gender	-.17*										
3—Education	.19**	-.14*									
4—Handset own	.25***	-.11	.21**								
5—SIM card own	.06	-.16*	.14	.05							
6—SIM card borrow	-.01	-.20*	.15*	.10	.57***						
7—ICT use frequency	-.05	-.44***	.40***	.36***	.32***	.28***					
8—Future Interest	-.11	-.49***	.50***	.40***	.34**	.24	.76***				
9—WhatsApp use	-.18*	-.10	.12	.19*	.19*	.26**	.39***	.76***			
10—Mobile voice use	-.03	-.16*	.21**	.17*	.25**	.27***	.36***	.43***	.70***		
11—Offer assistance	-.13	-.29***	.23***	.19**	.20**	.19*	.40***	.63***	.40***	.26***	
12—Receive assistance	-.11	-.11	.20**	.16*	.11	.14	.24***	.42***	.20*	.11	.44***

Note: * $p < .05$; ** $p < .01$; *** $p < .001$

Table 3. Models Predicting Collaborative Behaviors and Their Effects.

	Behaviors							Effects						
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(1)	(2)	(3)	(4)	(5)	(6)	(7)
	SIM card borrowing (odds ratio)	Offering assistance (odds ratio)	Receiving assistance (odds ratio)	WhatsApp use	Mobile voice use	ICT use frequency	Interests in future online activities							
Demographics														
Age	-.04 (.96)	-.50 (.61)	-.10 (.90)	-.04	.00	-.28***	-.03							
Gender	-.01 (.99)	-.51 (.60)	.16 (1.18)	.06	-.07	-.40***	-.16							
Education	.05 (1.05)	.13 (1.14)	.16 (1.17)	-.10	.02	.23***	.15							
Independent Variables														
SIM own	.21***(1.24)	.69 (2.00)	-.00 (1.00)	.00	.09	.17*	.01							
SIM borrow		-.36 (.70)	.07 (1.07)	.27*	.14	-.10	.25*							
Mobile own	.04 (1.04)	-.06 (.94)	.05 (1.05)	.20	.19	.33***	.24							
ICT use	.02 (1.02)	.92**(2.52)	.30 (1.35)	.25*	.18		.30*							
Offer assist	-.00 (1.00)		.51*(1.67)	.24*	.13	.23***	.33**							
Rec. assist	.02 (1.02)	.70**(2.01)		.11	-.04	.07	-.09							
Gender x borrow		-.92* (.40)	-.08 (.92)	.21*	.02	.16*	.27*							
Gender x offer	-.05 (.95)		.23 (1.26)	.01	.09	.08	.31**							
N	140	140	140	105	117	140	49							
DF	139	139	139	93	105	129	37							
McFadden's R ²	.27	.61	.45	.24***	.18***	.56***	.75***							
Adjusted R ²														

Note: *p < .05; **p < .01; ***p < .001

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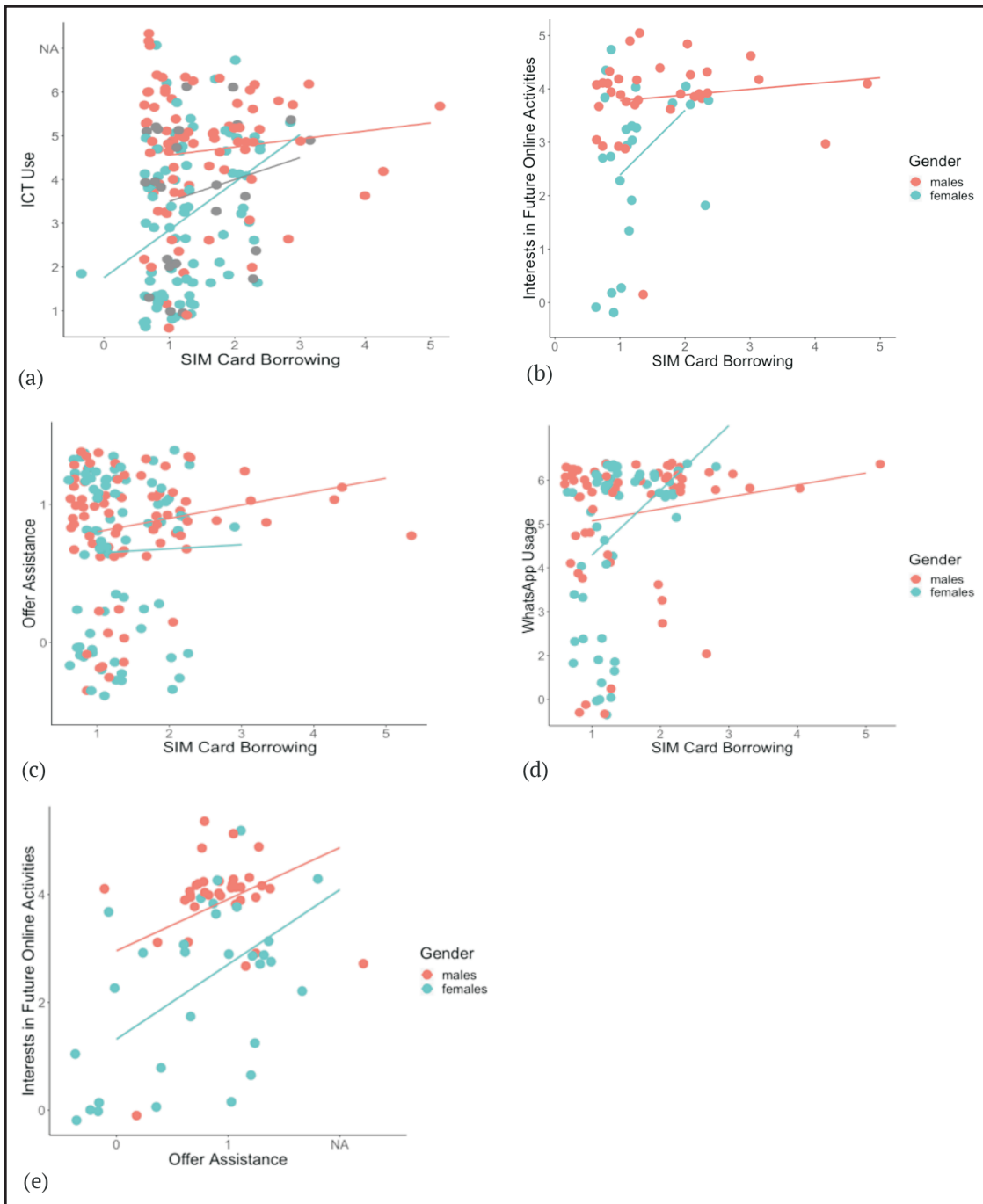


Figure 1. Gender and collective behavior interaction effects.

Note: Gray represents data where gender was not indicated.

Both SIM card borrowing and offering assistance (Table 3, models 4 and 5, respectively) have effects on WhatsApp use, while they have no effect on mobile voice. Receiving assistance affects neither. The interaction plot (Figure 1b) reveals SIM card borrowing has a strong positive relationship with WhatsApp use, with a stronger effect for women than men.

Collective behaviors' effects on ICT use frequency (Table 3, model 6) include a direct effect for offering assistance and an indirect effect of SIM card borrowing through the gender x borrow interaction term. The plot (Figure 1c) shows that women borrowing more SIM cards have significantly increased ICT use, while for men the positive effect is less pronounced.

Next, we examine the effects on "intentions to engage in future online activities," measured through an item asking "If Internet access was reliable, high speed, and inexpensive or free, which online/Internet-based activities might you be interested in?" This measure provided a contrast with current behaviors. Item responses consisted of an established list of Internet activities, with degree of interest for each assessed by a 5-point Likert-type scale, ranging from Not at All to Very Interested. Interest in future online activities is predicted by SIM card borrowing, offering assistance, and both interaction terms (Table 3, model 7). The plots of the interaction terms (Figures 1d and 1e) show that while SIM card borrowing has a more pronounced positive effect for women than men, the effect of offering assistance is more equal.

Finally, to understand the relationship of sharing and assistance as well as their effects, we generated a series of path models. The two indicating a strong fit, namely a CFI of .98, an RMSEA of .05, and an SRMR of .04, are depicted in Figure 2 (a and b) below.

Interpretation and comparisons of the two models (Figures 2a and 2b, below) are based on adherence to SET theory, previous findings, and their path coefficients. Tests of multidirectional relations, assessing whether assistance is a predictor of ICT use and ICT use of sharing, were not significant. The left sides of the models indicated both direct and moderated effects of sharing on ICT use, whereas the regression analysis found only the latter. As suggested by the interaction graph Figure 1c, and confirmed here, the moderated effect is stronger. Consistent with the regression analysis, handset ownership is also a significant predictor of ICT use.

The right side of the model, where ICT use serves as a predictor of assistance, is less clear. For model (a) we reasoned that offering assistance, having created goodwill and reciprocity expectations, increases the likelihood of receiving assistance. For model (b) we reasoned that while some people develop the skills and self-efficacy to offer assistance on their own, others need to receive prior to offering assistance. Statistically, while model (a) maintains its strong fit, the path from ICT use to receiving assistance is no longer significant. In comparison, while the path coefficients are slightly smaller in size, in model (b) all three paths between ICT use, receiving assistance, and offering assistance are significant. Because offering assistance is likely to require skills and confidence, we accept the logic biased toward self-efficacy and reciprocity rather than reciprocity alone as appropriate. Consequently, we put forward model (b) as having the best logical and statistical fit.

Summarizing the effects of collective behaviors, we find receiving assistance only has effects on offering assistance, based on both our regression and path analyses. Offering assistance influences WhatsApp use, ICT use, and future intentions, via our regression analyses. However, our path model suggests ICT use is a *predictor rather than effect* of offering assistance. Sharing SIM cards has positive implications for WhatsApp use and future intentions as well as a direct effect on ICT use as indicated in the path model.

One of the more striking findings is the differences between effects on men and women. In particular, SIM card borrowing has a more pronounced positive effect for women's WhatsApp and ICT use as well as future intentions. Only mobile voice was unaffected. Interestingly, offering assistance had a similarly positive effect on men's and women's future intentions. In the path models, gender moderated the effect of SIM borrowing on ICT use.

Discussion and Implications

In the following text, we discuss our findings, including comparisons of the collective behaviors and their effects as well as reflections on exchange theory.

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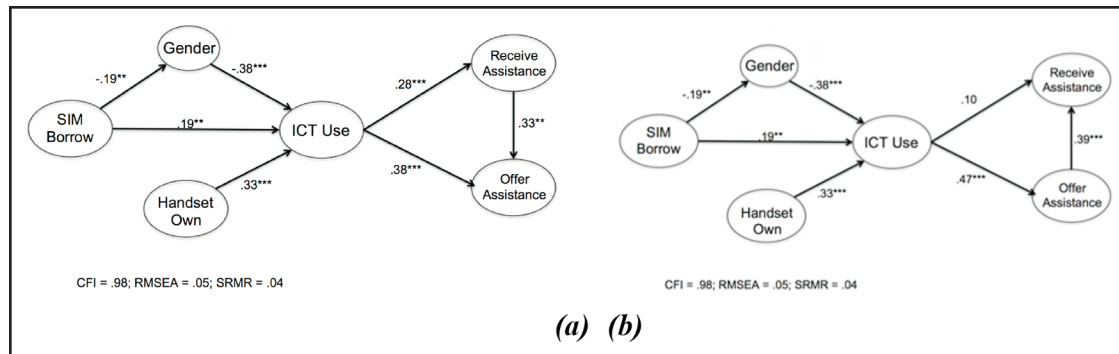


Figure 2. Path models of collective behaviors.

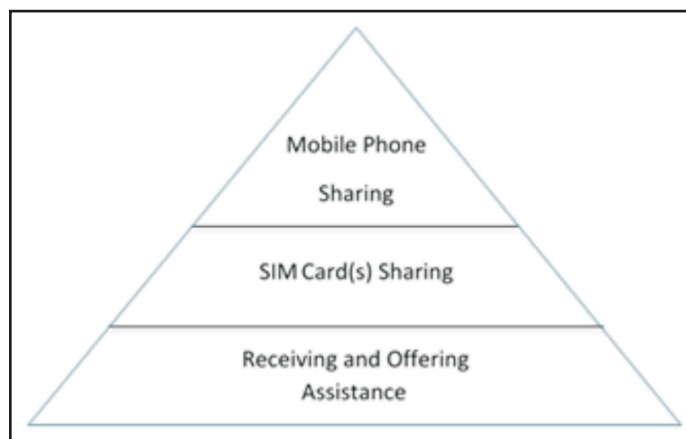


Figure 3. Behaviors by exchange group size.

Comparing Collective Behaviors

To begin, our empirical findings on sharing comport with previous studies, both qualitative (Burrell, 2010; Dodson et al., 2013; Oduor et al., 2014) and quantitative (Blumenstock & Eagle, 2012). The latter found handset sharing was limited (sharing with 2.2 persons on average), primarily occurring between spouses (38% for women, 43% for men). Our results also support those of Walton et al. (2012) in finding differences in sharing across mobile phone assets. However, their findings related to the high likelihood of handset sharing are not supported.

Our research builds on these insights, adding comparisons with assistance. Considering sharing and assistance together, our qualitative results reveal a pyramid structure of collective behaviors (Figure 3). The pyramid reflects the theoretical number of people one is willing to engage with in a particular behavior, with assistance exchanged with the largest number (on the bottom), SIM card sharing with a moderate number (in the middle), and mobile handset sharing with the fewest (on the top).

Drawing on TCE and SET, respectively, our findings highlight the interaction between the relative value of the asset with its specificity as well as the relationship between the parties to the exchange. The mobile handset is more expensive than the SIM card, and it also has a relatively higher degree of owner specificity than a SIM card. In comparison, the knowledge shared during assistance has lower monetary value as well as specificity, making it more available for exchange. SET also explains relational differences in asset sharing, particularly between family members (spouses vs. others). From SET, sharing some assets but not others within a relationship can be explained as an individuals' ability to change incentive structures (Takahashi, 2000), in this case, the resources available for exchange. Also, the sharing of highly specific and valued assets between spouses can be seen in light of the nature of dependence and power in exchange relations (Cook & Rice, 2013).

Additionally, the pyramid structure of Figure 3 may also reflect the relative impact of these three forms of collective behavior on community solidarity. In SET, exchanges can be characterized as negotiated, reciprocal, or generalized, with an associated hierarchy of impact on community solidarity. Here, the willingness to provide assistance to strangers can be viewed as *generalized exchange*, with a relatively greater impact on community solidarity. Similarly, SIM card or handset sharing, respectively aligning with reciprocal and negotiated

forms of exchange, are likely to have relatively lower impacts on community solidarity. Future research needs to confirm the relationship between ICT collective behaviors and community solidarity.

Our exchange perspective also offers a potential path forward for resolving heretofore contradictory findings, where scholars have argued both for (Parikh & Ghosh, 2006) and against (Burrell, 2010) the role of culture in collective behaviors. On the one hand, our subjects explained their collective behaviors are part of their Syrian and even broader Arab culture, as simply “what they do.” On the other hand, this reasoning clearly fails to explain the differences in assistance and sharing across different assets (e.g., handsets vs. SIM cards) and different relationships (strangers, friends, spouses). So, future research might pursue the addition of an exchange perspective so as to offer greater nuance to understanding where culture, asset value, and relationships are the dominant factor explaining collective behaviors.

Our supposition that sharing might predispose one to assistance, and vice versa, was not supported. While a direct relationship exists between both forms of assistance, the link between sharing and assistance is mediated by ICT use. Further, our analysis of predictors of sharing and assistance, which included age, education, and gender, found only SIM ownership and assistance, respectively. Previous research has explained handset and SIM sharing as driven by a variety of factors, including fulfilling norms of reciprocity, convenience, having low battery charge, or the need to access a particular carrier’s network (Blumenstock & Eagle 2012; Burrell 2010; de Souza e Silva, Sutko, Salis, & de Souza e Silva, 2011; Steenson & Donner, 2009). Our finding that age, education, and gender are not direct predictors of sharing and assistance supports the notion of collective behaviors as widespread social behaviors.

Finally, in considering the two forms of assistance, we argued that receiving assistance likely generates the self-efficacy needed for offering assistance. This contention is supported by SET theory, which has shown individual and community exchanges can generate self-efficacy (Lawler, 2001; Liao et al., 2010; Walumbwa et al., 2011).

Effects on Use

The effects of sharing and assistance together differ across ICT services, with no influence on mobile voice calling, as compared with positive effects for WhatsApp use, general ICT use, and interest in future Internet activities. Previous research finds handset and SIM card sharing support more extensive mobile phone use (Blumenstock & Eagle 2012; Burrell 2010). However, our results, separating out various uses, suggest there may be a diffusion influence. It may be that mobile voice calling is so ubiquitous, there is no need for sharing or assistance for this service. Yet, more complex mobile phone and particularly mobile data uses may benefit from collective behaviors. Consequently, collective behaviors may have greater implications for newer technologies and services.

A notable finding, related to the magnitude of impact, is the effect of collective behaviors on women. Our findings show that for women the positive effects of SIM card borrowing on the three behaviors of WhatsApp use, ICT use, and interest in future online activities are much stronger than for men. At the same time, the positive effects of offering assistance for women’s interest in future online activities were similar to the positive effects experienced by men, although the men’s levels of interest are higher. These results suggest that where resources are implicated, such as with SIM card sharing, the beneficial impact on women is higher. However, where the resource being shared is largely free and not depletable, as with expertise shared through assistance, the benefits of collective behaviors are similar. While our framing predisposes us to analyze differences in assets through their specificity, the role of access to resources and power alluded to by SET theory needs to be more fully integrated into consideration of assets in exchange.

Taken together, our findings suggest collective behaviors are important for extending women’s access and use. Previous studies on handset sharing found men have higher levels of use, yet women with shared access remained active users (Mehrotra et al., 2012; Murphy & Priebe, 2011). Here we provide quantitative evidence of the magnitude of effects of different collective behaviors (SIM card borrowing vs. offering assistance) on various forms of use (WhatsApp, ICT use, and future interest). Quantitative evidence can be helpful to aid organizations in justifying new campaigns that might promote collective behaviors, particularly to the benefit of women.

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Future research might more fully explore the relationship between women's access and their engagement in collective behaviors. From a SET perspective, collective behaviors can be viewed as both a source of as well as an enactment of power. Research might build on Molm and Hedley's (1992) experimental findings that, in interpersonal exchange, women's strategic use of power is akin to that of power-disadvantaged males. Future research might also examine, through a lens of relationship power, how women experience and participate in assistance and its subsequent effects.

Exchange Theory of ICT Collective Behaviors

Our use of the exchange theory lens builds upon the depth and breadth of SET, with insights ranging from relational dependence to power and gender as well as TCE, and its focus on assets. Together, these theories bring a systematic means of analyzing both the relationships and assets at the heart of the exchange. This approach provides a complement to perspectives that view devices as bundles of affordances. The exchange perspective also provides an important link between individual level analyses and broader societal structures.

Yet, our test of these exchange theories has several limitations. We lack data on effects beyond ICT use that would help to establish the individual–societal connections. Future investigations should compare ICT collective behaviors' potential for the positive outcomes predicted by exchange theory, namely increased self-efficacy and greater community solidarity. Also, as previous research on ICT collective behaviors has found deeply embedded elements of context often serve as important explanatory, predictive, or outcome variables (Best et al., 2012), future research might use carefully controlled field experiments to better understand the role of cultural, relational, and physical context in ICT collective behaviors. Moreover, as our research is limited to the benefits of exchange, future studies should more directly attend to collective behaviors' social and relational costs.

An additional limitation is our study's uncertain range of generalizability. We found high levels of collective behaviors that resemble those found in crisis survivors generally (Bokszczanin, 2012; Vollhardt, 2009). However, it is unclear the extent to which the high levels are due to the traumatic nature of the context or self-described cultural affinity, or both. Also, while our sample is relatively well educated, refugees in camps in Jordan have typically lost most their assets (cars, homes, savings) and, unable to legally work, generally are poor. This is not to say all refugees are poor. Due to a lack of publicly available demographic data on Syrian refugees in Jordan, it is difficult to know whether our findings generalize to poor refugees across the country, particularly those in other camps, or to poor Jordanians generally. Regardless, our findings represent an extension to Middle Eastern ICT scholarship and ICT collective behavior scholarship in three ways. First, as collective behaviors vary across countries and cultures (Smith, 2015), our research provides evidence of collective behaviors among Syrian refugees. Second, as Middle Eastern ICT-use studies largely focus on social media and political change (Lim, 2012; Tufekci & Wilson, 2012; Wulf et al., 2013), our work adds an "everyday use" dimension. Finally, although our sample population is reasonably presumed to be impoverished, they are highly educated, providing a contrast to the less-educated, low-income context prevalent in ICT collective behavior research.

Conclusion

Our comparative analyses of ICT collective behaviors provide systematic insights into their implications for mobile Internet access and use. Focusing on sharing and assistance, we find they are separate constructs, where participating in one is not associated with the other. However, within the "assistance" umbrella, receiving is associated with offering assistance.

Further, our findings highlight the *effects* of sharing and assistance, particularly for women. Our outcomes suggest sharing promotes access and use. Also, increased use is associated with higher levels of assistance. Sharing has larger effects on women than men. Yet, for offering assistance, the positive effect on men and women is similar.

We explain these results through a novel framework, combining social exchange and transaction cost theories. The analysis demonstrates the benefits of this combination, namely, accounting for social relations in addition to the specificity of assets in these exchange behaviors. However, the framework requires further development to differentiate the role of the monetary value of assets, particularly among the poor. ■

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