Digital Connections: Tracing the Evolving Role of Technology in Local Storytelling Networks

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Abstract

This chapter explores the evolving role of digital technology in urban communities over the last two decades. The discussion of online connections and their place in the structure of local storytelling networks is grounded in communication infrastructure theory (CIT) and the media system dependency (MSD) framework. We offer a comparative examination of two approaches to integrating the Internet in the communication infrastructure perspective. The first one sees technology as facilitating, the second as catalyzing social processes. Tracing the evolution of both approaches allows us to identify the social and research dynamics likely to drive future work exploring the role of technology in the communication processes and structures of local communities. We discuss three major trends underpinning the trajectory of the field: (1) a move from exploring general patterns of technology use to a focused examination of specific platforms and behaviors; (2) a shift from early works identifying adoption levels and key uses of technology across social groups, to gaining a deeper understanding of its individual and community-level effects; and (3) a push to integrate online activities into existing constructs and measures.

Keywords: communication infrastructure theory; media system dependency; storytelling network; social shaping of technology; Internet connectedness index; Internet dependency; communication technology; new media; social media; social network; civic engagement; online participation

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In the late 1990s and early 2000s when personal computers and Internet access became widely available in the United States, unrealistic hopes and misplaced fears about the role they would play in society were fairly common (Ball-Rokeach & Hoyt, 2001; Matei, Ball-Rokeach, Wilson, Gibbs, & Hoyt, 2001; Sturken, Thomas, & Ball-Rokeach, 2004). This was by no means unusual, as new technologies of any nature are frequently met with exaggerated expectations, both positive and negative, when they are first introduced (Marvin, 1997). Optimistic views emphasized the potential of the Internet to narrow social inequality by giving more opportunities to those who lacked resources (US Department of Commerce, 1999). Pessimistic predictions suggested that the Internet would inhibit social contacts and relationships (Nie, Hillygus, & Erbring, 2002).

Research grounded in *media system dependency theory* (MSD) and *communication infrastructure theory* (CIT) adopted a more careful and nuanced position informed by history and sociology. It was noted that new communication technologies necessarily operate within a sociocultural context, and can both influence and be influenced by existing social structures (Matei & Ball-Rokeach, 2001). Works in those theoretical frameworks posited that our relationships with technology are shaped by individual goals, interpersonal networks, media activities, social system dependencies, and social environments. The introduction of a new technology into that complex web of interdependent relations was unlikely to bring about an immediate drastic change in social and communication dynamics. This notion was consistent with the premises of *social shaping of technology* (Williams & Edge, 1996), a tradition which examines the constraints and opportunities of new technologies, and their ability to catalyze, accelerate, or impede various social processes (Baym, 2015).

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While digital platforms, services, and devices have changed considerably since the early days of the Internet, MSD and CIT continue to provide insights into the interplay of technology and community. This chapter examines the evolving role of the Internet in the structures and processes described by the two theories, providing a theoretical background and exploring the way online connections are conceptualized and measured. Tracing the evolution of key constructs and claims over time, we offer a comparative examination of two approaches to understanding the function of the Internet within the communication infrastructure framework. The first approach sees technology as facilitating, the second as catalyzing social processes. The chapter concludes with a discussion of key social and research dynamics likely to drive the direction of future research in this area.

Media System Dependency Theory

Media system dependency theory provides an important theoretical framework capable of capturing the social implications of new information and communication technologies. The theory development started in the 1970s and aimed to examine the power relations between individuals and social systems, with a particular focus on the media system (Ball-Rokeach, 1985, 1988; Ball-Rokeach & Jung, 2009). The power of the media system in a particular society is defined by its relations to individuals, organizations, and social systems. One of the ways in which media organizations gain power is through their control of scarce information resources grounded in the institutional capacity to gather, filter, process, and spread news (Ball-Rokeach, 1998).

With regard to individuals' dependency relations to media, MSD theory suggests going beyond demographic and psychological characteristics to explain how and why people connect to news outlets. The framework focuses on understanding the goals attained by individuals through

their connections to media sources (Loges & Ball-Rokeach, 1993). MSD relations are expected to determine both media use and its effects on consequent behavior; e.g., heavier dependency on a source to fulfill personal goals results in greater effects, even when exposure is more limited.

Key media dependency goals include understanding oneself and one's social environment, getting oriented in order to decide on a meaningful and effective course of action and communication, and solitary and social forms of play (Ball-Rokeach, Rokeach, & Grube, 1984). *Dependency* measures (e.g. *newspaper dependency*, *television dependency*, or *Internet dependency*) typically evaluate the extent to which an individual relies on a media type or technology to accomplish each of those goals. The relationship between the mass media and individuals is assumed to be asymmetrical because the mass media are much more likely than individuals to have access to scarce resources. Digital technologies, however, allow citizens to assume the role of content creators, potentially mitigating the power differential between media and audience and making individual dependency relations more diverse (Loges & Jung, 2001).

Dependency relations have been shown to predict a variety of attitudes and behaviors, including selective exposure (Ball-Rokeach et al., 1984), newspaper readership (Loges & Ball-Rokeach, 1993), product purchases (Grant, Guthrie, & Ball-Rokeach, 1991; Skumanich & Kintsfather, 1998), participation in public deliberation (De Boer & Velthuijsen, 2001), political perceptions (Halpern, 1994), and voting (Davies, 2009). Similar effects are observed with Internet dependency and the use of online sources, shown to be associated with outcomes including news consumption and political efficacy (Ognyanova & Ball-Rokeach, 2015; Patwardhan & Yang, 2003). Dependency on social network platforms likewise predicts a variety of outcomes related to community engagement (Kim et al., 2015).

Communication Infrastructure Theory

Communication infrastructure theory (Ball-Rokeach, Kim, & Matei, 2001; Kim & Ball-Rokeach, 2006a, 2006b) provides a multilevel ecological approach to the study of communication within urban communities. While it is rooted in the MSD perspective, CIT places less emphasis on mainstream mass media and pays more attention to alternatives such as local and ethnic media. Communication infrastructure theory also takes a more grounded approach that considers interpersonal networks and connections to different types of media within a particular context. People's interactions on the Internet are studied as part of their individual communication ecology, which includes micro-level interpersonal communications, meso-level connections to groups, organizations, and local/ethnic media, and macro-level connections to mass media.

A central concept in CIT research is the *neighborhood storytelling network*: a system encompassing residents, local media and organizations, as well as the connections between them (Kim, Jung, & Ball-Rokeach, 2006). That social structure allows micro-level agents (residents) and meso-level agents (local news media and organizations) to exchange and spread information about the community. A strong, well-connected storytelling network is also found to enhance a number of civic outcomes. Those include *neighborhood belonging*, or the attachment of residents to their local community; *civic participation,* or the extent to which individuals are involved in community activities; and *perceived collective efficacy*, or resident perception about the ability of the community to come together and solve local problems. CIT research has developed measures based on survey data that capture the scope of connections between community members and their neighbors, local media, and organizations (Kim & Ball-Rokeach, 2006a).

The exchange of information among residents, media, and local organizations is in the core of the *communication infrastructure* of a community. CIT defines communication infrastructure

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as the combination of a neighborhood storytelling network and its surrounding *communication action context*. That context includes various community resources that promote or hinder communication (e.g. school system, libraries, parks, streets, etc.).

The composition, structure, and resilience of a local communication infrastructure may vary depending on geographic location and local population demographics. Research has established the relevance of *geo-ethnicity*, a term referring to the distinctive properties of an ethnic group placed in a given cultural, spatial and temporal context (Kim et al., 2006). Geo-ethnic information sources produce content covering a geographic area, and/or focusing on issues relevant to residents of a particular ethnicity. These sources can play an important role in the storytelling networks, providing relevant and accessible information about the community.

In its take on technology, the CIT framework borrows many of its premises from media system dependency theory. The goal-based understanding of local information seeking is one important aspect of MSD adopted by communication infrastructure theory. Individuals are seen as purposefully constructing their *communication ecologies*, defined as networks of information resources (interpersonal, media, organizational, expert, and others) selected with a specific goal in mind within a particular communication environment (Ball-Rokeach, Gonzalez, Son, & Kligler-Vilenchik, 2012). This also suggests that communication ecologies cannot be studied in the abstract, but only in the context of specific thematic domains. For instance, digital tools and information sources used to learn about health will be different from the ones residents rely on in the domain of political information. Both of those may also differ from the general information and entertainment sources that people report using.

The Beginning: Conceptualizing and Measuring Internet Connectedness

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Early works in the CIT tradition investigated a series of questions prompted by the emergence and spread of new communication technologies (Jung et al., 2001; Matei & Ball-Rokeach, 2001). Researchers examined who connected to the Internet and why, what people did online, and looked for differences in patterns of use across social groups. Building on measures of media dependency, these early studies defined and operationalized new constructs describing the relationship between individuals and digital technology.

One important construct developed at that time was the *Internet connectedness index* (ICI), a multidimensional measure aimed at capturing people's objective behavior and subjective perceptions, goals, and orientations related to Internet use (Jung, Qiu, & Kim, 2001). The initial version of that index had nine items, including participants' duration of computer ownership at home; the number of tasks (personal, school, or work-related) they accomplished through Internet use; the number of locations where they could access the Internet; the number of online activities they participated in, as well as the goals those activities served; the time they spent on interactive online activities; the respondents' evaluation of the positive or negative effect of the Internet on their personal life, and the extent to which individuals would miss computers and the Internet if they became unavailable. The index has since been revisited and modified several times to streamline the items and strengthen the theoretical rationale for their inclusion. The duration of computer ownership, number of access locations, and goals served by online activities were excluded from the operationalization and reframed as antecedents of ICI (Jung, 2008). More recently, the measure was narrowed down to four variables examining the intensity and scope of activities individuals took part in through their personal computers and mobile phones (Jung, Toriumi, & Mizukoshi, 2013).

The Internet connectedness index emerged in response to a series of studies employing a conceptualization of Internet use as a unidimensional single-item exposure measure (e.g., as frequency of access or as time spent online). One major weakness of such metrics was that two people with identical exposure scores could still have vastly different patterns of use; they could be using different services, have different skill and participation levels, or seek to accomplish different goals. Because of those differences, similar levels of exposure could potentially result in different individual and social outcomes. The Internet can be used for entertainment, or to advance one's education, career, and financial status; to accrue economic, social, and cultural capital (van Deursen & van Dijk, 2014). Research has confirmed that individuals with lower income and education have a narrower scope of online activities that involve primarily entertainment and socializing (Büchi, Just, & Latzer, 2015; Wei, 2012).

Applying the Internet connectedness index, Jung et al. (2001) found that income and education had linear relationships with individual ICI scores. On average, more affluent and better educated people had a higher ICI. Those disparities disappeared, however, when the only thing taken into account was the time individuals spent online. Jung et al. (2001)'s study demonstrated that a more comprehensive and nuanced understanding of Internet connectedness was particularly important in the context of early studies of the *digital divide*: a term describing individual and community-level disparities in access to information and communication technologies.

Media system dependency and communication infrastructure research have been instrumental in expanding the conversation around digital inequality. Those works explored the multifaceted relationship of society and technology and the way Internet connections are incorporated into people's everyday lives and the communication infrastructure of communities (Hayden & Ball-Rokeach, 2007; Jung et al., 2001; Matei et al., 2001). This more nuanced take on

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the digital divide exposed flaws in the previously dominant notion that information and participation inequalities could be resolved by tackling the gap in access to devices and connectivity (Kim, Jung, & Ball-Rokeach, 2007). Today that gap is narrower, though Internet penetration is still lower in rural communities, among the elderly, people with disabilities, certain ethnic groups (Katz & Gonzalez, 2016), and for those in the lowest income and education bracket (Rainie, 2015). Larger disparities persist with regard to the quality of access and technology used across groups (Council of Economic Advisers, 2015). Further inequalities remain in the areas of digital literacy, skills, and participation (Jenkins, Clinton, Purushotma, Robinson, & Weigel, 2006).

Initial works using the ICI in the early 2000s focused on establishing the validity of the measure, demonstrating its advantages over traditional digital divide metrics, and comparing the connectedness of various social groups. In addition to Jung et al. (2001)'s work in introducing ICI and comparing it with the time spent online measure, Loges and Jung (2001) examined differences across age groups and found that older people were not only less likely to have Internet access, but also were interested in a narrower range of goals and activities when going online. Jung, Kim, Lin, and Cheong (2005) found that connectedness levels varied among young people in East Asia based on their social environments (family and friendship ties and support). Kim et al. (2007) uncovered significant differences in ICI among ethnic groups after controlling for other relevant demographic and socioeconomic variables. These studies focus more on the factors that shape people's disparities in connecting to the Internet (ICI) rather than the effects of Internet connectedness.

Theory Evolution: Two Approaches to Understanding Technology

Moving beyond the initial focus on constructing measures that can capture individual relationships with a new technology, the following sections discuss how CIT research (building on key premises of media system dependency theory) addresses the impact of the Internet on community life. An examination of the communication infrastructure literature reveals that two main approaches are used to conceptualize the role of digital technologies. The Internet is seen as either a *facilitator*, or as a *catalyst* of social processes. In its role as a facilitator, technology provides a new way to complete familiar tasks (e.g., reading the news online or communicating with community members online). As a catalyst, technology enables processes and events to unfold at a scale and speed that may not have been feasible without it (e.g., organizing global diaspora networks).
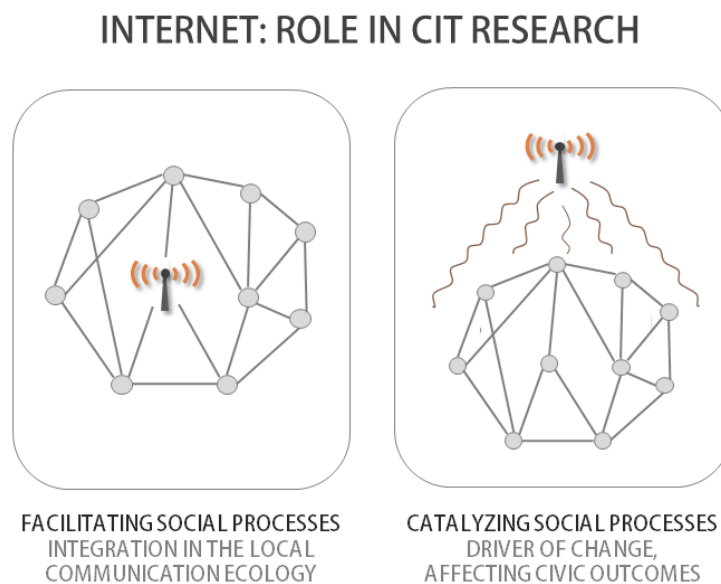

Fig.1 *Facilitating and catalyzing approach to integrating the Internet into the CIT framework*

The Role of the Internet as a Facilitator

Studies that focus on the facilitating function of digital technologies have examined the role of the Internet in the local communication infrastructure, as well as the individual, organizational, and

social factors known to shape that role. With regard to the former, research within communication infrastructure theory has explored how digital sources were integrated in individual and collective communication ecologies. Consistent with studies that found the Internet tends to complement rather than displace offline media consumption (Dutta-Bergman, 2006; Ksiazek, Malthouse, & Webster, 2010), Matei and Ball-Rokeach (2003) compared the ways in which the Internet was being incorporated into the communication infrastructure in different geo-ethnic communities. In dominantly Caucasian neighborhoods in Los Angeles, individual Internet connections were positively related to the community organizational membership that facilitated community engagement and belonging. On the other hand, in predominantly Asian and Latino neighborhoods, Internet connections were not related to community organizational membership or interpersonal storytelling, and were thus disconnected from the neighborhood storytelling network.

Examining differences in the facilitating role of the Internet across social groups, CIT scholarship also mapped the online and offline communication resources mobilized by geo-ethnic populations (Wilkin, Ball-Rokeach, Matsaganis, & Cheong, 2007), as well as those community organizers and practitioners relied on (Broad et al., 2013). Wilkin and colleagues found that the reliance on the Internet differed among eleven geo-ethnic communities. Residents from the same ethnic group living in different neighborhoods had different connectedness to the Internet and other communication resources. Broad and colleagues found that community organizers relied heavily on interpersonal resources, and used the Internet for information but not for communication with residents or other local organizations.

Another line of research has explored a variety of factors that shape the facilitating role the Internet plays in the communication infrastructure. The factors include *individual goals, meso-level actors, resources implicated in the communication action context,* and *social environment.*

With regard to individual goals and preferences, analyses conducted by Jung et al. (2012) found that personal goals shaped the combination of traditional and Internet communication resources selected by individuals. In an international comparative study, Song and her colleagues (2016) concluded that South Korean and Hong Kong residents preferred experience-based information on social media and blogs for health information, while respondents in the United States preferred expert-based sources on the Internet.

In addition to individual characteristics and goals, meso-level actors (local organizations and media) have the capacity to support or inhibit the connectivity and online activities of residents. Katz, Matsaganis, and Ball-Rokeach (2012) demonstrated the ways in which ethnic media, in collaboration with local anchor institutions, can promote the adoption of high-speed Internet access and help increase digital literacy in diverse communities with low broadband penetration. Another local actor with an important impact on Internet adoption is the community technology center. It is a crucial part of the communication infrastructure in urban communities (Hayden & Ball-Rokeach, 2007). Technology centers can serve as "communication hotspots" where residents gather to use technology and to interact with one another (Wilkin, Stringer, O'Quin, Montgomery, & Hunt, 2011).

The perceived importance of different local and other actors providing digital and traditional communication resources for residents can also be influenced by the social environment that individuals are embedded in. For example, studies have found differences in the roles of Internet and traditional outlets in times of high uncertainty in the social environment, such as during and after a crisis such as the 9/11 terrorist attacks in New York (Kim, Jung, Cohen, & Ball-Rokeach, 2004) and 3/11 earthquake in Japan (Jung, 2012).

The Role of the Internet as a Catalyst

Works that focus on the catalyzing role of the Internet emphasize the capacity of technology to foster social change at a scale or speed that might otherwise not be possible. Studies under the communication infrastructure framework have explored the capacity of the Internet to strengthen the neighborhood storytelling networks.

Building on previous research detailing the antecedents and patterns of Internet connectedness, CIT-based works have investigated how online behavior influences key civic outcomes. The Internet connectedness index, for instance, was shown to have a positive association with civic engagement in one's community among younger residents after a natural disaster (Jung et al., 2013). While the older generation was more likely to engage in civic activities by connecting to the neighborhood storytelling network, young people's civic engagement was associated with their ICI. The study conducted by Jung et al. (2013) reveals new possibilities for the Internet to catalyze civic engagement among those who have not been active before. Online platforms provide a space for civic communication and participation accessible to individuals who may not be easily mobilized through offline channels (Hampton, Livio, & Sessions, 2010).

A related construct, *Internet dependency*, has been found to be associated with higher levels of online political efficacy, defined as a person's perceived ability of using online tools to participate meaningfully in the political process (Ognyanova & Ball-Rokeach, 2015). Similarly to ICI, the Internet dependency index measures the importance of technology in accomplishing personal goals.

Studies conceptualizing technology as a catalyst have also identified specific types of online behavior particularly likely to affect key civic outcomes. Researchers examined the effects of community-oriented online activities such as seeking local information, discussing

neighborhood problems and staying in touch with local organizations on the Web (Ognyanova et al., 2013). An index including those activities was found to positively predict civic engagement in a multiethnic neighborhood in Los Angeles, CA. Higher levels of online participation were also associated with more interaction across ethnic groups, consistent with previous research suggesting that digital platforms may have the capacity to facilitate inter-ethnic conversations and collaborations towards shared community goals (Amichai-Hamburger & McKenna, 2006). Nationally representative survey research has found similar associations between Internet use and having a larger and more heterogeneous social network (Hampton, Sessions, Her, & Rainie, 2010).

Exploring the impact of digital platforms on civic engagement was also a key part of several Internet-based CIT projects aiming to support positive social change (Broad et al., 2013; Chen, Dong, Ball-Rokeach, Parks, & Huang, 2012). One of these projects, a research-driven participatory local news website covering an underserved multi-ethnic community (Chen et al., 2012; Chen et al., 2013), has sought to strengthen the neighborhood's storytelling network, increase civic engagement, and enhance intergroup interaction (see Chapter 10 in this book). Another engaged CIT project developed a website and mailing list designed to support community organizers by providing relevant information about local communication ecologies, and forging stronger connections within and across practitioners, local media, and residents (Broad et al., 2013).

Focusing on one important type of online platform, recent studies have uncovered a positive relationship between the use of social network services (SNS) like Facebook or Twitter, and behavioral outcomes including engagement in civic and political activities (Kim & Jung, 2016; Kim et al., 2015). The main explanatory variable, SNS dependency, was based on items measuring how useful online social networks might be in achieving personal goals defined in the media

system dependency literature. Those included understanding yourself and your social environment; getting oriented in order to decide on a meaningful and effective course of action and communication; solitary and social forms of play (Ball-Rokeach, 1998). One additional new dimension of the SNS index was based on a goal that would be difficult to achieve through connecting to mass media: expressing yourself, sharing thoughts and opinions with others. Rather than considering social media in general, respondents were asked to evaluate the helpfulness of the particular social network service they had reported using most often in their daily life.

In a study conducted in Seoul, South Korea, SNS dependency positively predicted engagement with political content on social media, as well as discussing politics offline (Kim & Jung, 2016). It was also positively associated with a variety of local community engagement outcomes, including neighborhood belonging, collective efficacy, and participating in community activities (Kim et al., 2015).

Key Trends and Directions for Future Research

Thus far, we have reviewed the evolving role of digital technology from the perspective of communication infrastructure theory (CIT) and media system dependency (MSD) theory. We outlined and discussed two approaches to conceptualizing the ways in which the Internet has been incorporated into existing social and communication processes: facilitating and catalyzing roles. The first approach focuses on the processes in which the Internet becomes part of the existing ways of engaging in familiar tasks. The second approach emphasizing the catalyzing role of digital technology focuses on the ways in which Internet connections or dependencies bring about new outcomes such as engaging the young generation in civic activities, or evoking collective actions across different local areas.

Based on the preceding overview of Internet research in the CIT tradition, we derive several key tendencies salient for current and future work. In particular, we highlight three major trends characterizing the field's trajectory and discuss their implications. The first trend reflects a shift from exploring general patterns of technology use to a focus on specific platforms and activities. The second trend refers to the move from early works examining Internet adoption levels across social groups to studies exploring the individual and community-level effects of Internet use. The final trend involves the integration of online activities into a variety of existing constructs and measures.

The first trend we discuss is the predictable but important transition from general to more specific constructs and objects of study. This is part of a larger trend in communication research. We are seeing fewer works exploring the Internet as a whole, and more studies focusing on specific platforms and activities – such as, for instance, the informational or political uses of social media (de Zuniga, Molyneux, & Zheng, 2014; Miller, Bobkowski, Maliniak, & Rapoport, 2015; Xenos, Macafee, & Pole, 2015).

Works grounded in media system dependency and communication infrastructure theory were among the first to highlight the importance of studying goals and activities rather than focusing exclusively on access and exposure levels. The civic outcomes of technology were seen as a product of the affordances of devices and online services, but also the intentions and actions of their users. In accordance with those assumptions, a number of CIT studies have focused on specific types of online behavior, such as the use of Internet for community participation (Ognyanova et al., 2013) or civic information sharing (Jung et al., 2013).

Instead of the Web in general, studies have also begun examining specific types of digital platforms, such as local news sites (Chen et al., 2012) or social network services (Jung & Moro,

2014; Kim & Jung, 2016; Kim et al., 2015). This narrower focus will likely persist as it is also driven by grounded community research allowing scholars to identify the devices and platforms which play a particularly important role in the local communication infrastructure. For instance, research may reveal that residents in a community rely primarily on Facebook to interact with each other, as well as to connect to local media and organizations. In that case, studies that examine the facilitating role of Facebook in the community may be more relevant than ones with a broader focus on Internet use. As services and platforms on the Internet and devices connecting to the Internet continue to diversify, this trend is likely to become more prominent.

A second key trend that should be mentioned here involves the changing nature of research exploring the social relevance of new communication technologies. We have observed a shift from early works identifying key Internet activities and functions, through comparisons of online with offline activities and users with non-users, to building on the previously generated knowledge to gain a deeper understanding of the individual and community-level effects of the new technologies. In other words, early research asked how and by whom the technology was used, while more recent work examines the outcomes of that use at multiple levels of analysis (Humphreys, Von Pape & Karnowski, 2013; Loader & Dutton, 2012).

We can track a similar trajectory in communication infrastructure research. The initial focus there was on patterns of information inequality and the role of the Internet in local communication ecologies. More recently, there is a stronger emphasis on evaluating the effects of technological connectedness on civic engagement. This stronger focus on civic outcomes is partly driven by a series of engaged scholarship initiatives using online tools to promote social change. Ongoing projects of this kind include the development of digital platforms providing information and engagement opportunities to local residents and community organizers (Broad et al., 2013;

Chen et al., 2012, also see Chapter 11 in this book). Because the design, features, and content of the Web-based platforms are informed by research, understanding the impact of online affordances on community outcomes is essential to the success of the projects.

Across theoretical traditions, the increased emphasis on civic outcomes will likely promote new research that examines the role of technology as a catalyst of engagement. The capacity of the Internet to accelerate or amplify social processes came to the forefront after a series of recent events in which digital tools were used to support large-scale citizen mobilization efforts (Steinert-Threlkeld, Mocanu, Vespignani, & Fowler, 2015). The Arab Spring (Tufekci & Wilson, 2012), the Occupy movement (Barberá et al., 2015), and the Ferguson protests (Jackson & Foucault Welles, 2016), for example, have each generated hundreds of academic works and news articles discussing the use of social media for collective action.

The volume of research focusing on the facilitating role of technology is also expected to grow, though those works will likely be situated in a different context. The Internet is increasingly incorporated into many aspects of our day to day life. One example of this is the *Internet of things*, a phrase that refers to the embedding of electronics and network connectivity in everyday objects and devices (cars, appliances, furniture, etc.). Individuals' increased connectedness to mobile devices, such as smart phones, provides another context for studying the role of the Internet as a facilitator of social practices. As our relationship with technology continues to change, researchers will also need to dedicate more effort to exploring the new ways in which the Internet, as well as specific services and applications, are incorporated into the daily routines of individuals and communities.

Third and perhaps most important, technology is becoming an increasingly central part of many theoretical constructs and measures at the micro (individual), meso (local institution), and

macro (social system) levels. Much of the research discussed in this chapter has connectivity or online behavior as its main or explanatory variable. Communication technology, however, should also be integrated in a variety of other measures examining the connections among residents, organizations, media sources, local government, political actors, and others.

For instance, *integrated connection to the storytelling network* (ICSN) is a key communication infrastructure index that incorporates interpersonal discussions, connections to local organizations, and geo-ethnic media (Kim et al., 2006). Traditionally, measures tracking the scope of media connections have been based on items asking participants to identify the print, radio, and television sources they used to stay on top of their community. In recent analyses, online news outlets, blogs, and social media sites have been added to that list (Chen et al., 2013; Kim et al., 2015; Wilkin, 2013). Items evaluating the other two parts of ICSN (interpersonal discussion and connection to community organizations) remain unchanged from their pre-Internet forms, and present a more serious challenge. People may have face to face or mediated conversations about their community, with neighbors they personally know or have only met online (e.g. exchanging comments in a Facebook group or on a news website). Similarly, residents could join a local organization by visiting its office – or they may have an online relationship with it (e.g. by joining a social media group). The current measures do not distinguish between those scenarios, and could potentially be capturing any or all of them. How the questions are interpreted by study participants likely depends on characteristics of the respondent. Research tackling methodological issues of this nature with regard to key communication infrastructure constructs is both necessary and timely.

Many of the key outcome variables examined by CIT (civic participation, belonging, individual and collective efficacy, etc.) were also traditionally evaluated based on offline activities.

Those constructs have been reexamined in an online format (Jung et al., 2013; Matei & Ball-Rokeach, 2002; Ognyanova & Ball-Rokeach, 2015; Ognyanova et al., 2013). Still, we see a need for a larger and more cohesive effort to develop online versions of the constructs, and/or integrate Internet-based activities into existing measures. More importantly, as technology changes rapidly, we also need a long-term strategy for generating construct measurement instruments that can capture new forms of relevant behavior while also allowing for comparisons with earlier research. This is a common concern that crosses disciplinary boundaries, and we would argue that communication infrastructure theory and media system dependency are well positioned to address it. One reason for that is that both theories examine the role of technology in the context of personal goals and social structures, rather than focusing on specific features or uses of technology which might change over time.

We believe that our review of Internet research within the media system dependency theory and communication infrastructure theory framework, and the identification of facilitating and catalyzing approaches, will serve as a useful resource in designing and developing variables and measures that reflect evolving communication ecologies.

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