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Consumer Connectivity in a Complex, Technology-enabled, and Mobile-oriented World with Smart Products☆

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Abstract

Today's consumers are immersed in a vast and complex array of networks. Each network features an interconnected mesh of people and firms, and now, with the rise of the Internet of Things (IoT), also objects. Technology (particularly mobile devices) enables such connections, and facilitates many kinds of interactions in these networks—from transactions, to social information sharing, to people interfacing with connected devices (e.g., wearable technology).

We introduce the POP-framework, discuss how People, Objects and the Physical world inter-connect with each other and how it results in an increasing amount of connected data, and briefly summarize existing knowledge on these inter-connections. We also provide an agenda for future research focused on examining potential impact of IoT and smart products on consumer behavior and firm strategies.

Keywords: Mobile marketing; Internet of Things; Social networks; Big data; Omnichannel

Introduction

Today's consumers are immersed in a vast and complex array of networks. Each network features an interconnected mesh of people and firms, and now, with the rise of the Internet of Things (IoT), also objects. Technology (particularly mobile devices) enables such connections, and facilitates many kinds of interactions in these networks—from transactions, to social information sharing, to people interfacing with connected devices (e.g., wearable technology). Because of the penetration

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of mobile and wearable devices, inexpensive provision of connectivity by firms such as Google and Facebook worldwide and exponential decrease in the costs and size of sensors, consumers now can have connectivity anywhere, almost with everyone and, in theory, with almost any object. Accordingly, these connections exist in both virtual and physical worlds. As technologies connecting people, firms, and objects continue to evolve, both virtual and physical networks connecting all of these entities will grow larger, more complex, more diverse, and even more mobile in nature. For this reason, the notion of the "connected consumer", which marketers have discussed now for decades, must evolve as well. Consumers are now connected in many ways, not only through social or communication networks with other people. Connectivity, therefore, is omnipresent, multifaceted, and multidimensional.

This paper presents a framework for representing and understanding consumer connectivity in a world that is increasingly global, technology-enabled, and mobile-oriented. Specifically, we examine the notion of omnipresent, multifaceted, and multidimensional connectivity, discuss how it is related to marketing value, and advance a number of associated research opportunities. We examine connectivity both from the conventional perspective where a consumer is *actively* engaged in a network through devices (particularly mobile or wearable), interacting with other consumers, firms, or objects; and also from an emerging perspective where a consumer is *passively* engaged in a network through objects such as IoT sensors and appliances that form networks and communicate with each other to "sense" consumers' locations, characteristics, needs, behaviors, and even moods and, then trigger actions or information transmissions that can create some form of value for consumers. This dual perspective of active and passive consumer engagements allows us to consider new avenues for interesting and important research.

A Framework for Consumer Connectivity

We propose a framework for consumer connectivity with three components: People, Objects, and Physical environments (POP) (see Fig. 1). Advances in mobile-oriented technologies enable consumers to connect with (1) People (other consumers and firms' representatives), (2) Objects, and (3) their Physical environments. These connections allow for information exchange, including passive sensing of data, multi-way communication exchange and data retrieval, and transactions. Generally, POP

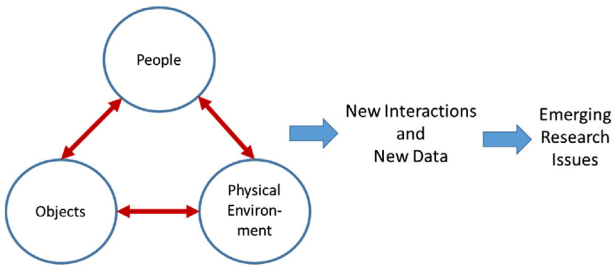

Fig. 1. Framework and flow.

connectivity means that consumers are embedded in vast digital networked information systems that can be used in myriad ways.

On the dimension of "People" in POP, consumers can instantly communicate with others through a variety of means. Vocally, consumers can talk with other people without them needing to be present in the same location. Visually, multiple smartphone apps (e.g., Facetime, Skype) enable people to see each other via live video. Virtually, consumers can connect with others through various text-based or social media platforms (e.g., Telegraph, Twitter, Facebook and Snapchat). Beyond connecting with others, consumers can also monitor others, such as employers their employees and parents their children. Consumers can also connect with themselves via wearable technology. Specifically, in what is known as the "connected self," wearable technology equipped with multiple sensors and LEDs, such as Fitbit provide wearers with instantaneous access to various personal health metrics such as heart rate, sleep patterns, and calories burned. Wearable technology is thus revolutionizing how people approach activities, such as how athletes train or how frequently office workers take a break from their stationary positions.

On the dimension of "Object", consumers can connect with the objects they possess and other "connected" objects and sensors present in both public and private spaces. For example, people can now start their automobiles remotely, monitor their "smart" homes and give commands to objects within the home (such as the thermostat), as well as sync information across devices. The IoT extends beyond current possessions to future ones as well, such as the ability to track packages while in transit, from the time of departure at the warehouse to delivery at houses or businesses. Generally, with respect to consumer IoT applications, we are observing many-to-many interactions between smart products—passively, without active human interventions—and interactions between smart products and consumers that are more active. This mixture of interactions, among objects and between consumers and objects, represents somewhat of a "frontier" for consumer connectivity as we currently understand it. The inclusion of connectivity with and among objects—a key part of this framework—adds a layer of additional complexity that, to date, has not been well understood in the consumer behavior and marketing literature.

On the dimension of "Physical", consumers can connect with their environment such as locating where they are in real-time in order to optimally navigate to a desired destination (e.g., using mobile apps such as Google Maps or Waze). As more cities become "connected cities" and "smart cities", consumers can instantly learn about the weather, traffic conditions, and current events, as well as the location of public transport (e.g., ride-shares, buses, trains, planes). Constant connectivity also enables citizens to report on various aspects of physical surroundings that may need extra attention from authorities, both actively (such as filing a report of some infrastructure malfunction on a mobile device) and passively (through enabling automatic location-based transmission of traffic and pavement malfunction). Wearable technology also enables consumers to monitor themselves in their physical environment, such as their distance traveled and the speed at which they traveled. The ability to connect to rich and