THE INTERNET OF PEOPLE, THINGS AND SERVICES

WORKPLACE TRANSFORMATIONS

Edited by
Claire A. Simmers and Murugan Anandarajan

The Internet of People, Things and Services

The transformational technologies of the Internet-Web compound continue to exert a vast and readily apparent influence on the way we live and work. Internet penetration is now very high in most parts of the world, affecting the context and content of the workplace, and the boundary between work and private life is even more porous. Not only has the reach increased, but the technologies to access the Internet-Web have further evolved toward increasing portability. The hardware evolution from desktops to laptops to mobile technologies (phones, tablets, watches, eyeglasses) marches forward. The increasing mobility and 24/7 accessibility offer the opportune time to revisit the transformations occurring.

Today the Internet consists of billions of digital devices, people, services and other physical objects with the potential to seamlessly connect, interact and exchange information about themselves and their environment. Organizations now use these digital devices and physical objects to produce and consume Internet-based services. This new Internet ecosystem is commonly referred to as the Internet of People, Things and Services (IoPTS).

Information and communications technology (ICT) expansion from desktops to laptops to ubiquitous smart objects that sense and communicate directly over the Internet—the IoPTS—offers us the opportune time to revisit how the Internet transforms our workplaces.

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Workplace Transformations

**Edited by Claire A. Simmers
and Murugan Anandarajan**

Claire: To my family, especially my husband, Michael; my daughters, Samantha, Jessica, and Christa and my grandchildren, Michael, Brianna, and Nathaniel; the party continues.

Murugan: To Sharmini, Vinesh, Dharman, and Bugsy

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Ted's research focuses mainly on the development of digital platforms, in particular IoT platforms, and how we may leverage them to create distinct value propositions for a range of different actors. Other research interests include affordance theory, entrepreneurship and digital innovation.

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1 Introduction

The Internet of People, Things and Services (IoPTS): Workplace Transformations

Claire A. Simmers and Murugan Anandarajan

Introduction

In 2006, we published a volume on the Internet and workplace transformations (Anandarajan, Teo, & Simmers, 2006). At that time, unknown to us, that volume was the midpoint of our journey in examining the interrelationships between user behavior and information and communication technologies (ICT) in the workplace. Our work began as the Internet was becoming more widely used in the business setting, and we investigated factors that influenced end-user adoption of the Internet in the workplace (Anandarajan, Simmers, & Igbaria, 2000). We extended our research by examining the multidimensionality of positive and negative personal Internet usage in the workplace, and we saw the personal and the work increasingly overlapping, enabling unprecedented accessibility to unlimited information on a 24-hour, seven-day-a-week basis. We were no longer bound to our physical location; through the Internet, we could be anywhere in the world. The troubling and promising ways the Internet transformed our workplaces were due to the vastness of information, the disaggregation of work and location, and the rapid worldwide adoption.

Our attention again shifted in sync with ICT advancements, with the increasing portability of devices. We were no longer tethered to desktop devices, but had laptops, tablets, and smart phones owned by the organization, or just as likely owned by the individual. This convergence and overlapping of devices and ownerships allowed for further extension of the 24/7 workplace, as work could be accessed on any device at any time and any place. The information world was in our pockets.

Layered onto hardware portability are advancements in the interconnectivity of the workplace. We are now able, primarily through the "cloud", to link our portable devices to anyone and anything in a spider web of connectivity increasingly known as the Internet of People, Things and Services (Eloff, Eloff, Dlamini, & Zielinski, 2009). IoPTS is about linking the physical world and the digital world through sharing common protocols facilitating interoperationality. This is a world of autonomous communication between intelligent devices that are sensitive to a person's presence and respond by performing specific services that enhance a person's lifestyle (Piccialli &
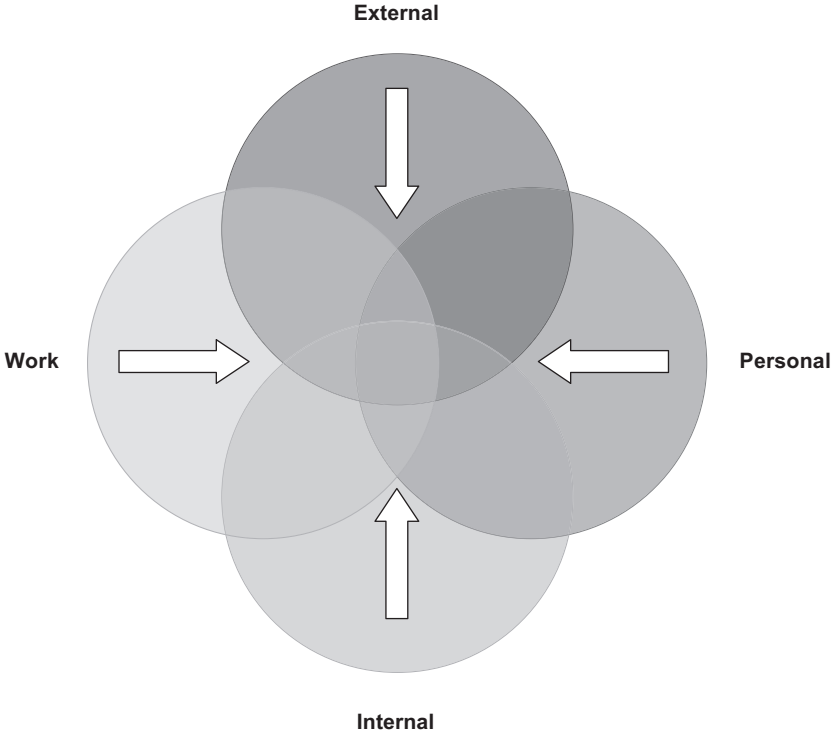
Figure 1.1 IoPTS Producing Increasing Convergence in the Workplace

Chianese, 2017). There are countless applications; more are introduced daily, and even more are planned for the future. Energy efficiency, health-care, transportation coordination, household appliances, wearables, and self-driving cars are just a few examples (Gershenfeld & Vasseur, 2014). This level of interconnectivity smashes the already blurred boundaries between work and personal lives that we explored in the 2006 volume (Anandarajan, et al., 2006)). Additionally, the porousness of an organization's internal and external boundaries increases; the impacts of the increasing convergence between these four forces are what we explore in this volume. This dyna-mism is illustrated in Figure 1.1, which shows the increasing convergence (represented by the four arrows) of the spheres of work and personal with the internal and external boundaries of the organization.

Background

Since our 2006 volume, worldwide Internet usage continued to grow. Pen-etration (defined as the number of users divided by the total population) rose from 1.5% in Africa in 2005 to 31.2% in 2017 and from 67.4% in North

America in 2005 to 88.1% in 2017. There are now 3.9 billon Internet users worldwide, which represents over half the world's population (51.7%) (World Internet Users Statistics, 2017). Internet usage and penetration is only half of the story in the IoPTS world; device connectivity is the more important statistic. The headline in a recent report reads "Gartner Says 8.4 Billion Connected 'Things' Will Be in Use in 2017, Up 31 Percent From 2016" (2017, February 7). This number is forecasted to reach 20.4 billion by 2020 with total spending on endpoints and services to be almost $2 trillion in 2017 (Gartner, 2017).

How will IoPTS affect the workplace? We are just beginning to investigate the impacts; it is a workplace where automation continues to grow rapidly (Corsello, n.d.). Challenges such as retrofitting buildings and homes, data management, and digital security will bring opportunities to those who can provide these types of services (Anderle, 2016). Careers and career paths are already changing as robots and artificial intelligence begin to become realities in the workplace (Ward, 2017). Although "things" will be increasingly providing "services", the role of "people", although shifting, will not only continue, but will become more indispensable. Qureshi and Syed (2014) examined the benefits and challenges of robots in the workplace. Future workers in most professions will need to be educated and trained to work in tandem with robots. Not only will people need education and training on the "things" and how to use the "services", but a recurring theme in this volume is that people will have to take increasing responsibilities in the IoPTS workplace. These responsibilities will be to set their own behavior boundaries in their personal lives and help develop those of others in their organizational lives.

In the pre-Internet workplace, the bilateral psychological contracts summarized employees' beliefs and discernments regarding the implicit and explicit promises and responsibilities comprising the relationship between employee and organization. They were transactional (focusing on tangible compensation requirements) and relational (involving socioemotional elements, such as trust, fairness, motivation, and commitment) (Robinson, Kraatz, & Rousseau, 1994). A new psychological contract evolved in the 1990s, emanating largely from increasing usage of the Internet and other information and communication technologies. This new psychological contract was based on shorter-term employment, employee responsibility for career development, commitment to the work performed rather than to the employer, and the diminishing importance of hierarchy (Ehrlich, 1994). In the IoPTS workplace, the psychological contract continues to evolve, becoming multifoci (Alcover, Rico, Turnley, & Bolino, 2016). Alcover et al. (2016) proposed that the traditional psychological contract based on a bilateral relationship between the employee and organization had been supplanted by a situation where "employees simultaneously depend on several agents, representing one or more organizations, who assign tasks and goals, supervise work, and provide rewards (or impose sanctions) depending on results"

(2016, p. 5). The relationships may be temporary and experienced from different locations, and may include interactions with nonhumans (robots or computers).

We take the multiple-foci psychological contract's approach (Alcover et al., 2016) one step further, proposing that these nonstandard work arrangements will be the standard work arrangements as the IoPTS becomes increasingly ubiquitous. However, there is a paucity of research on what will be motivating those in the IoPTS workplace to fulfill obligations and commitments in the performance of work and how the necessary levels of trust, security, and privacy critical in the IoPTS workplace will be attained (Eloff et al., 2009). This volume is a collection of conceptual and empirical work, providing a rich resource as well as an agenda for future scholarly endeavors.

Part 1: IoPTS Workplace—People

Part 1 has five chapters exploring ways people and the IoPTS interact in the workplace. In the chapters we are reminded that people are still central in the relationships among "things" and "services" but that the fissure between the positives of efficiency and connectivity and the challenges of disassociation and multiple exchange relationships continues to widen. All the authors make strong arguments that people have a major role and heightened responsibility to lessen this fissure rather than placing their reliance on the "things".

In Chapter 2, Lisa Nelson points out that despite the many positive effects, there are three prevalent negative effects: 1) increased disassociation among organizational users and between users and the organization, 2) decreased information quality due to inaccuracy and equivocality, and 3) deteriorating social skills because of user overreliance on technology. Nelson then reaches out to the past for guidance from Mary Parker Follett, an insightful management theorist of the early 20th century. Follett's three most important contributions to organizations—the concepts of circular response, integration, and the law of the situation—are suggested by Nelson as a basis for more humanism in the IoPTS workplace.

In Chapter 3 Constant Beugré argues for the central role of cognition, interpretation, and sense making, all inherent to "people" functionalities. As immense quantities of data are accumulated in the IoPTS, data sense making is necessary if the decision-making process is to have meaning. The mere availability of data is not enough to provide a competitive advantage. What is important is how organizations make sense of the data they collect. As Beugré explains in this chapter, analytics is more a cognitive process than a mere computation of numbers, however accurate they may be. To improve the use of analytics, it is important to combine the use of data with a deep understanding of the domain in which the data are collected and analyzed.

Veronica Godshalk, in Chapter 4, continues with a conceptual warning that the enormity of reach in the IoPTS workplace plants an increasing

responsibility on "people" to actively manage this new workplace. She contrasts the contribution that IoPTS can make to maintain work patterns over time and multiple employers and applies the *Too Much of a Good Thing* (TMGT) effect. The technology associated with IoPTS allows for constant 24/7 accessibility, invasive employer access to employee data and behavioral scans, and even implantable devices—thus the TMGT effect. The IoPTS also may have detrimental effects on individuals through higher stress, more discrimination in hiring, slower career progression, and work–life imbalance. IoPTS needs to be managed properly through individual and organizational support convergence.

Rashimah Rajah and Vivien Lim in Chapter 5 and Kimberly O'Connor and Gordon B. Schmidt in Chapter 6 continue the discussion of people in the IoPTS workplace. Rajah and Lim discuss the results of their empirical work indicating that cyberloafing (using the Internet at the workplace for personal matters) can have positive effects on productivity through the dimension of helping behavior in organizational citizenship behaviors (OCB). The reasoning is that if individuals can mitigate the 24/7 connectivity characteristic of the IoPTS workplace, with downtimes of their choosing for personal usage, productivity will be enhanced. This continues a theme of employee control and responsibility in the IoPTS workplace. In Chapter 5, O'Connor and Schmidt analyze court cases involving employees' personal use of social media, and they see a trend toward increasing legal protections for employees. They focus on the impact that social media use and the IoPTS has had on certain aspects of the life cycle of employment, such as selection and termination. They examine data privacy protections for workers and discuss the legal issues that organizations may face when monitoring employees or providing them with employer-owned devices. Additionally, they raise questions about the value gained from the use of social media and data monitoring by organizations as they may not be worth the reputational cost. They posit that such data gleaned from IoPTS *could* be helpful, but there is little research suggesting that the data actually *are* useful.

Part 2: IoPTS Workplace—Things

Part 2 contains four chapters focusing on how the "things" in the IoPTS affect various aspects of the workplace. The Internet of Things is a world where physical and digital objects are seamlessly connected and integrated into vast networks. These networks are active participants in business processes (Eloff et al., 2009). All the chapters highlight that the Internet of Things is going to give us the most disruption as well as the most opportunity (Burrus, 2014) and that organizational actions can and must be instrumental in building trust, privacy, and security (Eloff et al., 2009).

In Chapter 7 Ulrika H. Westergren, Ted Saarikko, and Tomas Blomquist investigated 21 Swedish firms, all early adopters of IoT. They conclude that in order for firms to successfully implement IoT into organizational processes

they have to 1) change their work practices accordingly; 2) make sure that they have access to all needed competencies, be they internal or external; and 3) create an environment of trust that will leverage privacy concerns.

Chapter 8 by Wendy Campbell and Chapter 9 by Irina Nedelcu and Murugan Anandarajan examine security infrastructure. The Campbell chapter explores the impact of IoT on the IT security infrastructure of colleges and universities in Utah. Her findings suggest there is awareness of the challenges and risks of the IoT environment and that strategies have been initiated to mitigate these challenges while also embracing the opportunities. Nedelcu and Anandarajan take a narrower focus by examining specifically the use of smart phones and what motivates users to express intentions to protect their smart phones. Their results indicated that the desire to self-protect is influenced by perceived severity, response efficacy, and response cost. Companies should implement stronger policies, train employees on ways to engage in self-protective behaviors, and work with security organizations to design effective intervention methods. Training should be divided by operating systems because iOS users tend to rely more on the system and less on self-protection than do Android users.

Chapter 10 by Elisabeth E. Bennett highlights another promising transformation in the workplace shaped by the IoT—the shift toward IoPTS as multiple intranets linked to leverage virtual human resource development (VHRD). VHRD emphasizes learning, strategy, and cultural dimensions with a focus on learning, development, and performance improvement. Important to implement is a concentration on the processes of interacting with the IoT such as learning agility and design thinking.

Part 3: IoPTS Workplace—Services

How do we use the technology of IoT in the workplace to be of service? The six chapters in this section offer ways organizations and nations can or do utilize IoPTS. Effectively using IoPTS to provide services requires organizational approaches that singly or in combination proactively minimize risk and increase opportunity through a better understanding of users' motivations and requirements, new leadership approaches, and improved organizational policies and procedures

Both Chapter 11 by Thomas Calvard and Chapter 12 by James Phillips explore the role of users' motivations and requirements to use the services offered in IoPTS. Calvard outlines how IoPTS will affect the design of performance management systems with the goal of increasing service to both the employees and the organization. He applies the results of the SWOT analysis to recommend that improving performance management practices and policies for managers and employees be accomplished via further skills development and the design of resilient systems based around users' motivations and needs. James Phillips posits that IoT offers a strong potential for health organizations to offer services to influence health behaviors and improve

outpatient support for addicts. When considering IoPTS, health organizations need to be aware of users' motivations and behaviors, as their addict clients will more likely filter their communications with the Internet to a greater extent than the general public and that the Internet of Things is not a panacea.

Carol Portillo and Terri R. Lituchy in Chapter 13 examine how online purchasing will continue to change due to the rapid introduction of IoT. Their study analyzed the predictor variables of gender, digital experience (digital native vs. digital immigrant), level of income, and level of education for impacts on the intent to repurchase online. None of the variables affected, positively or negatively, the intention to repurchase online, thus leading them to conclude that psychographic variables such as user motivations and attitudes are more important than demographic variables. With IoPTS, organizations will be better able to individualize products, services, and offers to a full spectrum of consumers.

In Chapter 14, David Kurz argues that if organizations are to provide the service of an integrated, demand-driven supply chain service aligned to organizational strategy, transformational leadership will be required. He discusses two case examples and then introduces a model that isolates the influence and potential impacts of leadership on the digital transformation of supply chains. The argument is that the digital supply chain, led by technologies such as IoT and advanced analytics, will require enhancements in the management layer's mind-set and attitudes, integration behaviors, and skills in order to offer supply chain services that will realize an organization's competitive advantage.

Chapter 15 by Erika Pleskunas and Murugan Anandarajan continues the theme of this section, which is that organization-wide changes are required to take advantage of the IoPTS technologies to offer enhanced services, whether in human resource management, patient self-regulation, online repurchasing, supply chains, or protections against security breaches. Pleskunas and Anandarajan propose a framework offering guidance on protection from security breaches.

Murugan Anandarajan and Claire Simmers in Chapter 16 discuss how the future workplace will include cross-cultural work forces, global interdependencies, skilled workers from emerging countries improving productivities from within their own borders, remote workers' increased flexibility to meet labor needs, and cultural diversity contributing toward businesses offering products and services. However, IoPTS is still in its infancy in multiple countries, as many of the required factors are in the beginning stage of development; each country has its own unique set of IoPTS capacity and readiness characteristics. The purpose of this chapter is to develop an IoPTS adaption score to classify a country's progress in adopting and using IoPTS.

In *The Internet of People, Things and Services (IoPTS): Workplace Transformations* we offer a more thorough look at how IoPTS is altering the workplace. We have shown the interconnections of people, things, and services in a variety of settings, discussing what currently exists, but more importantly, providing guidance on how to manage what is coming. IoPTS will come—the question before us, on which some guidance is provided in

this volume, is how to maximize the constructive aspects while minimizing the threats. The conclusion that is reached from reading the chapters in this book is that keeping People is paramount. Io**PTS** is the answer.

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Part 1

IoPTS Workplace—People

2 Moving From the IoT to the IoP

Applying Mary Parker Follett's Circular Response, Integration, and Law of the Situation to the Role and Responsibilities of the User in the IoPTS Workplace

Lisa T. Nelson

Users as Participants in the Internet of People, Things and Services

Information and communication technology (ICT) is pervasive in organizations for purposes of sharing, managing, and storing knowledge to increase efficiency, performance, decision making, and productivity (Knight, Pearson, & Hunsinger, 2008). Individual users in firms and organizations interact over ICT with each other and with internal and external constituents (e.g., customers, suppliers, and vendors). *Users* are defined here as "firms or individual consumers that expect to benefit from using a product or a service" (von Hippel, 2005, p. 3).

As ICT has become increasingly democratized, individuals find they "are living in a mobile-device-focused society (most people could not live without a mobile phone)" (Zhang, Wang, Vasilakos, & Ma, 2013, p. 91). ICT "has decentralized communication by allowing each individual to be not only an information consumer but a producer as well" (Malone, as cited in Hand & Ching, 2011, p. 364), implying that transactional relationships can also occur. Users of ICT, then, become active participants in what is known today as the *Internet of people, things and services* (IoPTS). The IoPTS is generally defined as "the vision where people, things (physical objects) and services are seamlessly integrated into the networks of networks as active participants that exchange data about themselves and their perceived surrounding environments over a web-based infrastructure" (Eloff, Eloff, Dlamini, & Zielinski, 2009, p. 1). The IoPTS "are three fundamental concepts that form the backbone of the Future Internet" (Aitenbichler et al., as cited in Weber, Martucci, Ries, & Mühlhäuser, 2010, n.p.).

First, the *Internet of people* (IoP) encourages interfacing and interactions between humans and machines, empowering "users with service-independent ubiquitous access" (Weber et al., 2010, n.p.) without using a special app or going through a third party. Luis Molina, founder and CEO of Fermat,

identifies the IoP as a way "to use the digital tools at our disposal to build a new and more human-friendly cyberspace alongside the corporate and government-run cyberspace we have now" (Lyons, 2017, p. 4).

Next, the *Internet of things* (IoT) "relates to interconnected physical devices, usually in the form of embedded systems and sensors with one or more network interfaces that are used to collect, forward, compute, or display data" (Weber et al., 2010, n.p.). The IoT "increasingly pervades our daily lives" (Miranda et al., 2015, p. 3), imposing "12.6 million connected devices, including people, processes, data, and things" (Cisco IoT Connections Counter, as cited in Miranda et al., 2015, p. 3). The "things" in the IoT are both physical, as in tangible devices, and virtual, as existing in the world of data and information (Jadhav, 2014). The IoT consists of networks of programs and devices—everything from smartphones, to coffee makers, to home heating and cooling systems, to televisions, to many industrial machines—that connect to the Internet and to each other (Hancock & Hancock, 2016; Miranda et al., 2015). Ideally, the IoT enables more user control over home and work, making both better and easier (Judge & Powles, 2015).

The *Internet of services* (IoS) may be understood to be at the intersection of the IoT and the IoP. Intended to be "the global marketplace of the future" (Weber et al., 2010, n.p.), the IoS deals primarily with the use of web-connected (i.e., Web 2.0) devices and service-oriented architectures (SOA) that enable organizations to manage and share knowledge and data (Schroth & Janner, 2007) in the conveyance of goods and services to consumers. "The objective of the IoS is to set up a fully-fledged digital equivalent of the existing service-based economy. Thus, IoS allows people and software-based entities to engage in service-based economic activities, such as negotiation, bidding, and contracting" (Weber et al., 2010, n.p.).

Problems in Organizations: Negative Effects of ICT on Users in the IoT

IoT devices and methods of use, although convenient and encompassing, can actually have a destructive impact on users in organizations. Three prevalent negative effects described here are increased disassociation among organizational users and between users and the organization, decreased information quality due to inaccuracy and equivocality, and deteriorating social skills because of user overreliance on technology.

Organizational User Disassociation

Organizational user disassociation may lead to deleterious impacts on organizational users' relationships and productivity by putting employee citizenship, productivity, trust, and commitment at risk. Workplaces are social spaces; in fact, telecommuting managers and employees may feel isolated simply from being off-site (see Cooper & Kurland, 2002). Machines and