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“The Pokémon that Got Away”: Employing Actor-Network Theory to Unmask the Technology Actor in Cybernized Services

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“THE POKÉMON THAT GOT AWAY”: EMPLOYING ACTOR-NETWORK THEORY TO UNMASK THE TECHNOLOGY ACTOR IN CYBERNIZED SERVICES

Research Paper

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Abstract

Digitalization and emerging technologies have given rise to cybernized services and a debate questioning the traditional Service-dominant logic (SDL) view of technology as a resource in service exchange. To date, little is known on the role of technology as a value co-creating (or co-destroying) actor in the context of services empowered by emerging technologies. Attaining an in-depth understanding of technology as an actor in cybernized service ecosystems is integral for practitioners and researchers alike to foster and investigate value co-creation in the sociotechnical interactions from the perspective of the involved human actors. To address this need, we unmask the technology actor by conducting a qualitative content analysis on in-depth laddering interviews with users of the Augmented Reality (AR) mobile game application Pokémon Go. Employing the Actor-Network Theory (ANT), we depict three emerging technology actor roles in service exchange and discuss their value co-creative/destructive implications to research and practice.

Keywords: Actor-Network Theory, Service-dominant logic, Value co-creation and co-destruction.

1 Introduction

Emerging technologies, such as AR, virtual reality (VR), mixed reality, and applications of artificial intelligence (AI), have opened new possibilities for advancing the value creation capacity of digitalized services. It follows that novel value-creating services such as autonomous vehicles and bots (Kaartemo & Helkkula, 2018), VR collaboration environments (Pallot et al., 2017), and AR sales applications (Cuomo et al., 2020) are increasingly present in our everyday lives. Such “context-aware and interactive” cybernized services (Tuunanen et al., 2019, p. 84) integrate computational and physical capabilities through sensor technologies (Baheti & Gill, 2011). However, multifaceted challenges lie in harnessing digitalization and newly emerging technologies, recently elevating technological aspects as one of the key research priorities in service research (Ostrom et al., 2015). Simultaneously, servitization has emerged as a focal area of interest in the information systems (IS) discipline (e.g., Rai & Sambamurthy, 2006), and the research domain of service science has been established to tackle challenges of complex sociotechnical service systems, wherein value is co-created in the interplay of people, technology, information, and value propositions connecting these (Maglio et al., 2009; Vargo et al., 2015, 2020). While it has been established that value can be co-created for the actors involved in service exchange, also negative value may emerge (e.g., Castillo et al., 2020; Lintula et al., 2017; Plé & Chumpitaz Cáceres, 2010). Further, particular risks relate to co-creation with services enabled by new emerging technologies (Ostrom et al., 2021), and thus, the dynamics of value co-creation and co-destruction have emerged as subjects of interest for IS researchers and practitioners (e.g., Tuunanen et al., 2019).

However, understanding the potential roles of emerging technology, or the non-human actor, in cybernized services remains insufficient (Koskela-Huotari & Siltaloppi, 2020). The SDL literature traditionally treats technology as an enabler rather than an actor in value co-creation. While the topic has recently attracted scholarly attention concerning AI applications, such as social robots and their actorhood (e.g., Čaić et al., 2018; Kaartemo & Helkkula, 2018), the abstract and technologically selective view does not generally consider cybernized services operating through emerging technologies. Cybernized services, such as AR applications or autonomous vehicles, by nature fuse the virtual world with the surrounding physical environment (Tuunanen et al., 2019), offering substantially novel value co-creation opportunities across industry boundaries (e.g., Goldman Sachs, 2016). Thereby, cybernized services represent a particularly important and exciting context for exploring the role of technology in service exchange, which is the focus of this study.

As an illustrating case in the domain of cybernized services, we employ the AR mobile application Pokémon Go—a mobile gaming application that allows users to visually perceive the presence of virtual objects (e.g., Pokémon characters) and their actions in the user's physical surroundings (Paavilainen et al., 2017). We see that virtual entities may be embedded in the physical service exchange setting as value co-creating/destroying actors. For instance, the application uses notifications to urge the gamer to complete specific tasks, and the virtual Pokémon characters may, for instance, annoy the user by running away, and even lead the gamer to get injured in a traffic accident when spontaneously running after the virtual monster (e.g., Ayers et al., 2016). While SDL traditionally holds that value is co-created among actors, and technological artifacts are typically regarded as vehicles for enabling such collaboration, the role of technology has also been discussed as an operant resource that may even have underlying "practices and processes" (p. 268 Akaka & Vargo, 2014).

However, the example of the Pokémon Go game underscores that technological aspects involved in the cybernized service exchange may also take independent courses of action (e.g., the Pokémon character running away and leading the gamer to hazardously chase it on a busy roadside). Such chains of action are not part of the practices and processes designed for the technology, but rather, they emerge from the nature of cybernized services that merge the worlds of "bits and atoms," leading to unprecedented scenarios for value co-creation/destruction (Tuunanen et al., 2019). Therefore, such emergent context-aware and interactive services provide a new perspective to the SDL view of the role of technology (Akaka & Vargo, 2014; Vargo & Lusch, 2004)—potentially manifesting as blind spots in service design and development or gaps between proposed value and value realized by the user. While previous studies have started to zoom in on the actor view of SDL for establishing a deeper understanding of the roles of human actors in value co-creation (e.g., Ekman et al., 2016), further investigations into the potential agency of non-human actors have been called for (Kaartemo & Helkkula, 2018).

To address this need, we draw from the Actor-Network Theory (ANT) (Latour, 1994), which enables the assessment of actors through the perspective of their agency. We conduct a qualitative content analysis (Schreier, 2012) on in-depth laddering interview data (n = 43) to distinguish involved actors and their works through a reported agency, focusing on the technology actor (Latour, 1994). The interviewed informants are enthusiastic Pokémon Go gamers who report their experiences of value co-creation and co-destruction in AR gaming activities with the technological gaming application and human actors involved. Our approach enables a shift from the SDL perspective of technology as a resource merely enabling actors' interactions toward viewing enablement as a form of agency—occurring equally among human and non-human actors. Thus, our analysis allows assessing contextual and phenomenological actorhood in complex actor networks wherein technology is realized as an actor through enactment (Latour, 1994). As findings, we propose a three-fold categorization of the roles of the technology actor in AR mobile games—translator, compositor, and delegator—and illustrate with examples how enactment of each role may trigger either value co-creation or co-destruction in cybernized service exchange. Implications of our application of ANT and findings are discussed to the prevailing views of the SDL and the service design, development, and provision practice.

2 Theoretical background

2.1 The Service-dominant logic (SDL) framework

SDL emerged as a new thought in marketing research for understanding firms and customers as equally resource integrating actors, aiming to co-create mutual value (i.e., increased well-being) through resource integrating interactions (Vargo & Lusch, 2004, 2011, 2017). SDL defines “service” as the application of competences for the benefit of another party. Accordingly, service exchange involves the integration of operand (i.e., tangible and static resources such as natural resources) and operant resources (i.e., competences such as skills and knowledge) for co-creating value by all social or economic actors involved in dyadic or networked relationships (Wieland et al., 2012). Continuously shaping and affecting the way value co-creative resource integration occurs are the prevalent institutional arrangements, underlying interactions from dyads to complex service ecosystems (Vargo et al., 2015; Wieland et al., 2016). Evolving toward a metatheoretical lens of value co-creation, SDL views the given role of actors in service exchange by nature as generic, while the derived value is characterized as subjective, contextual, and phenomenological (Vargo & Lusch, 2016, 2017).

Critical approaches have suggested that the SDL view of value co-creation as a process leading to positive outcomes is overly optimistic, and value co-destruction has been proposed as an equally feasible outcome of service exchange (Echeverri & Skålén, 2011; Lintula et al., 2017; Plé & Chumpitaz Cáceres, 2010). Thus, a balanced understanding of how value emerges ought to consider the emergence of both positive and negative value outcomes for the focal actor(s) involved (Lintula et al., 2018). Plé and Chumpitaz Cáceres (2010) defined value co-destruction as accidental or intentional resource misuse leading to the decrease of the well-being of at least one of the actors involved. Accordingly, SDL research has begun to acknowledge that the outcomes of value co-creation may be either positive or negative (Vargo et al., 2020), and a deeper understanding of the value co-destruction phenomenon was recently proposed as one of the key research priorities in service research (Ostrom et al., 2021).

However, to truly understand how service actors co-create (or co-destroy) value in such complex service ecosystems, an in-depth understanding is required of actors involved in service exchange. Despite the generic actor focus of SDL, most research to date has focused on dyadic actor relationships (such as provider–customer), tending to narrow the understandings regarding the generic actor (Echeverri & Salomonson, 2017). At the same time, zooming in on the collaborative relationships (Wang et al., 2018), actors’ diverging actor roles (Ekman et al., 2016), and a systems-oriented approach to value co-creation (Vargo et al., 2008) have been established as essential approaches and topics of research. While studies have shown that service exchange seldom occurs in isolation, such generic actors tend to form networks of actors, giving rise to complex and potentially conflictive actor relationships (Ekman et al., 2016; Pathak et al., 2020). In such networks, the actor role may vary from active engagement to passive avoidance, depending on the individual actor’s objectives and perceptions of derived value (Ekman et al., 2016).

2.2 The roles of technology in value co-creation

Traditionally, technology has been regarded as either an operand or operant resource, contributing to the emergence of value by enabling information sharing between actors (Akaka & Vargo, 2014; Vargo & Lusch, 2004). While the information revolution and digital transformation have been widely accredited to technological advancements (Maglio & Spohrer, 2008; Rust & Huang, 2014), and SDL research has started to acknowledge technology as focal in service provision (Akaka & Vargo, 2014; Lusch et al., 2016), research has still focused mainly on understanding interactions between human actors rather than resource integration between human and non-human actors (Kaartemo & Helkkula, 2018; Koskela-Huotari & Siltaloppi, 2020).

However, the role of technology in value co-creation (and co-destruction) becomes pivotal in the new era of cybernized services, which are by nature interactive and context-aware (Tuunanen et al., 2019). It has been proposed that emerging technologies take an increasingly active role in service exchange

(compared to more traditional digital services, such as self-service kiosks or internet banking), which may also be harnessed to balance between value co-creation and co-destruction (Vartiainen, 2019). Accordingly, Koskela-Huotari and Siltaloppi (2020) conceptualize that “actorhood is not an innate or static quality of humans. Instead, it is an outcome of the social processes that structure the roles through which individuals engage in value cocreation, as well as the personal identities that direct individuals in the selection and enactment of roles (p. 449).” While individual human actors have many social roles that drive their actions (Koskela-Huotari & Siltaloppi, 2020), recent studies have also indicated that non-human actors such as social robots or AI applications may have agency (Čaić et al., 2018; Kaartemo & Helkkula, 2018). Investigating the social roles of technological and human actors have been suggested as a way forward to understanding the non-human actorhood (Koskela-Huotari & Siltaloppi, 2020).

As studies have already indicated that technology may have agency also in the context of service exchange (Lusch et al., 2016), the traditional approach of viewing technology as a mere enabler or mediator for service exchange is partially conflicted, especially in the realm of cybernized services empowered by emerging technologies. Attaining an in-depth understanding of the potential agency of technology emerges as a focal topic of investigation to understand how human actors perceive value co-creation processes. Such insights are integral for mitigating potential adverse effects between the human and technology actors in the design and development of services. Thus, more clarifications are needed concerning alternative non-human actors (Koskela-Huotari & Siltaloppi, 2020), and research building on ANT has been called for to extend the SDL understanding of technology as actors in service exchange (Kaartemo & Helkkula, 2018).

2.3 Actor-Network Theory (ANT)

Drawing from the theoretical background of ANT, this study focuses on how technology may take part in the value co-creation and co-destruction in the context of cybernized services. In ANT, outcomes are seen to arise from the joint efforts of humans and non-human entities, such as technology, without giving inherent priority to either. In their interaction process, the human and technology actors may mutually shape each other’s activities, and as a result, the outcomes of this interaction become emergent and dependent on both humans and technology (McKenna et al., 2012). Such an interaction can alter human participants’ conception of the meaning and value of an action (Beekhuyzen et al., 2015), including stretching and altering the participants’ notion of what is deemed morally sound behavior (Beekhuyzen et al., 2015).

ANT has been used in IS for method purposes, such as developing a generalizable socio-material inquiry (Gaskin et al., 2014) and for examining the ways in which humans and non-humans are interconnected when enacting technology-dependent routines (Leonardi, 2011). In the work context, ANT has also been used for studying the dynamics of drift in digitized processes (Pentland et al., 2020) and for developing AI for working together with human experts (van den Broek et al., 2020). Although the previous studies have focused on showing how technology may take part in producing outcomes, often with unintended consequences, they have not yet covered the mechanisms by which the service providers’ original value proposition may become altered in this process in the context of cybernized services, either co-creating or co-destroying value. Such an understanding would be integral for facilitating positive value outcomes in service design and provision while avoiding adverse ones.

In IS research, it has been established that ANT may be applied for developing a unique contribution through an improved understanding of the social context of IS (Hanseth et al., 2004). For instance, Baird and Maruping (2021) theorized humans delegating and transferring rights and responsibilities for task execution to agentic IS. In the new era of emerging technologies applied in service provision, human and digital agents collaboratively contribute to the changes in (partially) merged digital and physical reality (Recker et al., 2021). Such combining of human and technological agencies has led to the lines of action becoming constant flows, where goals are undergoing transformations (Baygi et al., 2021).

As an exemplar context of cybernized services, we consider instances of Pokémon Go gaming as potential manifestations of such delegations, transferrals, and the resulting emergent transformations.

As noted above, Pokémon Go in-game characters may take independent courses of action, where the character interacts with the gamer in their real-world surroundings via AR technology. We see that these courses of action may lead to emergent outcomes that were not initially designed for the technology (e.g., the gamer risking their safety while chasing a Pokémon on a busy roadside). Not assuming a predefined micro-macro hierarchy of actors and their relationships within a network (Latour, 1996), ANT does not pose a-priori assumptions of an actor's importance for a network based on its size or proximity to the other actors (Latour, 1996). Instead, any micro-level and distant actor can yield macro-level modifications for the network, or vice versa, depending on its connections to the other actors (Latour, 1996). We note that this appears to be the case for instance, when the Pokémon Go character's AR-enabled actions unexpectedly lead the gamer astray during gaming, potentially transforming the outcome of the gaming process for them in the physical world. Therefore, we see that ANT is particularly suitable for our research aim, as it can be used for zooming in and out on actor networks roles of both human and non-human actors for uncovering how, and with what kinds of implications, such transformations emerge.

For analyzing the mechanisms by which technology mediates value co-creation and co-destruction in AR mobile games, we employ Latour's (1994) theory of technical mediation as our analytical framework. In this theory, a *network* refers to the quality of participants' union: if united, participants influence each other and make each other do something, they comprise a network. We define a participant in a network drawing from Latour (1996, p. 371) as an "actor who does some work." Here, *work* refers to the actor's capacity for producing modifications in the network comprising other actors it is part of. *Actor*, in turn, can take any form if it works as described above. The actorhood, in this case, is dependent on the participant's capability to produce these modifications. Thus, an actor can be either human or non-human, such as the game application, its virtual characters, the game provider, and gamers. *Mediation* refers to the process of actors disseminating the participants' work within and across the network (Latour, 1994). ANT allows for mapping of actors and networks revealed by researching their mediations and trials with the adjacent outcomes, such as collectives, in which all the participants, relationships, roles, and workings of an actor-network are revealed. The technical mediation can take three forms: 1) translation, where technology enables a human agent's goal attainment while potentially altering or adding to this goal in the process, 2) composition, where the human acting with a certain process towards a goal joins forces with technology with a process of its own, resulting in a third process, and 3) delegation, where a human mandates technology to carry out their own intention, altering its execution and meaning by translating and composing the goals and processes of its user (Latour, 1994).

3 Methodology

We employ ANT (Latour, 1994) and draw from the lens of SDL (Vargo & Lusch, 2004, 2008, 2017) to zoom in on cybernized service exchange. The objective was to depict instances where the technology actor is an active contributor in the resource integration and service exchange process with the user (and other involved actors), resulting in both positive (value co-creation) and adverse outcomes (value co-destruction) for the focal actor. The AR mobile game Pokémon Go was found to be a particularly interesting case for the study due to its high value co-creation (and co-destruction) potential unleashed by the interactive and context-aware AR characters (e.g., Ayers et al., 2016; Baranowski, 2016). Adopting a qualitative approach, we conducted a secondary analysis of a data set of 43 laddering interviews (Reynolds & Gutman, 1988; Tuunanen & Peffers, 2018) with the Pokémon Go gamers.

Drawing from the SDL, we conceptualize the activity of Pokémon Go gaming as a service exchange wherein gamers integrate resources with other gamers as well as the game application and in-game characters (i.e., technology actors) for value co-creation. In Pokémon Go, the gamers interact with the mobile application to "search, capture, collect, train, evolve, and battle virtual Pokémon characters (Paavilainen et al., 2017, p. 2493)" simultaneously deriving value outcomes (such as improved physical well-being) in their physical environment. In addition to the game application, the in-game characters, and peer gamers, actors directly or indirectly affecting the gamers' experiences within the service

ecosystem include, e.g., Niantic as the service provider and non-gamers/onlookers (Sergeeva et al., 2017). Some of the most integral value propositions of the service include gamers' experience of togetherness, fun, and physical exercise (The Official Pokémon YouTube Channel, 2015). Combining fun and exercise with Pokémon Go has been suggested as one of the primary motivations for the gamers to engage with the game (e.g., Kari et al., 2017). Furthermore, gamers' interactions with Pokémon Go may increase the gamers' physical and psychological well-being and a sense of social unity (e.g., Althoff et al., 2016; Kari et al., 2017). However, value co-destruction can also occur. Negative outcomes for the gamer might result, for instance, from perceived value contradictions, unmet expectations, technical challenges, or loss of resources while gaming (Lintula et al., 2018). Thus, it is integral to understand the dynamic nature of service exchange (i.e., both co-creation and co-destruction) to attain an in-depth view of how value emerges for the gamers.

The analyzed data comprehended gamers' positive and negative experiences of Pokémon Go gaming and was collected using the laddering interview technique (Reynolds & Gutman, 1988). Laddering is particularly suitable for eliciting service users' underlying goals and personal reasoning for the use of a service by structuring these as chains of attributes (e.g., system features), consequences (i.e., reasoning), and values (i.e., personal goals and values) (Peppers et al., 2003; Reynolds & Gutman, 1988). Following the laddering protocol at the beginning of the interviews, participants were presented with a list of stimuli further explained by short written scenarios (Peppers et al., 2003). Since the objective of the original study (Lintula et al., 2018) was to determine the users' reasoning for the experienced value co-destruction in the game, the stimuli collection included nine scenarios with potential value co-destruction occurrences. Participants were asked to select two scenarios they had experienced as particularly relevant in their gaming history. They were also told that if the scenarios presented did not seem to fit, it would be possible to create new ones. However, each participant could find at least two scenarios from the pre-designed stimuli collection. As the interview protocol focused on the gamers' negative experiences, the laddering interviews progressed with a series of targeted probes, presented as "What in this scenario was particularly negative for you?". The participant then began to describe a particular experience connected to that scenario. The interviewer continued probing, "And why was this negative for you?" and the participant continued reflecting. The "why" questions continued if the participant provided further explanations. When no further reasoning could be provided, the participant's ultimate value or goal was usually found. Then, this part of the interview ended, and the researcher moved on to ask questions about the next stimuli.

The co-creative experiences of the participants occurred "naturally" during the interviews as deviations from the structured laddering probes. As most of the participants were Pokémon Go enthusiasts, the rich data set included detailed descriptions of also the positive side of gaming, thus enabling us to analyze both the co-destructive and co-creative experiences in connection to the technology actor. Interpreting the qualitative, in-depth data provided us an opportunity to understand the users' goals for using the service and the role of the technology actor in translating, composing, and delegating those goals towards co-created and co-destroyed outcomes (Reynolds & Gutman, 1988). Consequently, the data allowed us to map and understand the connections between the gamers' experienced value co-creation and co-destruction outcomes and zoom in on the technology actor instigating these outcomes. We employed a qualitative content analysis, a method suitable for systematically discovering and understanding recurring meanings in qualitative data (Schreier, 2012). We reviewed the interview transcripts (n = 43) for obtaining an overall understanding of the data and used purposeful sampling (Patton, 2002) to select information-rich cases where technology appeared to have a focal role in the respondents' descriptions.

In the coding, we employed the Atlas.ti software starting from the most information-rich cases selected and continued coding until saturation was reached (Schreier, 2012). One of the authors thoroughly read the interview transcripts and coded all the instances where the informant mentioned technology in conjunction with an activity (e.g., A1: game application, A2: in-game character). These were coded as technology actors, and related experience descriptions were coded as "works" of these actors (e.g., A1W, A2W). Further, the nature of the experience was coded as positive or negative depending on the

outcome of the activity described by the informant. Saturation was reached coding ten cases (i.e., 10 separate interviews). The codes were discussed and confirmed among the authors. Subsequently, we drew from Latour (1994) to attain a structured understanding of the technology actor roles emerging in the data. We created a categorization of the technology actor roles in the service exchange process (cf. Table 2) and mapped the derived codes (i.e., the technology actors and connected experience descriptions), searching and allocating representative examples to each category—translator, compositor, and delegator (Latour, 1994)—which illuminated and confirmed the technology actor roles and activities in the service exchange process from the perspective of the gamer.

Technology actor code	Actor work (descriptive excerpt from transcript)	Outcome code	Classification	Justification
In-game character	“Last summer, there was a good feeling whenever there was a lot of people [gaming] and then we like saw somewhere and heard people running after a Bulbasaur, and someone yelled “there is Bulbasaur!” and then it was somehow so amusing and fun...”	positive	Compositor	The in-game character is making goal attainment (here: fun, gaming together) a joint effort of actors (here: gamer, other gamers, and the technology actor).
Game application	“Well, it has happened to me that on my way to work, I have wandered off elsewhere looking for a Pokémon close by or saw that there was a raid happening in which I joined with other gamers...”	negative	Translator	While supporting the gamer's original goals (gaming on the way to work), the game supports the creation of new goals for the gamer on the go. The negative outcome here ensues from the gamer being late from work motivated by game-driven impulses.

Table 1. Exemplar coding and classification.

4 Findings

This section presents our findings of technology as an actor in the AR mobile game environment of Pokémon Go. We adopt the lens of ANT (Latour 1994) and depict three roles for the technology actor: translator, compositor, and delegator (Table 2). Drawing from Latour (1994), we focus on the instances where the game application poses an active contributor in the resource integration and service exchange process with the gamer and other actors involved. Further, we zoom in on instances where the service exchange between the involved parties results in positive (potential value co-creation) and adverse outcomes (potential value co-destruction) for the gamer (i.e., the focal actor). Such occurrences showcase the complex and dynamic nature of the gamer–technology interaction within the service system of the AR mobile game. In the following, we depict each emerging technology actor role one by one.

Role	Description	Example with positive value outcomes	Example with adverse value outcomes
Translator (i.e., transforming goals)	Enabling the focal actor’s original goals while	A gamer’s interaction with the game application (i.e., integration of resources) enables the gamer’s goal of enjoyment and produces an	A gamer’s enjoyment-seeking interactions (i.e., resource integration) with the game application on the go produce a new

	spawning novel ones.	additional goal of walking longer distances, potentially leading to health benefits, i.e., improved well-being for the gamer.	goal of catching a nearby Pokémon, leading to the gamer taking a longer route to work and being late from a meeting.
Compositor (i.e., programming joint action)	Making goal attainment a joint effort of all actors, both human(s) and technology.	The game application participates in resource integration enabling the attainment of a gamer's and gaming friends' desired programs of action, such as spending time and having fun together.	The gamer's interactions with other gamers and the game application take away time from attending to non-gaming friends and family members, conflicting with the gamer's core values.
Delegator (i.e., inscribing meanings to designed functions, and users' intended goals and actions)	Participating in and affecting the meaning-making process of actor's goals and actions.	The game application shifts the experience of a simple work commute toward an exciting search for Pokémon characters, potentially enriching the gamer's everyday life.	The game application does not support (i.e., integrate resources for) the realization of gamers' initial goal of social interactions (i.e., a leading value proposition of the game). Instead, gaming becomes an activity and experience pursued alone by the individual gamers.

Table 2. Categorization of the technology actor roles in the service exchange process.

4.1 Technology as a translator

We found the technology role of *translator* sets technology as an actor supporting the gamer with their desired program of action, i.e., enabling the achievement of their goals and intentions, simultaneously challenging their original goals, and transforming them to novel ones. The gamer may, for instance, have a particular goal of enjoyment while commuting to work, but the accomplishment of that goal may not be possible without involving other actors in the process. Drawing from our data with the lens of ANT (Latour 1994), the gamer may then make a detour and seek another actor, here the AR mobile game application (i.e., technology), to support them in achieving that goal. While the game application may support the gamer in achieving their original goal, as observed in our data, it is likely that the interaction may also produce new goals for the gamer. For example, one of the informants described how the mobile application not only helped them to pursue the goal of enjoyment but spawned new in-game goals:

...the app always shows that there's another Pokémon nearby... and so I wonder if I still have a moment to run there and back to get it, taking yet another detour home. It does make me feel good having had a good run in the evening... and I also get much better sleep after being outside, and then have better readiness in my everyday life... going for a jog relaxes you after all... (Informant 13).

Further, we found that the technology actor plays an integral role in translating new goals of physical well-being (Latour 1994). Figure 1 illustrates such a gamer-game application interaction drawing from examples emerging in our data, wherein the gamer (A1) seeks enjoyment (GOAL 1) and proceeds to interact with the game application (detour to A2) to pursue this goal. In this example, together with the game application, the gamer indeed achieves their original goal of enjoyment (GOAL 1). However, the interaction between the gamer and game application leads to the formation of new goals for the gamer enthused by the game. Subsequently, the gamer sets a new goal to catch a nearby Pokémon (GOAL 2) and to walk for a longer distance with the aim to pursue physical well-being (GOAL 3). While the gamer may not have possessed such goals before, they appear to emerge from the interaction with the game application.

Interruption: Enjoyment not possible alone

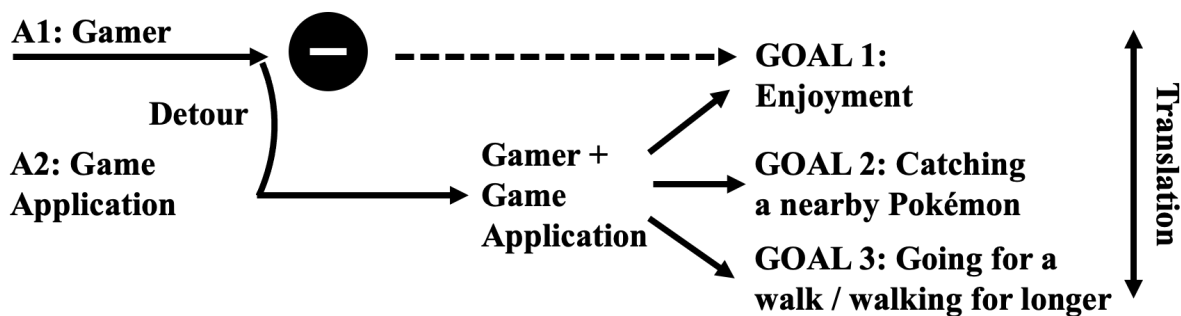


Figure 1. Example of the technology actor as a translator. Adapted from Latour (1994).

Furthermore, respondents reported not only positive but also adverse outcomes from the newly spawned goals. For instance, as the game may spark the new goal of catching a nearby Pokémon, the wondering off pursuing this goal may result in the gamer unintentionally being late from work:

---I have sometimes wondered off after a rare Pokémon on my way to the office, and yes, I also arrived late to work because of that... On the one hand, we play to have some entertainment when it's otherwise boring... it consumes a lot of time, and okay, the trip to the office may sometimes take longer when I take a detour... I didn't want to be late, but as [the in-game Pokémon character] happened to jump off, I sort of had to go after it and find it--- (Informant T36).

Well, it's happened to me that on my way to work, I have wandered off elsewhere looking for a Pokémon close by or saw that there was a raid happening in which I joined with other gamers. (Informant 21).

The above examples showcase how the interaction between the gamer and technology may lead to divergent outcomes for the gamer. Thus, our data sheds light on the goal transforming role of technology actor with respect to not only enabling the gamer's original goals but also spawning new ones, which may have either positive or adverse outcomes for the gamer.

4.2 Technology as a compositor

Emerging from our analysis, the *compositor* role of the technology actor allocates the game application in a role that actively programs action in a broader network (i.e., a composition) of actors. Accordingly, we draw from ANT (Latour 1994) and see that the technology actor shifts goal attainment toward a joint effort by multiple actors involved in the service exchange: both human and technology actors. For instance, the game application may contribute to the desired program of action (spending time/having something to do/share together), creating shared activities for otherwise less connected actors:

--- [gaming together] has allowed me to create a better connection with my son, speaking about things more with him... [while gaming] you sort of talk more and communicate more than usual... I feel we are in a better place now, or he's much more open to me, telling me things... (Informant T36).

Another example highlights how the game application may program the gamers' interactions with other gamers and non-gamers, by orchestrating collaborative goals:

...after all, connecting with this small yet active group enables the gaming for me, as with the old gym stream, taking down gyms was sort of a 10-level task and tough job, taking loads of time, "potions" and "revives", and all that one might need, so in the new collective mode it's just easier... (Informant T16).

As illustrated in Figure 2, we draw from our data with the lens of ANT positioning technology in the compositor role. We consider that the gamer (A1) has the desired program of action (such as taking down a Gym), but this goal cannot be achieved without the involvement of another actor, i.e., the game

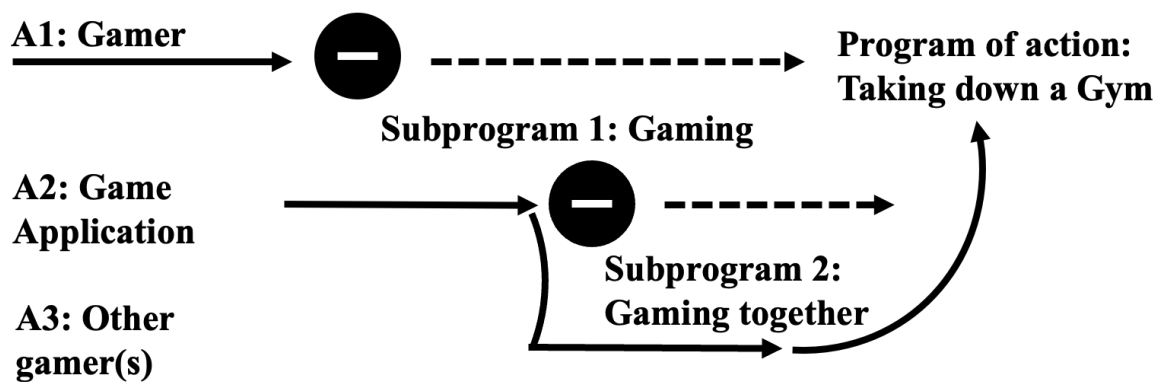


Figure 2. Example of the technology actor as a compositor. Adapted from Latour (1994).

application (A2). Thus, the first detour begins, and a subprogram of gaming is created. Still, the gamer cannot reach their goal merely together with the game application. Instead, other actors, peer gamer(s) (A3), are required, and with joint goals and collaborative effort, they may together attain a common goal (i.e., taking down a gym effectively). Thus, together with the game, the gamer (A1) takes another detour and finds other actors (i.e., other gamers) to interact with. As an optimal outcome, the composition of the three actors enables the gamer to reach the desired program of action.

However, as all partaking actors (incl. the technology actor) may have diverging goals and agendas, the composition may produce adverse outcomes or experiences for the gamer. For example, the gamer may not want to engage with others but must do so to reach the desired goal, thus resulting in a negative experience albeit the accomplished program of action. The game application may also prohibit the achievement of the mutual goal (e.g., due to malfunction) like in this instance:

...it's sort of even more disturbing when [the game] crashes at that exact moment, or something like that happens... you've just put so much mental effort into it, you know... to find out about the events and then sort of screen where there are good catches available, and finally summon a good raid crew and at the most crucial moment when you're just playing together to get that gym, game crashes... it's just so annoying to think why am I addicted to such a game. (Informant T08).

In a second example, the gamer's interaction with the game application creates discrepancies among the relationship between the gamer and their non-gaming friend/family members:

---I usually turn [the game] on when I go out for a walk, so that I can spot [Pokémon characters] on the way...and if [my friends] are with me, they tell me to put the game away... They probably perceive that I'm not fully focusing on our discussion even though I just hold the phone in my hand...it starts to annoy me when they keep repeating the same requests and ask me to sort of do something else... I want to play... but it makes it all so negative, also for myself... (Informant 19).

The former two examples showcase how the game application may interrupt collective goal attainment of involved actors (such as gamer and family/friends) as the gamer's attention is (partially) directed to the game itself, ensuing in an interaction wherein adverse outcomes of interacting with the game application emerge not only for the other non-gaming actors (e.g., not receiving attention from the gamer) but also for the gamer (e.g., negative gaming experience).

4.3 Technology as a delegator

Our analysis showcases that the technology actor may also take the role of a *delegator*, participating in the gamer's meaning-making process and inscribing positive or adverse meanings for the gamer's goals and actions. For instance, we found that interacting with the Pokémon Go application during a simple work commute may shift the experience of the work commute toward an exciting search for Pokémon characters, potentially enriching the gamer's everyday life. Drawing from Latour (1994), the mobile

application, thus, inscribes a new positive meaning, “exciting search” for the gamer’s original meaning of the action, i.e., “a simple work commute.”

However, we found that the game application may also participate in inscribing new meanings with adverse outcomes from the gamer’s perspective. For instance, while gamers often had positive exercise goals in mind using the application, sometimes the engagement required by the game application appeared as detrimental toward their other exercise-related goals, such as going to the gym:

I prioritized it [gaming] over other hobbies, and then it was a bit too good an excuse to switch from going to a gym to going for a walk, and then it started to be so that the progression/intensity of the exercise was not enough...I found myself switching to that walk [with the game] a little too often... (Informant 7).

Further, we found that the value propositions proposed by the game provider (Niantic, Inc.) regarding togetherness with other gamers were at times adversely delegated by the gamer-game application interactions. For instance, gamers may have initially engaged with the game to build more social connections and meet other gamers, but they found that the application-mediated interactions with other gamers were not supporting this meaning or goal. In some cases, this led to a situation where gamers kept engaging with the game regardless of missing the social dimension. Thus, the game application inscribed the new meaning of gaming alone in place of the original meaning of creating a gaming community and togetherness with others (cf. Figure 3), as illustrated in the following quote:

...they emphasized from the start that this is a kind of community game and there would be events where you should go with a group, but those still haven’t come...I have probably no talked to any new people, just a couple of times, talking and taking down a Gym if it has happened to be there. That kind of community is missing from the gam...it was a big part of what they were promoting in the beginning... (Informant 8).

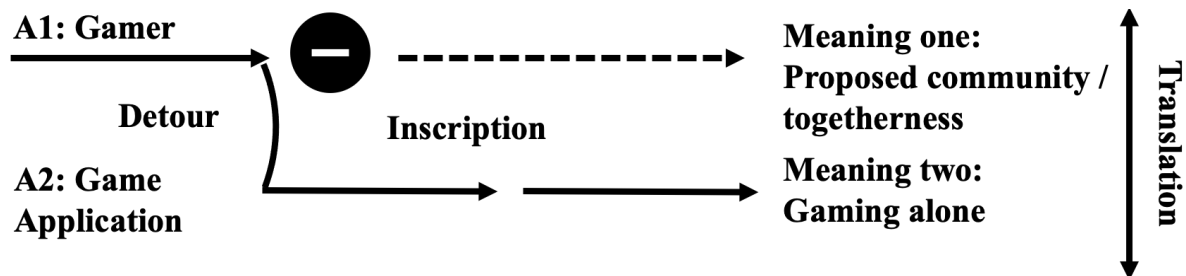


Figure 3. Example of the technology actor as a delegator. Adapted from Latour (1994).

5 Discussion and concluding remarks

Drawing from ANT (Latour, 1994), we conduct a qualitative content analysis (Schreier, 2012) depicting three emerging technology actor roles—the translator, compositor, and delegator—in the cybernized service exchange of AR mobile games. Our findings support the notion that resource integration may occur between human and non-human actors in service exchange (Koskela-Huotari & Siltaloppi, 2020), bringing forth the potential for not only value co-creation but also value co-destruction (e.g., Čaić et al., 2018; Tuunanen et al., 2019). As a novel underpinning, we draw from Latour’s (1994) insights on actor networks to illuminate human and non-human actor interactions with the SDL lens (Vargo & Lusch 2004) of value co-creation and co-destruction. Accordingly, we showcase empirical evidence of the three emerging roles taken by the technology actor and resulting outcomes, as described by Pokémon Go gamers.

First, we propose the technology actor role of translator, which represents the technology actor’s potential ability to not only enable but also create new goals for the technology—user interaction.

Accordingly, we draw from SDL (Vargo & Lusch, 2004) and argue that the focal actor (e.g., the gamer) may integrate resources, such as time and skills with the technology actor (e.g., the AR mobile application) to co-create value (e.g., enjoyment, and physical well-being), potentially resulting in the co-creation of new goal(s). Such a goal-transforming influence of the game application on the gamer underlines the technology's role as an actor rather than a mere resource utilized to pursue the actor's inherent goals. Further, with examples from our data, we showcase how the novel transformed goals may result in not only co-creation but also co-destruction of value, as the resource integration between the gamer, technology, and potential other actors was found to lead to either positive or adverse outcomes for the gamer. Second, we draw from ANT (Latour, 1995) to understand the emerging technology actor role of a compositor, acting as a programmer of action in a network of other actors. Drawing from our analysis and SDL, we conceptualize that the focal actor may co-create value by integrating resources with the game application and subsequently with other actors (i.e., peer gamers) who participate in such a value co-creation process by integrating their resources. Further, we find that the newly programmed collective actions may also interrupt the collective goal attainment, leading to adverse outcomes for the involved actors. Thus, our findings reinforce the understanding that the gamer—application relationship may be considered as human and non-human actor interactions (Kaartemo & Helkkula, 2018), which do not take place in isolation but as a part of a broader network of actors (Ekman et al., 2016; Pathak et al., 2020). Finally, we posit the technology actor in the potential role of the delegator, representing the meaning-making ability of technology in service exchange. Our analysis showcases occurrences wherein technology inscribed new meanings to the gaming as perceived by the focal actor (i.e., the gamer), which may have either positive or adverse outcomes and implications on the focal actor.

Thus, our empirical findings aggregately illustrate the dynamic roles technology may take not only as a co-creator for positive outcomes but also a co-destructor of value leading to adverse outcomes in cybernized service exchange (Echeverri & Skålén, 2011; Plé & Chumpitaz Cáceres, 2010). Such duality between value co-creation and co-destruction was indicated as implications of the three emerging roles (cf. Table 2.) For instance, within the translator role, value co-creation may occur when a gamer integrates resources with the game application, enabling the gamer's goal of enjoyment and simultaneously producing the additional goal of walking longer distances. With the SDL lens, the creation of such a novel goal may be regarded as an acceptive response to a newly emerging value proposition of health benefits offered by the game provider (Vargo & Lusch, 2004). However, the potential of value co-destruction also exists. For instance, within the translator role, a gamer may participate in resource integration with the game application to experience excitement or enjoyment on their way to work. Aside from value co-creation, the resource integration with the application may lead to the gamer desiring to catch a nearby Pokémon (a new goal), leading to the gamer taking a longer route to work and being detrimentally late from a meeting, indicating misuse of resources and value co-destruction (Plé & Chumpitaz Cáceres, 2010). In the same vein, the delegator role of the technology indicates an interesting duality between meaning-making. For example, we see that integrating resources with the game application may lead to the technology actor producing a shift of the experience of a simple work commute toward an exciting search for Pokémon characters, potentially enriching the gamer's everyday life, indicating value co-creation. On the value co-destruction side of the delegator role, we find that, at times, the game application did not integrate the resources required for the fulfillment of the value proposition of social interactions. Instead, the application's non-integration of resources (Plé, 2016) descended the gaming experience toward an individual, "lonely" activity.

While emergent studies have suggested that technology may have processes and practices (Akaka & Vargo, 2014) and even agency (Kaartemo et al., 2019), research has tended to treat technology as a resource or an artifact distinct from users (Akaka & Vargo, 2014). The social theory of ANT has been suggested to have the potential for contributing with a deeper understanding of the technological artifact and its potential agency in IS use (Hanseth et al., 2004). Such an understanding becomes particularly integral as IS are increasingly designed, developed, managed, and understood as cybernized services (Tuunanen et al., 2019), wherein users integrate resources with other users and technological artifacts for mutual co-creation of value (Rai & Sambamurthy, 2006). With the rise of emerging technologies,

service researchers have begun to discuss AI applications and robots as potential actors (Kaarremo & Helkkula, 2018; Koskela-Huotari & Siltaloppi, 2020) and contributors to value co-creation or co-destruction (Čaić et al., 2018). However, as IS and emerging technologies are increasingly embedded in cybernized service exchange occurring in our everyday lives, we argue that a shift is needed for viewing technological applications as potential actors contributing to value co-creation/destruction. Drawing from ANT (Latour, 1994), our analysis develops a bridge between IS and service research, zooming in on technology actors and understanding their perceived agency. We propose that any technological application may be viewed as an operand or operant resource in service exchange, and upon enactment, as an actor (Latour, 1994).

Accordingly, we contribute to the evolving discourse on service management thinking within the IS community (e.g., Rai & Sambamurthy, 2006; Tuunanen et al., 2019). Further, we contribute with empirical evidence to the newly emerging SDL shift toward viewing technological applications as potential actors that may take divergent roles, potentially going beyond their designed practices and processes (Akaka & Vargo, 2014) and enablement of the service (Koskela-Huotari & Siltaloppi, 2020). Zooming in on technology actors through their perceived agency, our analysis addresses the calls for shedding light on how human and non-human actors may interact for value co-creation (Kaarremo & Helkkula, 2018) and the potential roles taken by technology (Koskela-Huotari & Siltaloppi, 2020), wherein ANT has been particularly called for as a fruitful path (Kaarremo & Helkkula, 2018).

We also respond to the calls for more empirical investigations into the formulation of adverse outcomes of service exchange, i.e., value co-destruction (Ostrom et al., 2021; Plé & Chumpitaz Cáceres, 2010). As practical implications, the depicted technology actor roles provide IS and service development with novel perspectives to understanding the service user's experience and perceptions of how value may be derived. While technology is often considered an enabler of service exchange, technology may also take independent courses of action, sometimes leading to undesired outcomes. We see that acknowledging the potential agency of technology in value co-creation, and co-destruction may be a key for patching gaps between value proposed to and realized by the user. Accordingly, practitioners ought to zoom in on the potential roles of technology—a task for which our categorization provides useful tools.

While appropriate for obtaining contextual insights, a contextualized study may pose limitations for the development of theoretical knowledge. We acknowledge that our study may not be generalizable to all cybernized services and contexts. Instead, we have only scratched the surface applying ANT in investigating technology actor roles on the quest to extend prevalent IS and service research views on human and non-human actors' interactions. Thus, we recognize a need for more research into value co-creation and co-destruction with and by technology actors in divergent contexts toward developing aggregated theoretical insights. Our application of ANT presupposes that it is the human who initiates the joint action with technology: even when colliding with a speed bump, it is the human who comes into the premise (Latour 1994). This supports the idea that through human initiation, both human and digital agents may collaboratively contribute as actors in service exchange (Recker et al., 2021). Accordingly, we acknowledge that in Pokémon Go, the gamer initiates action by installing and opening the game application, likely with the intention to engage with the game and allow the game to start mediating actions. However, we believe that in some instances, cybernized services may be capable of initiating actions within their technological boundaries, fostering digital engagement. Implications of such instances may be interpreted from Pokémon Go gamers who end up gaming due to pressure posed by the persistent ques of the application (Lintula et al., 2018). Therefore, going beyond the Latourian view of human-initiated action, we see that more investigations are needed in analyzing the initiative power of cybernized services in divergent contexts. Future research might also aim to derive mechanisms for the transition of technology from resource to a particular actor role. With a strong potential to contribute to the practice of IS/service design, a subsequent topic of investigation might build on such an understanding of technology roles and develop scales for assessing human and non-human actors' interactions.

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