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## Abstract

*In the 1990s, the broad diffusion of the internet allowed firms such as Amazon, eBay, and Google to invent new digital business models. Since then, research has formalized recurring configurations as digital business model types, still frequently being used to analyze existing business models and develop new ones. Now, the next wave of digital transformation – enabled by ongoing improvements in processing power, the miniaturization of hardware, and ubiquitous wireless connectivity – is again driving innovation. For instance, in the mobility sector, startups such as Uber, Turo, and Streetline have formed business logics that cannot be understood with existing types. Therefore, we identified and formalized new business model configurations by systematically analyzing a comprehensive data set of technology startups from the US mobility sector. We found that, in order to adequately account for the new digital logics, 14 digital business model types must be added to existing collections: app developer, autonomous products/robots manufacturer, data analytics provider, integrator of third-party services, IT-enabled self-service provider, IT-guided service provider, manufacturer of connected physical products, manufacturer of connectivity devices for physical products, mobilized service provider, P2P goods sharing platform, P2P information sharing community, P2P service provision platform, seller of sensor information, and sensor-enabled service innovator.*

*Keywords: Digital Business Model Types, E-Business Model Types, Mobility Sector, Startups, CrunchBase.*

# 1 INTRODUCTION

In the 1990s, new opportunities stemming from the broad diffusion of the internet led to a transformation of large parts of the economy (Porter 2001). These opportunities enabled new digital business model types, such as Google's content-targeted advertising model, Amazon's virtual merchant model, and eBay's auction broker model (Rappa 2001). Today we are facing the next wave of digital transformation, facilitated by ongoing improvements in processing power, the miniaturization of hardware, and ubiquitous wireless connectivity (Porter and Heppelmann 2014). This time also industrial-age manufacturing industries are affected more strongly, as key functionalities of physical products, such as cars, are being digitized (Yoo 2010). Thus, the next phase of digital transformation is so far-reaching that research has postulated that IT strategy in the future must be an integral part of business strategy (Bharadwaj et al. 2013).

To understand new digital business logics that deviate fundamentally from their previous knowledge (Hylving and Schultze 2013), managers are more frequently thinking in terms of business models (Priem et al. 2013). The business model concept is a useful lens for better understanding the digital transformation on a level that goes far beyond anecdotal stories, because it serves as intermediary construct between technological inventions and the creation of economic value (Al-Debei and Avison 2010). Already in the 1990s and early 2000s several researchers have identified recurring business model configurations with common characteristics and formalized them in collections of digital business model types (e.g., Applegate 2001; Hanson 2000; Rappa 2001; Timmers 1998; Weill and Vitale 2001). Such business model types allow researchers to systematically analyze individual firms, differences among several firms, and the changes of one or several firms over time (Weill et al. 2005).

However, in the meantime important advances in digital technologies, "viewed as combinations of information, computing, communication, and connectivity technologies" (Bharadwaj et al. 2013, p. 471), were achieved. Ubiquitous information systems, e.g., smart phones, have become an integral part of everyday life (Vodanovich et al. 2010). Formerly composed purely of mechanical and electrical parts (Porter and Heppelmann 2014), products are now more frequently embedded in a new layered modular architecture (Yoo et al. 2010). Thus, today's digital business models look different than they did more than a decade ago – for instance, customers can become co-creators of value (Veit et al. 2014; Lusch et al. 2007) and multi-sided ecosystems are replacing linear value streams (El Sawy et al. 2010). Therefore, collections of business model types from the 1990s and 2000s are not up-to-date any longer and thus must be updated.

The personal mobility sector is particularly suitable to study new digital business models that have recently emerged. The strategy consultancy Roland Berger (2015) has found that the current digital transformation will hit the automotive industry faster and harder than any other manufacturing industry. Large IT companies have recently shifted their focus to the mobility sector, for instance, Google providing maps for navigation (Google Maps), intermediating vehicle insurances (Google Compare), and developing autonomous cars (Google Self-Driving Car Project). Recently, rumors have arisen that also Apple is developing a self-driving vehicle (The Guardian 2015). Incumbent firms such as BMW are transformation their business model now also providing services such as car sharing (Drive Now), parking services (ParkNow, park@myHouse), and city portals (MyCityWay). Further, numerous startups have emerged in this sector, including the P2P ride sharing platform Uber, which is already valuated higher than 80% of the S&P 500 companies such as Ford Motor Company, General Motors Company, and Delta Air Lines (Bloomberg 2015).

Therefore, several of the most frequently cited articles on the current digital transformation use examples from the mobility sector to demonstrate key aspects of this next wave of IT-driven competition (e.g., Bharadwaj et al. 2013; Porter and Heppelmann 2014; Yoo et al. 2012). So far, research on the mobility sector has started to investigate the transformation of incumbent firms (e.g., Desyllas and Sako 2013; Henfridsson and Yoo 2014; Hylving and Schultze 2013). In contrast, with this research we focus on startups, whose business models we assume to be more disruptive because

different from incumbents they do not rely on existing organizational structures, processes, and dominant logics (Christensen and Overdorf 2000).

The objective of this research is to discover new digital business model types that are missing in prior collections by analyzing startups from the mobility sector. To do so, we proceed in four major sections. First, we review existing literature on digital business model types. Second, we use the world's most exhaustive startup database to identify technology startups from the mobility sector, classify their business models, and discover recurring digital business model types. Third, we explain each digital business model type identified in greater detail and integrate our results with prior research. Finally, we discuss implications for theory and practice before we conclude.

# 2 BACKGROUND

## 2.1 Business model types

The business model is a useful tool to analyze and design a firm's business logic (Veit et al. 2014). During this process it helps managers to focus the most relevant aspects for the creation of economic value (Amit and Zott 2012). As changes regarding the business model are harder to replicate than product innovations (Amit and Zott 2012), they are considered a strong indicator of competitive advantage (Magretta 2002). Thus, in order to stay successful, companies must adapt their business model over time to changing environmental conditions (Demil and Lecocq 2010).

Most research on business models can be assigned to one of the following two streams (Hedman and Kalling 2003): the description of components belonging to a business model (e.g., Hedman and Kalling 2003; Osterwalder and Pigneur 2010; Teece 2010) or the identification of different business model types (e.g., Andrew and Sirkin 2006; Gassmann et al. 2014; Weill et al. 2005). With this research we focus on the second stream. Business model types, i.e., abstract instances with common characteristics (Osterwalder et al. 2005), allow to quickly analyze the existing business models of companies (Amshoff et al. 2015). During business model innovation, they function as a valuable source for creativity (Johnson 2010). Furthermore, companies thinking in business model types are forced to explicitly decide which model they want to apply (Andrew and Sirkin 2006). As we focus on those business model types, which are digital, we further elaborate on them below.

## 2.2 Digital business model types

Veit et al. (2014, p. 48) define a business model as digital "if changes in digital technologies trigger fundamental changes in the way business is carried out and revenues are generated". The authors refer to Venkatraman's (1994) five levels of IT-enabled transformation and require these changes to be part of the fourth or fifth level, i.e., business network redesign or business scope redefinition.

In order to identify existing digital business model types from prior literature, we conducted a comprehensive review. We searched in common databases (e.g., EBSCO, Web of Science, Google Scholar) for several search words (e.g., digital business models, e-business models, internet business models, business model types, business model taxonomy) and also used forward and backward referencing (Webster and Watson 2002) to identify additional articles. In addition to the original sources, we identified several reviews on digital business model types (e.g., Hedman and Kalling 2003; Lam and Harrison-Walker 2003; Zott et al. 2010), whose articles in scope we have also added to our sample. Therefore, we are confident to have identified the vast majority of relevant literature. Next, we excluded articles from our sample that were not dealing with digital business model types (according to the above mentioned definition from Veit et al. 2014), but rather with business model types in general (e.g., Gassmann et al. 2014; Johnson 2010; Tuff and Wunker 2010).

In total, our search revealed 12 studies of digital business model types (Table 1). Some authors present a few rather generic business model types (e.g., Tapscott et al. 2000), whereas others provide detailed lists of different types and examples (e.g., Rappa 2001). The applied research methodology, if described, is either conceptual (e.g., Timmers 1998) or an empirical analysis of real-world examples

(e.g., Bienstock et al. 2002). The individual business model types are unstructured (e.g., Eisenmann 2001), grouped into categories (e.g., Hanson 2000), or mapped on one or two dimensions (e.g., Timmers 1998).

| **Source** | **Number of business model types** | **Research methodology** | **Structure** |
|---|---|---|---|
| Applegate 2001 | 24 | Conceptual, along the value chain | 6 categories: focused distributor models, portal models, producer models, infrastructure distributor models, infrastructure portal models, infrastructure producer models |
| Bienstock et al. 2002 | 11 | Empirical, taxonomy through analysis of 400 websites | 6 dimensions: number of buyers, number of sellers, type of seller, price mechanism, nature of product, frequency of offering |
| Clemons 2009 | 9 | n.a. | 2 categories: selling virtual things, selling access to customers |
| Eisenmann 2001 | 8 | n.a. | n.a. |
| Hanson 2000 | 18 | n.a. | 5 categories: enhancement, efficiency, effectiveness, provider pays, user pays |
| Hartman et al. 2000 | 5 | n.a. | n.a. |
| Rappa 2001 | 41 | n.a. | 9 categories: brokerage, advertising, infomediary, merchant, manufacturer, affiliate, community, subscription, utility |
| Strauss and Frost 2014 (initial version from 2001) | 20 | n.a. | 1 dimension: level of business impact |
| Tapscott et al. 2000 | 5 | Empirical, analysis of more than 200 case studies | 2 dimensions: economic control, value integration |
| Timmers 1998 | 10 | Conceptual, along the value chain | 2 dimensions: functional integration, degree of innovation |
| Weill and Vitale 2001 | 8 | Empirical, from consulting work | Alphabetical order |
| Wirtz et al. 2010 (initial version from 2000) | 4 | n.a. | n.a. |
| **Sum** | **163** | | |

*Table 1. Literature on digital business model types.*

However, at least the initial versions of nearly all collections stem from the early 2000s. The authors refer to business models on the web (Rappa 2001), b-webs (Tapscott et al. 2000), electronic business models (e.g., Applegate 2001), internet business models (Eisenmann 2001), internet monetization systems (Clemons 2009), web business models (Bienstock et al. 2002), and web benefits to firms (Hanson 2000). These types – although still relevant today – almost exclusively refer to business models arising from the diffusion of the internet.

In the meantime, important advances in digital technologies have changed our society and transformed various sectors of our economy (Lucas et al. 2013). The use of mobile phones has become the norm and thus digital natives typically are always and everywhere connected (Vodanovich et al. 2010). Sensors turn traditionally physical products into smart devices (Porter and Heppelmann 2014). New layered modular product architectures force companies to cooperate on one layer whereas they compete on another (Yoo et al. 2010). Belonging to the right digital ecosystems is considered to be a

strong competitive advantage for firms, but on the other hand short-lived due to frequent changes (El Sawy and Pereira 2013).

Therefore, we argue that in the recent years new digital business model types have evolved that are different from those stemming from the 1990s and early 2000s. To investigate, in the next chapter we analyze a large data sample of business model innovations by technology startups from the mobility sector in the recent decade.

# 3 RESEARCH METHODOLOGY

The objective of our research was to identify new types of digital business models that have evolved from the application of innovative digital technologies. To do so, we analyzed companies from the personal mobility sector, including the automotive and passenger transport industries. By analyzing this sector rather than the whole economy, we could compare the employment of digital technologies in specific business models in much greater detail. In contrast, analyzing all companies would either be extremely complex and potentially confusing or be relatively superficial, omitting important details. We found the mobility sector to be a particularly relevant field for our study due to several reasons. First, it is an industry with physical products that are consistently being enriched by digital functionalities (Henfridsson and Lindgren 2010). But in contrast to other sectors such as media, these physical products (e.g., vehicles) will very likely never diminish. Second, ubiquitous IS (Vodanovich et al. 2010) offer special opportunities in this sector as they allow for the real-time connection of formerly loosely coupled infrastructures, vehicles, and people. Third, due to these changes, incumbent firms have been adapting their business models (e.g., the vehicle manufacturer BMW offers new services such as car sharing and parking) and many new startups have been entering the market (e.g., Uber, the world's highest funded startup (New York Times 2015; Quartz 2014)).

With our analysis we decided to focus on startups because we assume their business models to be purer and more disruptive than those of incumbents, who can also make incremental adjustments just to secure digital options (Sambamurthy et al. 2003). For instance, BMW's core business is the production and sale of vehicles, whose profits can be used to subsidize innovative but potentially unprofitable business models. In contrast, startups depend on their business models to be functional by themselves. Furthermore, startups are free of several factors that make disruptive innovations by incumbents more difficult, e.g., existing budgeting processes and a well-established business model (Christensen and Overdorf 2000). Startups are also considered to launch new business models at earlier stages (Koch 2015). Finally, the stars of the last digital transformation through the internet – e.g., Google, Amazon, and eBay – were mostly startups finding new ways to use the internet rather than incumbents transforming their business models.

The data we analyzed came from CrunchBase, the world's most comprehensive database for high technology startups (Marra et al. 2015). CrunchBase was founded in 2007 and is operated by TechCrunch, a highly regarded blog on digital innovations (Block and Sandner 2009). The database contains nearly 300,000 company profiles, which are maintained by a community of more than 10,000 contributors. Unlike many other databases, CrunchBase also contains startups that are still in the funding phase, which allows for capturing business model innovations at very early stages. Due to these advantages, researchers are increasingly using this data source to analyze startups and venturing (e.g., Block and Sandner 2009; Marra et al. 2015; Spiegel et al. 2011; Werth and Boeert 2013; Yu and Perotti 2015).

We adapted the research design from Andersson et al. (2013), who identify generic archetypes of P2P service sharing platforms by analyzing ride sharing platforms, and slightly adjusted it to our needs. Most importantly, we used an established coding scheme from Weill et al. (2005) and thus did not rely on an explorative pilot study. Furthermore, we did not employ the diverse case selection technique – Andersson et al. (2013) selected 41 ride sharing platforms – as we conducted a comprehensive analysis. Thus, we proceeded in three phases (Table 2). First, startups employing digital business

models from within the mobility sector were identified. Second, two independent researchers analyzed and classified their business models. Third, recurring digital business model types were identified.

| | **Phase 1: Identification of startups from the mobility sector with digital business models** | **Phase 2: Analysis and classification of business models** | **Phase 3: Identification of recurring digital business model types** |
|---|---|---|---|
| Steps | • Search for companies from the mobility sector<br>• Filter for:<br>– Duplicates<br>– Bankrupt companies<br>– Non-startups<br>– Wrong classifications from other sectors<br>– Non-digital business models | • Collect additional information on startups<br>• Cluster startups through two independent researchers according to:<br>– Rights being sold<br>– Types of assets involved | • Pre-group companies with identical or very similar business models<br>• Identify recurring roles of digital technologies among different business models |
| Source | CrunchBase database, homepages of startups | CrunchBase database, homepages of startups, third-party sources | Coded business models |
| Results | 3,545 instances identified; 487 after filtering | Business models of 487 companies coded | 27 digital business model types identified |

*Table 2. Research design overview.*

### 3.1 Identification of startups with digital business models from the mobility sector

The CrunchBase database was accessed through a non-commercial use license for academic research. We used the CSV-export functionality and extracted all organizations listed on August 30, 2015 for the US market, which accounts for more than one-third of all organizations listed and contains many of the world's most innovative and valuable startups (e.g., Uber, Airbnb, and Dropbox). The initial data sample contained 112,117 organizations.

Next, we searched for companies from the mobility sector by searching the description of each organization for several keywords. We successively expanded the keywords by adding strings that frequently appeared in the descriptions of the initial companies that we identified. The final string contained 36 search words (*aircraft; airline; airplane; automobile; automotive; bicycle; bike; boat; *bus *; bus.; *car *; car-; car.; cars; commute; driver; flight; gas station; motorbike; motorcycle; navigation; parking; passenger; * plane *; railway; ride; scooter; * ship *; ship.; taxi; *train *; train.; transport; travel; valet; vehicle*) and led to a sample of 3,545 organizations.

Afterwards, we applied several filters to ensure that we would only be analyzing startups from the mobility sector with digital business models. First, we filtered for duplicate instances by using the ID and the name columns. Second, we excluded all bankrupt companies by testing whether the webpage was still functional. Third, we defined startups as companies that have existed for a maximum of 10 years (similarly to, e.g., Spiegel et al. 2011), i.e., were founded in 2005 or later, and excluded all other companies. This time period is particularly useful because many digital technologies that are insufficiently covered by existing collections of digital business model types, e.g., the mobile internet, started their broad diffusion after 2005. For instance, the first iPhone was introduced in 2007. Fourth, we filtered for companies belonging to the personal mobility sector, i.e., the companies must directly support people in getting from one place to another or offer assisting products and services. We excluded all other companies, such as those from the logistics industry that transport goods, not people. Fifth, to evaluate whether a business model is digital, we used the definition of Veit et al. (2014) and thus only included those that depend on digital technologies and would not be functional otherwise. For instance, a traditional car dealership that also lists its inventory online does not employ a digital business model, whereas a car dealer that operates purely online – i.e., does not offer

stationary car sales – employs a digital business model. In total, the filtering process resulted in a final data sample of 487 startups from the mobility sector with digital business models.

### 3.2 Analysis and classification of business models

To better understand the individual business models in our relatively large sample of nearly 500 companies, we pre-classified them. In order to adequately classify all companies from the data sample, the coding scheme had to be mutually exhaustive and collectively exhaustive. Furthermore, it had to be able to also classify digital business models that were not purely directed to the web, but also using other digital technologies. None of the typologies of digital business model that we identified during our literature review, however, fulfills these requirements. Furthermore, also the majority of typologies for general business models (which we had already systematically reviewed for another research project) does not fulfill these requirements. The only exception that we could identify stems from Weill et al. (2005), who already proved the usefulness of their classification scheme by examining the performance of the business models of the US's top 1,000 firms. The framework classifies a company's business model along the two dimensions rights being sold and type of asset involved. Each of the two dimensions has four characteristics (Table 3), which means that 16 combinations are possible.

| **Dimension 1: Rights being sold** | **Dimension 2: Type of asset involved** |
|---|---|
| • **Creator:** Designs, produces, and sells a product by transforming raw materials and components delivered from suppliers.<br>• **Distributor:** Buys a product and resells it without significantly transforming it.<br>• **Landlord:** Sells not the product but rather the right to use a product for a specific time period.<br>• **Broker:** Facilitates a transaction between a buyer and a seller, often in exchange for a commission. | • **Financial:** Includes cash, stock, bonds, and insurance policies as well as other assets that give their owners rights to potential future cash flows.<br>• **Physical:** Includes durable items (such as houses, computers, and machine tools) as well as non-durable items (such as food, clothing, and paper).<br>• **Intangible:** Includes legally protected intellectual property (such as patents, copyrights, and trademarks) as well as other intangible assets.<br>• **Human:** Includes people's time and effort (and for legal reasons can only be combined with the rights-selling dimensions landlord and broker). |

*Table 3. Dimensions to classify business model types (Weill et al. 2005).*

Two independent researchers coded all 487 companies from the data sample in parallel along the two dimensions from Weill et al. (2005). Each researcher was using a triangulated approach and combining the information from the description field of the CrunchBase database with independently researched information from the company's homepage as well as third-party sources, such as press articles. We started the coding process with a random sample of 50 companies and achieved an inter-rater reliability of 82%. Afterwards, we discussed each deviation and – if necessary – consulted a third researcher to agree on a specific coding. Based on this first result, we defined some of the categories more precisely and agreed on common rules for coding. For instance, we agreed to classify all transportation services in which another driver is transporting a passenger, e.g., a taxi, bus, or airline, as a human asset (the driver), even though a physical asset (the vehicle) is also involved. We then classified the remaining instances with an inter-rater reliability of 87%. Again, we discussed each division and, where necessary, consulted an independent third researcher to agree on a final coding. During the coding, we also collected additional information on each company, which we added to our data sample, e.g., more detailed company descriptions. The final distribution of companies within the coding scheme can be found in Table 4.

| Rights being sold | Type of asset involved | | | | |
|---|---|---|---|---|---|
| | Financial | Physical | Intangible | Human | **Total** |
| Creator | 0% | 15% | 0% | 0% | **15%** |
| Distributor | 0% | 4% | 0% | 0% | **4%** |
| Landlord | 3% | 3% | 29% | 8% | **43%** |
| Broker | 1% | 16% | 5% | 16% | **38%** |
| **Total** | **4%** | **38%** | **34%** | **24%** | **100%** |

*Table 4. Classification of digital startups from the US mobility sector.*

### 3.3 Identification of recurring digital business model types

The coding scheme from Weill et al. (2005) proofed very useful for the systematic identification of digital business model types, as it immediately reveals two important aspects – the rights being sold and the asset involved – of each company's business model. We analyzed our data sample cell by cell, which significantly reduced the complexity as we had to analyze 487 companies in total. For instance, the cell "broker and physical" contained 77 companies (16% of the 487 companies). One company belonging to this cell is Turo (previously known as RelayRides), employing a P2P car sharing business model. Turo has built a digital platform allowing customers to rent cars from each other. The transaction is initiated via an app, and then customers arrange vehicle handover and return by themselves. We found that 8 additional companies operate a P2P car sharing platform. Furthermore, an additional 16 companies employ a comparable business model allowing customers to rent other physical goods from each other, including bikes, boats, and parking spaces. Thus we assigned all 25 companies as employing the business model type *P2P goods sharing platform*. Companies in the cell "broker and physical" also employ the digital business model types *B2C marketplace for physical goods* (e.g., autoweb), *P2P marketplace for physical goods* (e.g., Beepi), and *service comparison portal* (e.g., Car Rentals Market).

After we had analyzed each cell of our coding scheme the same way, we also compared for similar digital business model types across cells and if useful combined them. For instance, *service comparison portals* can be found in the cell "broker and financial" (e.g., CoverHound comparing car insurances), "broker and physical" (e.g., Car Rentals Market comparing car rental offers), and "broker and human" (e.g., RepairPal comparing auto repair shops). Furthermore, we allowed for one company to employ multiple digital business model types because they are just describing selected recurring elements of companies' business models (Weill and Vitale 2001). In total, our systematic analysis revealed 27 distinct types of recurring digital business models, which we further describe in the next chapter.

## 4 RESULTS

To increase readability, we arranged the 27 digital business model types identified by the rights being sold (according to Weill et al. 2005). The list comprises 5 manufacturers, 1 distributor, 12 landlords, and 9 brokers. Each digital business model type is provided with a short description as well as several sample companies from the mobility sector (Table 5).

However, not all of the digital business model types are completely new. For instance, the business model type *manufacturer direct sales* can already be found in existing literature as "manufacturer direct model" (Rappa 2001, p. 1), "direct distribution" (Strauss and Frost 2014, p. 58), or "direct to customer" (Weill and Vitale 2001, p. 21), with Dell as the most frequently mentioned example. This mostly accounts for those types that use Internet technology as part of their business models but do not rely on mobile internet, sensor information, or other more recent advances in digital technologies. Therefore, two independent researchers compared each of the 27 identified digital business model types with the 163 digital business model types from prior research (Table 1). They identified equivalents for 13 of the digital business model types in the existing literature (see Appendix 1 for

these sources), whereas the other 14 were not included in literature on digital business model types, which is indicated in the last column of Table 5.

Due to space limitations we had to exclude further details for the digital business model types, which we have created during this research project. Amongst others, we identified the degree of digital technologies that is embedded in each type, analyzed the business model components (i.e., value proposition, value delivery, value creation, and value capture) that are affected by each type, and searched for companies from other industries applying the digital business model types.

| | **Digital business model type** | **Description** | **Sample companies (short description)** | **New?** |
|---|---|---|---|---|
| **Creator** | Autonomous products/robots manufacturer | Produce and sell products that use digital technologies to independently perform services formerly conducted by humans | Auro Robotics (autonomous car), next V3.0 (autonomous transportation) | Yes |
| | Manufacturer direct sales | Produce and sell physical goods directly to the customer online, often allowing customization | Bolt Motorbikes (electric motorcycle), Mission Bicycle Company (bikes) | No |
| | Manufacturer of connected physical products | Produce and sell physical products that are connected to the internet and thus can be complemented by additional services | bluesmart (connected luggage), superpedestrian (connected bikes) | Yes |
| | Manufacturer of connectivity devices for physical products | Produce and sell a device that can be attached to a physical good, thereby connecting the good to the internet and serving as a platform for new services | Zubie (connectivity platform for cars), Veniam (connectivity platform for public transport) | Yes |
| | Manufacturer of IT devices | Produce and sell IT devices such as displays and computers | Hammerhead (bike navigation system), Skully (motorcycle helmet head-up display), SenseDriver (car head-up display) | No |
| **Distrib.** | Online reseller | Buy and resell physical products purely through the internet | SailRadios (online ship equipment shop), Carvana (online car dealer), 2WheelPros (online motorcycle equipment shop) | No |
| **Landlord** | App developer | Develop and sell mobile applications via app stores for smartphones | travefy (app to plan group trips), loungebuddy (app to access airport lounges), driversiti (app to monitor and teach on safe driving) | Yes |
| | Data analytics provider | Analyze large amounts of data to make predictions by applying big data and other technologies | metromile (usage-based car insurance), Transit Labs (data analytics for public transit), Hopper (prediction of airfares) | Yes |
| | Digital service provider | Provide services completely through use of digital technologies, replacing a traditionally non-digital service | Triptive (online loans for trips), Passport (mobile payment for parking and transit), Confident Financial Solutions (online loans for auto repair) | No |
| | IT-enabled self-service provider | Replace traditionally necessary service staff and processes with IT, thus allowing customers to service themselves | Zagster (B2C bike sharing), Scoot (B2C scooter sharing), ChargePoint (e-mobility charging infrastructure) | Yes |
| | IT-guided service provider | Guide semi-professional/unskilled service staff with IT, thereby replacing more professional staff | Uber (commercial ride sharing), Diagnostic Innovations (digital vehicle diagnosis assistant) | Yes |
| | Mobilized service provider | Enable traditionally stationary services to be provided on the go through localization technologies | Earth Car Wash (mobile car wash), ZIRX (mobile valet parking), Joule (car ownership as a service) | Yes |

| | | | | |
|---|---|---|---|---|
| | Publisher model | Publish journals online, e.g., articles, videos, reviews | Electric bike review (reviews of e-bikes), Driverless Transportation (information on autonomous vehicles), Carcarekiosk.com (videos for car repair) | No |
| | Sell services online | Use the internet to sell services online, often allowing customers to request new services on-demand | Silvercar (online car rental), Buster (on-demand bus), Fly Blade (on-demand helicopter) | No |
| | Seller of sensor information | Sell information gathered from multiple sensors | Motionloft (sensors to count pedestrians), Streetline (sensors to monitor parking spots), WeatherCloud (wheather sensors for cars) | Yes |
| | Sensor-enabled service innovator | Use sensor information to provide new or better services, such as a more accurate pricing | Metromile (usage-based car insurance), KidzJet (tracking of kids during bus transport), Rideleap (dynamic tracking and booking of buses) | Yes |
| | Software provider | Develop and sell software to businesses or consumers | VesselVanguard (maintenance software for boat owners), TowerSec (embedded car cyber security software), luum (software for management of parking facilities) | No |
| | Third-party information aggregator | Collect large amounts of third-party information and provide customers with the information necessary for a specific situation | Vehiclehistory.com (vehicle record information), GoScopia (information on stations and schedule), RideScout (intermodal transportation information) | No |
| **Broker** | B2C marketplace for physical goods | Create marketplace to trade physical goods between customers and retailers, focusing on the aggregation of offers from different retailers | autoweb (marketplace to buy cars from dealers), CarDaddy (agent for trading in vehicles), moreboats (marketplace to buy boats from dealers) | No |
| | Location-based advertising platform | Provide a platform for companies to deliver advertising messages to customers based on their current location | Vugo (advertising during ride sharing), Wrapify (on-car advertising), CabbyGo (taxi app with local advertising) | No |
| | Integrator of third-party services | Create platform allowing professional services to be booked from several third parties; the focus lies on integrating the services | ValPark (Valet parking platform), Flywheel (taxi booking platform), JetSmarter (aircraft charter platform) | Yes |
| | P2P goods sharing platform | Create platform to rent physical goods from peers, thus replacing professional lenders | Spinlister (P2P bike sharing), Turo (P2P car sharing), Sailo (P2P boat sharing), SPOT (P2P parking) | Yes |
| | P2P information sharing community | Provide a platform to share dynamic information among members for mutual benefits | Waze (crowd navigation platform), CurbNinja (crowd-sourced motorcycle parking information), BR8KER (mobile social network for drivers) | Yes |
| | P2P marketplace for physical goods | Create marketplace to trade physical goods between customers; the focus is on matching needs and providing additional services to ensure safe transactions | Beepi (P2P marketplace for cars), Tachitout (P2P marketplace for motorsport vehicles) | No |
| | P2P service provision platform | Create platform intermediating a service in which customers replace professional service personnel | Uber (commercial ride sharing), Zimride (non-commercial ride sharing), RedCap (chauffeurs on-demand) | Yes |
| | Service comparison portal | Provide online portal for comparing price, user rating, and other properties of third-party services; the focus lies on comparing the services | CoverHound (online vehicle insurance comparison), RepairPal (Car repair platform), faretrotter (intermodal transport comparison), Car Rentals | No |

| | | | | |
|---|---|---|---|---|
| | | | Market (car rental comparison) | |
| | Social network | Provide an online platform for communication among people with common interests | Rever (social network for bikers), Carsactive (social network for cars) | No |

*Table 5. Digital business model types identified.*

# 5 DISCUSSION

In total, we identified 27 digital business model types that were implemented by startups from the mobility sector in the last 10 years. A comparison with incumbents from the mobility sector reveals that they also implemented several of these digital business models. For instance, car insurers more frequently offer pay-as-you-drive insurances (Desyllas and Sako 2013), i.e. become a *sensor-enabled service innovators*. Some automotive manufacturers such as General Motors embed connectivity platforms in their physical products (Barabba et al. 2002), i.e. become *manufacturers of connected physical products*. Furthermore, automotive manufacturers such as BMW have started to sell their vehicles online, i.e. apply the *manufacturer direct sales* type.

The main theoretical contribution of this research is updating existing collections of digital business model types as they were outdated: 14 of 27 identified digital business model types were not included within existing collections as they rely on new digital technologies such as the mobile internet, sensors, and advanced forms of data processing. For each of these new digital business model types – even though resulting from an analysis of startups from the mobility sector – we found companies from others sectors that have implemented the same type, giving them more general validity. For instance, if customers want their TVs to be connected to the internet they can either purchase connectivity sticks such as Google's Chromecast (*manufacturer of connectivity devices for physical products*) or buy smart TVs such as those offered by Samsung (*manufacturer of connected physical products*). Another example is the digital business model type *data analytics provider* that is also applied for predictive maintenance of machines by startups (e.g., Cassantec) and incumbents (e.g., GE Predix). Also the newly identified P2P business model types are observable in other sectors. For instance, Airbnb allows for rental of different types of accommodation between private customers (*P2P goods sharing platform*), eToro enables social trading by sharing investment profiles (*P2P information sharing community)*, and Helpling intermediates on-demand cleaning services (*P2P service provision platform*).

Further, the 14 types help to better understand characteristics of new digital business models, in particular those being employed by startups. For instance, 11 of the 14 new digital business model types are landlords or brokers. This shift in focus can also be observed when comparing the distribution of companies in our data sample with those of Weill et al. (2005), who used the same logic to classify the largest 1,000 US companies in the year 2000. In contrast to the largest 1,000 companies, the digital technology startups in our data sample employ landlord (43% vs. 34%) and especially broker models (38% vs. 2%) more often and use creator (15% vs. 46%) and distributor models (4% vs. 18%) less often. Furthermore, digital business models often redefine the customer's role as co-creator of value (Lusch et al. 2007; Veit et al. 2014). This is most apparent in the business model types *P2P goods sharing platform*, where one customer rents physical goods to other customers, and *P2P service provision platform*, where one customer provides a service for another customer. In addition, the necessity of digital business models for creating an ecosystem that provides benefits for all parties involved (El Sawy and Pereira 2013; Iansiti and Levien 2004) is observable in most of the 14 business model types. For instance, the *IT-enabled self-service provider*, such as providers of e-mobility charging infrastructure, must balance benefits among customers, automotive manufacturers, energy utilities, and administration.

Our research also confirms the central findings of related research streams, such as digital innovation and digital transformation. Fichman et al. (2014) summarize the most important characteristics of digital innovations as digitization, Moore's Law, and network effects. All of these are part of one or

several of our digital business model types. The digitization of processes, for instance, is reflected by the business model type *IT-guided service provider*; the exponential price–performance improvements of IT components, i.e., Moore's Law, is a prerequisite to *seller of connectivity devices for physical products*; and network effects, i.e., the increasing value for one adopter if others join, probably accounts for all of the 14 new digital business model types. As the digital transformation is regarded to be a consequence of technological advances (Porter and Heppelmann 2014), the digital business model types identified serve as intermediary between these technological inventions and the creation of economic value (Al-Debei and Avison 2010). For instance, new opportunities through ubiquitous IS (Vodanovich et al. 2010) are used by *mobilized service providers*, the emergence of sensitized objects (Malhotra et al. 2013) is leveraged by *sellers of sensor information*, and the new layered modular architecture of physical products (Yoo et al. 2010) is translated into an operational business model by *manufacturers of connectivity devices for physical products*. Furthermore, 7 of the 14 new digital business model types are not pure digital platforms but instead significantly depend on other assets (a*utonomous products/robots manufacturer*, *IT-enabled self-service provider*, *IT-guided service provider*, *manufacturer of connected physical products*, *manufacturer of connectivity devices for physical products*, *mobilized service provider*, *seller of sensor information*). This emphasizes that the next digital transformation also affects industrial-age industries, as IT is becoming an integral part of traditionally purely physical products (Porter and Heppelmann 2014). Thus, with our research we shed light on how specifically the digital transformation manifests itself in such under-researched settings (Yoo et al. 2010).

Moreover, our results have important implications for managerial practice. First – and most evident – the digital business model types allow for a quick orientation and gaining new ideas for startups and incumbents when seeking to innovate business models. The importance of business model innovation is being propagated increasingly by research for a variety of reasons. Technological innovations are of no value when not employed in proper business models (Teece 2010), inferior technologies can become more successful if employed in superior business models (Chesbrough 2010), and the return on investment through business model innovation is considered to be greater (Amit and Zott 2012). Second – less obvious but just as important – our results have important implications for incumbents, as digital transformation is considered to be both an opportunity and a risk at the same time (Porter and Heppelmann 2014). For instance, 38% of the startups in our sample employ a broker business model. Hence, they themselves do not produce anything but rather sell a product or service for a third party, attempting to own the primary customer relationship. For instance, startups employing an *integrator of third-party services* business model sell services from other providers to the customer. Currently, these are mostly services provided by smaller companies (e.g., taxi drivers, parking facilities, valet parking operators); once these platforms gain traction also more incumbents (e.g., larger transportation service providers) might be forced to use them as sales channels. Furthermore, most of the identified digital business models can be considered a digital platform. Such platforms naturally lead to new monopolies because they can capitalize on very low or zero marginal cost (Shapiro and Varian 1999). Thus, on the one hand, our results are a tool for making opportunities arising from new digital technologies more useable for business model innovation; on the other hand, they highlight the need for incumbent firms to define a strategy of how to deal with these new digital business model types.

Our study is not free of limitations and we propose future research to address them. First, with this research we aimed at identifying new types of digital business models. For future research a more detailed investigation and explanation of the underlying business logics of each type appears promising, for instance to derive detailed design rules and success factors. Second, we focused on the mobility sector to identify new digital business model types. Even though the identified digital business model types were also observable in other industries, they are not necessarily exhaustive (similar all prior collections of digital business model types, which are also not exhaustive). This means that future research may analyze other sectors that undergo a digital transformation, such as logistics, machinery, or energy to investigate if additional types should be added. Third, we used data for the US market, which we argue is the most innovative market. However, the analysis of startups

from other countries, such as Germany, Japan, or China, would be highly interesting. Fourth, while our focus on startups was particularly suitable for identifying independent digital business models, many incumbents are also transforming their business models, which we consider another fruitful area for future IS research.

# 6 CONCLUSION

The business model concept is a powerful tool to link technological innovations to efficient value creation logics. However, existing research on different types of digital business models has not been updated for many years although the diffusion of digital technologies has enlarged massively. Therefore, we systematically analyzed the business models of most recent technology startups in the personal mobility sector and identified new digital business logics that cannot be understood with existing collections of digital business model types. Thus, we formalized these new business model configurations into digital business model types updating existing research for recent technological advances. Thereby, our results aid in better understanding the nature of digital transformation manifested in digital business models and provide practice with a tool for business model innovation.

# APPENDIX 1

| **Identified digital business model type** | **Identical or very similar digital business model types from previous research** |
|---|---|
| B2C marketplace for physical goods | Broker (Bienstock et al. 2002), online brokers (Eisenmann 2001; Strauss and Frost 2014) |
| Digital service provider | Selling online services (Clemons 2009) |
| Location-based advertising platform | Contextual mobile advertising (Clemons 2009) |
| Manufacturer direct sales | Direct selling (Strauss and Frost 2014), direct to customer (Weill and Vitale 2001), manufacturer direct model (Rappa 2001) |
| Manufacturer of IT devices | Equipment/component manufacturers (Applegate 2001) |
| Online reseller | Online retailers (Eisenmann 2001), retailer (Applegate 2001), virtual merchant (Rappa 2001) |
| P2P marketplace for physical goods | Agora (Tapscott et al. 2000), auction broker (Rappa 2001), exchange (Applegate 2001) |
| Publisher model | Content publisher (Strauss and Frost 2014), information and service providers (Applegate 2001), selling content (Clemons 2009) |
| Sell services online | Service providers (Applegate 2001) |
| Service comparison portal | Aggregator (Applegate 2001), search agent (Rappa 2001), vertical portals (Applegate 2001) |
| Social network | Social networking (Strauss and Frost 2014), social networking services (Rappa 2001), virtual community (Weill and Vitale 2001) |
| Software provider | Software firms (Applegate 2001) |
| Third-party information aggregator | Information collection (Hanson 2000) |

## References


Al-Debei, M.M. and Avison, D. (2010). Developing a unified framework of the business model concept, European Journal of Information Systems, 19 (3), 359–376.

Amit, R. and Zott, C. (2012). Creating value through business model innovation, MIT Sloan Management Review, 53 (1), 40–49.

Amshoff, B., Dülme, C., Echterfeld, J. and Gausemeier, J. (2015). Business Model Patterns for Disruptive Technologies, International Journal of Innovation Management, 19 (3), 1–22.

Andersson, M., Hjalmarsson, A. and Avital, M. (2013). Peer-to-Peer Service Sharing Platforms: Driving Share and Share Alike on a Mass-Scale. In Proceedings of the 34th International Conference on Information Systems (ICIS 2013) (Baskerville, R., Chau, M. Eds.), Milan, Italy.

Andrew, J.P. and Sirkin, H.L. (2006). Payback: Reaping the rewards of innovation. Harvard Business School Press, Boston, USA.

Applegate, L.M. (2001). E-business Models: Making sense of the Internet business landscape. In Information technology and the future enterprise: New models for managers (Dickson, G.W. and DeSanctis, G. Eds.), Prentice Hall, Upper Saddle River, USA, 49–94.

Barabba, V., Huber, C., Cooke, F., Pudar, N., Smith, J. and Paich, M. (2002). A multimethod approach for creating new business models: The General Motors OnStar project, Interfaces, 32 (1), 20–34.

Bharadwaj, A., El Sawy, O.A., Pavlou, P.A. and Venkatraman, N. (2013). DIGITAL BUSINESS STRATEGY TOWARD A NEXT GENERATION OF INSIGHTS, MIS Quarterly, 37 (2), 471–482.

Bienstock, C.C., Gillenson, M.L. and Sanders, T.C. (2002). The complete taxonomy of web business models, Quarterly Journal of electronic commerce, 173–186.

Block, J. and Sandner, P. (2009). What is the effect of the financial crisis on venture capital financing? Empirical evidence from US Internet start-ups, Venture Capital, 11 (4), 295–309.

Bloomberg (2015). Uber Is Now Valued Higher Than 80% of the Companies in the S&P 500, available at: http://www.bloomberg.com/news/articles/2015-12-03/uber-s-latest-funding-round-gives-it-a-larger-valuation-than-80-percent-of-the-s-p-500 (accessed 4 February 2016).

Chesbrough, H. (2010). Business model innovation: opportunities and barriers, Long range planning, 43 (2), 354–363.

Christensen, C.M. and Overdorf, M. (2000). Meeting the challenge of disruptive change, Harvard Business Review, 78 (2), 66–77.

Clemons, E.K. (2009). Business models for monetizing internet applications and web sites: Experience, theory, and predictions, Journal of Management Information Systems, 26 (2), 15–41.

Demil, B. and Lecocq, X. (2010). Business model evolution: in search of dynamic consistency, Long range planning, 43 (2), 227–246.

Desyllas, P. and Sako, M. (2013). Profiting from business model innovation: Evidence from Pay-As-You-Drive auto insurance, Research Policy, 42 (1), 101–116.

Eisenmann, T.R. (2001). Internet business models: texts and cases. McGraw-Hill, Boston, USA.

El Sawy, O.A., Malhotra, A., Park, Y. and Pavlou, P.A. (2010). Research Commentary-Seeking the Configurations of Digital Ecodynamics: It Takes Three to Tango, INFORMATION SYSTEMS RESEARCH, 21 (4), 835–848.

El Sawy, O.A. and Pereira, F. (2013). Business Modelling in the Dynamic Digital Space: An Ecosystem Approach. SpringerBriefs in Digital Spaces. Springer, Berlin, Germany.

Fichman, R.G., Dos Santos, Brian L. and Zheng, Z. (2014). DIGITAL INNOVATION AS A FUNDAMENTAL AND POWERFUL CONCEPT IN THE INFORMATION SYSTEMS CURRICULUM, MIS Quarterly, 38 (2), 329–A15.

Gassmann, O., Frankenberger, K. and Csik, M. (2014). The Business Model Navigator: 55 Models That Will Revolutionise Your Business. Pearson, Harlow, UK.

Hanson, W.A. (2000). Principles of internet marketing. South-Western College Pub., Cincinnati, Ohio.

Hartman, A., Sifonis, J.G. and Kador, J. (2000). Net ready: Strategies for success in the E-conomy. McGraw-Hill, New York, USA.

Hedman, J. and Kalling, T. (2003). The business model concept: theoretical underpinnings and empirical illustrations, European Journal of Information Systems, 12 (1), 49–59.

Henfridsson, O. and Lindgren, R. (2010). User involvement in developing mobile and temporarily interconnected systems, Information Systems Journal, 20 (2), 119–135.

Henfridsson, O. and Yoo, Y. (2014). The liminality of trajectory shifts in institutional entrepreneurship, Organization Science, 25 (3), 932–950.

Hylving, L. and Schultze, U. (2013). Evolving the Modular Layered Architecture in Digital Innovation: The Case of the Car's Instrument Cluster. In Proceedings of the 34th International Conference on Information Systems (ICIS 2013) (Baskerville, R., Chau, M. Eds.), Milan, Italy.
Iansiti, M. and Levien, R. (2004). Strategy as ecology, Harvard Business Review, 82 (3), 68–81.
Johnson, M.W. (2010). Seizing the White Space: Business Model Innovation for Growth and Renewal. Harvard Business Press, Boston, USA.
Koch, O.F. (2015). BUSINESS MODEL DEVELOPMENT IN IT STARTUPS–THE ROLE OF SCARCITY AND PERSONALIZATION IN GENERATING USER FEEDBACK. In Proceedings of the 23rd European Conference on Information Systems (ECIS 2015) (Becker, J., vom Brocke, J., de Marco, M. Eds.), Münster, Germany.
Lam, L.W. and Harrison-Walker, L.J. (2003). Toward an objective-based typology of e-business models, Business Horizons, 46 (6), 17–26.
Lucas, H.C., Agarwal, R., Clemons, E.K., El Sawy, O.A. and Weber, B. (2013). IMPACTFUL RESEARCH ON TRANSFORMATIONAL INFORMATION TECHNOLOGY: AN OPPORTUNITY TO INFORM NEW AUDIENCES, MIS Quarterly, 37 (2), 371–382.
Lusch, R.F., Vargo, S.L. and O'Brien, M. (2007). Competing through service: Insights from service-dominant logic, Journal of Retailing, 83 (1), 5–18.
Magretta, J. (2002). Why Business Models Matter, Harvard Business Review, 80 (5), 86–92.
Malhotra, A., Melville, N.P. and Watson, R.T. (2013). SPURRING IMPACTFUL RESEARCH ON INFORMATION SYSTEMS FOR ENVIRONMENTAL SUSTAINABILITY, MIS Quarterly, 37 (4), 1265–1274.
Marra, A., Antonelli, P., Dell'Anna, L. and Pozzi, C. (2015). A network analysis using metadata to investigate innovation in clean-tech–Implications for energy policy, Energy Policy, 17–26.
New York Times (2015). Facing Demand, Uber Expands Funding Round by $1 Billion, available at: http://dealbook.nytimes.com/2015/02/18/uber-expands-funding-round-by-1-billion/ (accessed 30 March 2015).
Osterwalder, A. and Pigneur, Y. (2010). Business model generation: A handbook for visionaries, game changers, and challengers. Wiley, Hoboken, USA.
Osterwalder, A., Pigneur, Y. and Tucci, C.L. (2005). Clarifying Business Models: Origins, Present, and Future of the Concept, Communications of the Association for Information Systems, 16 (1), 1–25.
Porter, M. (2001). Strategy and the Internet, Harward Business Review, 62–78.
Porter, M.E. and Heppelmann, J.E. (2014). How smart, connected products are transforming competition, Harvard Business Review, 92 (11), 11–64.
Priem, R.L., Butler, J.E. and Li, S. (2013). Toward reimagining strategy research: retrospection and prospection on the 2011 AMR decade award article, Academy of Management Review, 38 (4), 471–489.
Quartz (2014). Uber just had the biggest funding round of all time, available at: http://qz.com/217998/uber-just-had-the-biggest-funding-round-of-all-time/ (accessed 30 March 2015).
Rappa, M. (2001). Managing the digital enterprise-Business models on the Web, Raleigh, USA.
Roland Berger (2015). The digital transformation of industry: How important is it? Who are the winners? What must be done?, Munich, Germany.
Sambamurthy, V., Bharadwaj, A. and Grover, V. (2003). Shaping Agility through Digital Options: Reconceptualizing the Role of Information Technology in Contemporary Firms, MIS Quarterly, 27 (2), 237–263.
Shapiro, C. and Varian, H.R. (1999). Information rules: A strategic guide to the network economy. Harvard Business School Press, Boston, USA.
Spiegel, O., Abbassi, P., Fischbach, K., Putzke, J. and Schoder, D. (2011). Social Capital in the ICT Sector–A Network Perspective on Executive Turnover and Startup Performance. In Proceedings of the 32nd International Conference on Information Systems (ICIS 2011) (Beath, C., Myers, M.D., Wei, K.K. Eds.), Shanghai, China.
Strauss, J. and Frost, R. (2014). E-marketing. 7th ed. Pearson Prentice Hall, Upper Saddle River, NJ, México.
Tapscott, D., Lowy, A. and Ticoll, D. (2000). Digital capital: Harnessing the power of business webs. Harvard Business School Press, Boston, Mass.
Teece, D.J. (2010). Business models, business strategy and innovation, Long range planning, 43 (2), 172–194.

The Guardian (2015). Documents confirm Apple is building self-driving car, available at: http://www.theguardian.com/technology/2015/aug/14/apple-self-driving-car-project-titan-sooner-than-expected (accessed 4 February 2016).
Timmers, P. (1998). Business models for electronic markets, Electronic markets, 8 (2), 3–8.
Tuff, G. and Wunker, S. (2010). Beacons for business model innovation, Chicago, USA.
Veit, D., Clemons, E., Benlian, A., Buxmann, P., Hess, T., Kundisch, D., Leimeister, J.M., Loos, P. and Spann, M. (2014). Business Models. An Information Systems Research Agenda, Business & Information Systems Engineering, 56 (1), 45–54.
Venkatraman, N. (1994). IT-enabled business transformation: from automation to business scope redefinition, Sloan management review, 73.
Vodanovich, S., Sundaram, D. and Myers, M. (2010). Research commentary-Digital natives and ubiquitous information systems, INFORMATION SYSTEMS RESEARCH, 21 (4), 711–723.
Webster, J. and Watson, R.T. (2002). Analyzing the past to prepare for the future: Writing a literature review, Management Information Systems Quarterly, 26 (2), xiii–xxiii.
Weill, P., Malone, T.W., D'Urso, V.T., Herman, G. and Woerner, S. (2005). Do some business models perform better than others? A study of the 1000 largest US firms, Cambridge, USA.
Weill, P. and Vitale, M.R. (2001). Place to space: Migrating to ebusiness models. Harvard Business School Press, Boston, USA.
Werth, J.C. and Boeert, P. (2013). Co-investment networks of business angels and the performance of their start-up investments, International Journal of Entrepreneurial Venturing, 5 (3), 240–256.
Wirtz, B.W., Schilke, O. and Ullrich, S. (2010). Strategic development of business models: implications of the Web 2.0 for creating value on the internet, Long range planning, 43 (2), 272–290.
Yoo, Y. (2010). COMPUTING IN EVERYDAY LIFE: A CALL FOR RESEARCH ON EXPERIENTIAL COMPUTING, MIS Quarterly, 34 (2), 213–231.
Yoo, Y., Boland Jr, Richard J, Lyytinen, K. and Majchrzak, A. (2012). Organizing for innovation in the digitized world, Organization Science, 23 (5), 1398–1408.
Yoo, Y., Henfridsson, O. and Lyytinen, K. (2010). The New Organizing Logic of Digital Innovation: An Agenda for Information Systems Research, INFORMATION SYSTEMS RESEARCH, 21 (4), 724–735.
Yu, Y. and Perotti, V. (2015). Startup Tribes: Social Network Ties that Support Success in New Firms. In Proceedings of 21st Americas Conference on Information Systems (AMCIS 2015), Puerto Rico.
Zott, C., Amit, R. and Massa, L. (2010). THE BUSINESS MODEL: THEORETICAL ROOTS, RECENT DEVELOPMENTS, AND FUTURE RESEARCH, Madrid, Spain.