CAPABILITIES, CONFIGURATIONS AND CUSTOMER-CONTEXTS: A BUSINESS MODEL FRAMEWORK FOR THE PROCESS OF DIGITAL SERVICE INNOVATION

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ABSTRACT:

We posit that the basic challenge for digital service innovation is to design new services that achieve the dual goals of value creation and value appropriation within digital business ecosystems that require a new set of assumptions and structures. Due to new phenomena such as open innovation, these two goals are increasingly in conflict, but the literature holds few answers to this problem. We draw upon a marketing perspective on value creation, a strategy perspective on value appropriation, and information systems theory about digital business ecosystems, to generate a framework for explaining how digital business models reconcile these three issues. Using the new framework, we analyze three case studies of successful digital service innovation, and inductively derive new findings about how such innovation occurs. We find that digital service innovation is anchored by established and envisioned business models, and unfolds as a co-evolutionary process in interaction with adjacent ecosystems.

KEYWORDS:

digital service innovation; digital business models; value creation; value appropriation; digital business ecosystems;
1. INTRODUCTION

We posit that the basic challenge for digital service innovation is to design new services that achieve the dual and often conflicting goals of value creation and value appropriation (Chesbrough & Appleyard, 2003; Schlagwein & Schoder, 2011) within digital business ecosystems that require a new set of assumptions and structures (El Sawy et al, 1999; El Sawy, 2003). The tension between value creation and value appropriation has grown more important as innovative strategists and researchers have discovered the value-creating potential of business models like loose coupling, open platforms, and open innovation. In each case, firms give up one of the traditional sources of competitive advantage – e.g., inimitable capabilities, exclusive alliances, or defensible intellectual property – to multiply the value they can offer to customers, but in doing so make appropriation of value as profit much more difficult.

These phenomena do not seem to have been anticipated by the strategy literature, in which we find a number of important theories about value appropriation, but a consistent assumption that stronger “appropriability” is always better (Teece, 1986; West, 2003). In contrast, the service-dominant logic emerging from the field of marketing (Vargo & Lusch, 2004; 2008) equips us with powerful new tools for understanding value creation, but doesn’t yet contain a theory of value appropriation in competition. To understand digital service innovation, we need to take a view that simultaneously considers value creation, value appropriation, and the digital business ecosystem – a necessarily interdisciplinary perspective. In this paper, we ask the question: How does digital service innovation occur, and how do digital service innovators maximize value creation and value appropriation, given the new assumptions and rules of the game? The rest of the paper is organized as follows: in section 2, we review the theoretical perspectives that explain value creation, value appropriation, and digital business ecosystems, and propose a digital business model framework to integrate them; in section 3, we examine the digital service innovation process in several case studies; in section 4, we present findings from inductive case study analysis; and in section 5, we conclude with implications for research and practice.

2. THEORY DEVELOPMENT

2.1 VALUE CREATION AND THE SERVICE-DOMINANT LOGIC

Many schools of thought in economics and management treat value as “utility” embedded in goods and services, or “value-in-exchange” measurable by the prices consumers are willing to pay. From this perspective, the role of the firm is to add value to raw materials, or deliver value to customers. We diagram businesses as “value chains” of value-adding activities, or as any of a variety of different forms such as “value shops” and “value networks” (Stabell & Fjeldstad, 1998). Theories of strategic management argue that firm strengths result in competitive advantage if they add more value (“effectiveness”), or deliver value at lower costs (“efficiency”) than competitors (Barney, 1991). This view of value has been with us since the time of Adam Smith, whose economic analysis focused on the commodity exports of goods-producing nations, and has yielded many insights. However, when we move away from the basic
model of goods manufacturers making standardized products, we find that this conceptualization of value no longer fits. Value-in-exchange is a useful tool for talking about coal, steel, or wheat, but we have to jump through theoretical hoops to describe the value-in-exchange of a digital service, or of a concept like “mobility” (Lee et al, 2010).

In digital service ecosystems, products and services are complex, customized, and made up of modular components provided by networks of firms. In the case of digital products like mobile phones, for example, customers using the same hardware will rarely if ever make all of the same software choices, or use the devices in the same ways and in the same contexts. Customers’ willingness to pay, too, will vary greatly. Instead of assuming value is delivered in standard quantities by digital products and services, then, it is more useful to see value as an experience created through use and perceived by each customer upon the enactment of a digital service. This perspective of “value-in-use” or “value-as-experience” is embodied in Theodore Levitt’s famous example of the drill: “customers do not want a drill; they want the holes that the drill will make” (cf. Chesbrough, 2011). This is even more true in digital business ecosystems. Digital services, unlike drills, do not even come off an assembly line looking the same.

The value-in-use perspective was written about by strategy researchers Normann and Ramírez (1993) and in recent years has grown into a bold new logic of value creation in the marketing field (Vargo & Lusch 2004, 2008). Called the service-dominant logic (SDL), this new theory holds that value is co-created by customers and a network of firms and other actors. Whether these actors are providing activities (services), or “frozen activities” in the forms of products (like Levitt’s drill), what they are really exchanging are applications of capabilities, skills, and knowledge. Thus products and services are best thought of as value offerings or propositions. They have potential value that may or may not be exercised by customers. To create value, then, firms and customers are partners. Firms develop and deliver potentially-valuable offerings, and customers assemble and utilize these offerings in context to realize value. Value is phenomenologically experienced and contextually interpreted by the customer (Vargo & Lusch, 2008; Chesbrough, 2011).

This paradigm draws our attention to the importance of the unique characteristics of customers and the contexts in which they use services. One of the key takeaways from the service-dominant logic is that no service occurs unless customers apply the offering (activity or product) in context. We may be used to thinking of a firm’s services as activities that it can provide. That may be appropriate when a firm’s service offerings are standardized and repeated – it’s analogous to treating services as commodity products – but when studying digital business ecosystems where every enactment of a service is unique, we must study value creation by focusing on how service offerings are (and are not) actually applied. This leaves us with no good answer to the question of how managers can appropriate, or even measure, the value that they are co-creating with customers through digital services.

3. VALUE APPROPRIATION AND THE RESOURCE-BASED VIEW
The literature of strategic management, by contrast, has a long tradition of theorizing about value appropriation in competition. The dominant strategy paradigm at the firm level of analysis is the resource-based view (RBV) in which competitive advantage accrues to firms that have control of strategically important resources, such as assets and capabilities (Barney, 1991). In its basic form, the RBV states that resources must be valuable (have value-creating potential), rare among competitors, imperfectly imitable, and non-substitutable – the so-called “VRIN” characteristics – in order to be sources of competitive advantage. Combining the RBV with the value creation logic just discussed, one might argue that if a firm has a VRIN capability to perform an activity better, faster, or cheaper (from the customer’s point of view) than its competitors, its value proposition is more likely to be accepted. As the joke goes, “step two: … ; step three: profit.”

Interestingly, Vargo & Lusch (2004) also used a theory of resources in their explanation of the service-dominant logic of marketing. They distinguish between operant resources (“resources that act” such as knowledge, skills, and processes) and operand resources (“resources that are acted upon” such as land and raw materials), and argue that the new logic places a focus on the former. Both the RBV and the SDL are concerned with operant resources; in the RBV firms can expect to appropriate value merely by holding and defending VRIN operant resources, but in the SDL value is only created when the potential of these resources is applied in context by customers. Customers, too, are operant resources in the SDL.

The VRIN conditions do not always hold, and are especially problematic in digital business ecosystems where capabilities evolve and become obsolete quickly, technologies are often substitutable for one another, and service-oriented, pay-for-use business models mean that powerful competencies are equally accessible to the largest and smallest competitors. These empirical problems have led some researchers to develop new variations on RBV theory to explain value appropriation in less ideal environments. The first variation argues that firms can profit from services in which they have no VRIN advantages as long as they have complementary assets that are VRIN (Teece, 1986). This explains why IBM, which has VRIN capabilities in hardware and applications, would be willing to embrace the non-proprietary operating system Linux (West, 2003). While IBM appropriates no value from sales of Linux, the widespread adoption of Linux allows it to appropriate value from its complementary offerings.

The relational view (RV) is a variation on the RBV in which individual firms may have no VRIN resources at all, but may yet attain competitive advantages if they form alliances that have VRIN combinations of resources (Dyer & Singh, 1998). A related concept is that of cospecialization of resources; resources may be designed such that they have greater value potential together than separately (Teece, 1986). We might suppose, for example, that Intel’s microprocessors and Microsoft’s operating systems are not VRIN by themselves, but being designed to work in concert, the combination of the two may have unique advantages compared to other platforms. An interesting question is whether the RV theory applies the same way to platforms as it does to alliances. In the years since Dyer and Singh (1998) wrote about dyadic alliances possessing VRIN resource combinations, we have seen a rise in the importance of digital platforms (Gawer & Cusumano, 2008; Iansiti & Levien, 2004). Defined by standard architectures
and interfaces, platforms allow modular connection of activities and resources across firms. Platforms are less exclusive than alliances, but potentially much more powerful. The open resource-based view (Schlagwein et al, 2010) extends the relational view from formal alliances to open platforms, and also uses complementarity and cospecialization or resources to explain value appropriability.

4. NEW ASSUMPTIONS FOR DIGITAL BUSINESS ECOSYSTEMS

We have alluded above to the fact that digital business ecosystems are new and different. Digital service innovation takes place in a technology-enabled and digitally interconnected environment characterized by new affordances, structures, and rules (El Sawy et al, 1999). The information systems discipline has explored and explicated many of these differences. One of its most important conclusions is that technology and business are effectively fused into one fabric – it no longer makes sense to talk about information technology as a tool or environment that is kept at arm’s length from business activities (El Sawy, 2003). To theorize digital service innovation by taking “service innovation” and adding a few “digital” features to the theory would lead to what we call the “horseless carriage” fallacy. That term for the first automobiles constrained the imagination and blinded inventors to the fact that the new design challenge was fundamentally different than the old. We realize that a theory of digital service innovation must integrate the distinct attributes of digital business ecosystems from the get-go (Yoo et al, 2010). There are at least three such attributes: time compression, turbulence, and new architectures.

4.1 VELOCITY

Digital business proceeds at an ever-accelerating pace, driven by intense competition and rapidly-improving technological capabilities (El Sawy et al, 1999). The velocity of exchange in digital business ecosystems has a number of implications. First, it means that competitive advantage is short-lived. Strategies are perishable, whether attained by first-mover advantage, advantageous positioning vis-à-vis the marketplace, or unique capabilities. Thus, even within the resource-based view, it turns out that the most important capabilities are not the ones that deliver products and services, but the dynamic capabilities that modify those primary capabilities, such as R&D, marketing, new product development, and business process re-engineering (Eisenhardt & Martin, 2000; Winter, 2003) and improvisational capabilities (Pavlou & El Sawy, 2010) that enable firms to cope with unexpected changes. In this context, we see agility, rather than advantageous positioning, as the key to meeting strategic opportunities and threats (Teece, 2007; Sambamurthy et al, 2003; Overby et al, 2006). Technologies and services rapidly become obsolete in the digital business ecosystem. Therefore, constant innovation is not just an advantage: it is a necessity to even play the game.

4.2 TURBULENCE

Digital business ecosystems are not only fast-paced, they are also turbulent. Turbulence is a causal texture of the environment that stems from complex interconnectedness between players (Selsky et al, 2007). In turbulent environments,
changes to strategic variables are not only rapid but also unexpected, as disruptions may come at any time from firms innovating in different fields (Burgelman & Grove, 2007) or from the larger society. Unlike other business environments, digital business ecosystems can never be expected to revert to any kind of “equilibrium” after disruptions change things; turbulence implies that cause-and-effect may cascade in unpredictable ways to alter the structure or health of the ecosystem, or end it entirely. Preparing for these “unknown unknowns” requires a new kind of management sensibility: an ability to develop new frameworks and perspectives, and a strategic eye for vulnerability to “black swan” events (Meyer et al, 2005; Taleb, 2007). Because the fates of all players are intertwined with that of the ecosystem, competitors must often work together in “coopetition”, for example to establish technical standards or common platforms (Emery & Trist, 1965). Through constant interaction, business models and digital innovations coevolve, and we cannot truly understand their trajectories if we examine each one in isolation (Boland et al, 2007).

4.3 NEW ARCHITECTURES

Digital business ecosystems feature not only idiosyncratic technological architectures (Yoo et al, 2010) but also important new interorganizational business architectures. Responding to the velocity and turbulence of the environment, and taking advantages of the affordances of digital technology, firms and groups of firms have been prolific in establishing digital platforms for the combination of technologies and the delivery of services (Gawer & Cusumano, 2008). Platforms are standards or architectures that allow modular substitution of complementary assets (West, 2003). Taking advantage of the digital affordance of modularity, platforms enable firms to focus their attention (and innovation) on one part of a system at a time, and to assemble those parts – whether they are products or activities – into a variety of configurations. As business models have become more digital, firm capabilities themselves have become more modular, more easily connectable, and more conveniently shareable. In prior decades it might have taken a formal alliance and a joint venture to make one firm’s technology compatible with another’s, but today, riding on rails of application programming interfaces (APIs) and broadband fiber optics, we can “mash up” digital services like Google’s maps and Facebook’s social newsfeed in no time and on a shoestring budget. Digital business ecosystems enable the possibility of combining capabilities across boundaries into innovative new offerings and solutions to create and capture value (Schlagwein & Schoder, 2011).

5. DIGITAL BUSINESS MODELS AS INTEGRATING FRAMEWORK

Figure 1 diagrams the research overlap between value creation (primarily the domain of marketing), value appropriation (primarily the domain of strategy) and digital business ecosystems (primarily the domain of information systems). There are many interesting phenomena in the interdisciplinary space between any pair of domains, such as open innovation, business models, and platform strategies. However, it is clear from the preceding analysis that digital service innovation requires insight from all three domains.
In order to develop theory about digital service innovation, we need to adopt a framework that integrates the three challenges and gives us a basic language to discuss them. The best way to achieve this integration is by extending the interdisciplinary concept of business model to digital business ecosystems. A business model is a representation of the design choices that characterize a business venture. These choices are made either intentionally or by default, so the contribution of a business model is to make them explicit (Morris et al, 2005). Thus, business models in practice can be used as communication or planning tools. They allow entrepreneurs, investors, and partners to examine strategic choices for internal consistency, to surface the assumptions of the business plan, and to understand the vision toward which the business is being built. Although business model development may be part of new venture planning, it is just as useful in sensemaking around a going concern, and
business models provide a powerful language for discussing innovation and “reinvention” (Johnson et al, 2008).

There have been several attempts to define business model frameworks over the past decade or two, including our own (CTM; Fife & Pereira, 2008), and they occur throughout the fields of strategy, entrepreneurship, and e-commerce. As seen in Table 1, adapted from Morris (2005) and Schafer (2005), business model definitions vary in the number and type of components. In general, three general categories of definitions have been identified: operational, economic, and strategic. Each category emphasizes its own set of decision variables (Morris, 2005). The operational business models focus on the firm’s internal processes and design of infrastructure that enables them to create value, with key components including production or service delivery methods, administrative processes, resource flow and knowledge management (Mayo & Brown, 1999). The economic models focus on how a firm can make a profit, and key variables from this approach include revenue sources, pricing methodologies, cost structures, margins and expected volumes. Fundamentally stated, this approach deals with how a firm can appropriate value and sustain its revenue stream (Stewart & Zhao, 2000). In contrast, strategic business models emphasize the overall direction of the firm’s position, interactions across organizational boundaries, and growth opportunities. They describe the totality of how a firm identifies customers and stakeholders, defines tasks and partners, and creates value in the context of networks and alliances (Slywotsky, 1996).

<table>
<thead>
<tr>
<th>Source</th>
<th>Components</th>
<th># of Components</th>
</tr>
</thead>
<tbody>
<tr>
<td>Horowitz (1996)</td>
<td>Price, Product, Distribution, Organizational Characteristics and Technology</td>
<td>5</td>
</tr>
<tr>
<td>Donath (1999)</td>
<td>Customer understanding, Marketing Tactics, Corporate Governance and Intranet/Extranet capabilities</td>
<td>4</td>
</tr>
<tr>
<td>Mahadevan (2000)</td>
<td>Value stream, Revenue stream, Logistical stream</td>
<td>3</td>
</tr>
<tr>
<td>Gordijn et. al. (2001)</td>
<td>Actors, Market segments, Value Offering, Value Activity, Stakeholder network, Value interfaces, Value ports and Value Exchanges</td>
<td>8</td>
</tr>
<tr>
<td>Linder and Cantrell (2001)</td>
<td>Pricing model, Revenue model, Channel model, Commerce process model, Internet-enabled commerce relationship, Organizational form and Value proposition</td>
<td>8</td>
</tr>
<tr>
<td>Author(s) and Year</td>
<td>Value proposition, target markets, Internal value chain structure, Cost structure and profit model, Value network and Competitive strategy</td>
<td>Page</td>
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<tr>
<td>Chesbrough and Rosenbaum (2000)</td>
<td>Value proposition, target markets, Internal value chain structure, Cost structure and profit model, Value network and Competitive strategy</td>
<td>6</td>
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<tr>
<td>Gartner (2003)</td>
<td>Market offerings, Competencies, Core technology investments, and Bottom Line</td>
<td>4</td>
</tr>
<tr>
<td>Hamel (2001)</td>
<td>Core strategy, Strategic resources, Value Network and Customer interface</td>
<td>4</td>
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<tr>
<td>Afuah and Tucci (2001)</td>
<td>Customer value, Scope, Price, Revenue, Connected activities, Implementation, Capabilities and Sustainability</td>
<td>8</td>
</tr>
<tr>
<td>Weill ad Vitale (2001)</td>
<td>Strategic objectives, Value proposition, Resource sources, Success factors, Channels, Core competencies, Customer Segments, and IT Infrastructure</td>
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</tr>
<tr>
<td>Applegate (2001)</td>
<td>Concept, Capabilities and Value</td>
<td>3</td>
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<tr>
<td>Amit and Zott (2001)</td>
<td>Transaction content, Transaction structure and Transaction governance</td>
<td>4</td>
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<tr>
<td>Rayport and Jaworski (2001)</td>
<td>Value cluster, Market space offering, Resource system, and Financial model</td>
<td>4</td>
</tr>
<tr>
<td>Bertz (2002)</td>
<td>Resources, Sales, Profits and Capital</td>
<td>4</td>
</tr>
<tr>
<td>Hedman and Kalling (2003)</td>
<td>Value network, Resources, Capabilities, Revenue and pricing, Competitors, Output, Management</td>
<td>7</td>
</tr>
<tr>
<td>Rappa (2004)</td>
<td>Types*: Brokerage, Advertising, Infomediary, Merchant, Manufacturer (Direct), Affiliate, Community, Subscription, Utility</td>
<td>9</td>
</tr>
<tr>
<td>Osterwalder &amp; Pignuer (2009)</td>
<td>Customer segments, Value propositions, Channels, Customer relationships, Revenue streams, Key Resources, Key activities, Key Partnerships, Cost structures</td>
<td>9</td>
</tr>
</tbody>
</table>
As we can see, business model frameworks have been used to ask and answer many different questions about value creation, value appropriation, and the business environment. One of the reasons these frameworks are so flexible is that they are snapshots in time, representations of a venture’s current activities, key variables, and design decisions already made. This allows an observer to speak in the resource-based language of strategy (advantages we have, capabilities we can offer) and also in the experience-oriented language of marketing (customers realizing value and contexts in which our services are being enacted). Each business model framework is adapted to the question it is designed to answer, by emphasizing the elements and decisions that matter. Thus, if we wish to take a snapshot of a digital service business, we must identify elements like:

- The value proposition (offering of potential value) the business makes available;
- The experienced value, as explained by the SDL, which requires that we identify:
  - The customers who enact the digital service,
  - The context in which it is enacted, and
  - The digital interfaces that connect offering, customer, and context;
- The resources and capabilities that the business draws on to assemble the value proposition, which may require that we know about the digital platforms through which external capabilities are accessed, and any partnerships or relationships through which they are acquired;
- The configuration (the set of complementarities or cospecializations) among capabilities, or between capabilities and contexts, that reflect the business’s strategic advantage for value appropriation.

Following the literature on open value creation (Schlagwein & Schoder 2011), we view value propositions as being assembled out of capabilities and resources (hereafter, “capabilities”) distributed throughout the ecosystem – some internal, some shared with partners, some available to all. Following the SDL, these value propositions only result in value creation when they are instantiated as services by customers in contexts. Following the latest RBV thinking, since these capabilities are rarely exclusive or unique, the key to value appropriation must be configuring them in distinctive ways, or extracting synergy through complementarity or cospecialization. Because of the nature of digital business ecosystems, choices are made about the digital platforms through which capabilities are accessed and assembled, and the digital interfaces through which they’ll reach customers and contexts. An aspect of this business model framework that surprises us is that having ownership of capabilities is no longer critically important to value appropriation. Instead, it seems that value appropriation results from” the ability to conceive of the entire value-creating system and make it work” (Normann & Ramírez, 1993). See Figure 2.
6. DIGITAL SERVICE INNOVATION AND BUSINESS MODELS: CASE STUDIES

6.1 DIGITAL BUSINESS MODELS AND DIGITAL SERVICES

The digital business model framework developed above is a snapshot of a business at a point in time. It shows the accumulation of choices made, and services provided, to date. As such it provides a powerful tool for managers to understand their businesses. For researchers, it provides a language for discussing how value propositions relate to the digital business ecosystem and how businesses manage the dual challenge of value creation and value appropriation. Because we wish to understand how digital service innovation unfolds given the way the environment works and given the need for business models to account for both creation and capture of value, this section of the paper examines case studies in digital service innovation, using the digital business model framework as a guide.

The relationship between digital business models and digital services is as the relationship between abstraction and instantiation. Following the service-dominant logic, a service is enacted when a value proposition is taken up by a customer who applies it in context and experiences value. A value proposition by itself is not a service, merely the potential for service provision. Because digital business models are abstractions of going concerns, they depict stable value propositions and regular or expected avenues connecting them to customer experience. But many digital services occur outside the
business model! Beta tests and experiments are common ways of offering new value propositions and enabling customers to experience new services, temporarily or as one-off cases, especially in some of the new digital business ecosystems (e.g. Iyer & Davenport, 2008). Only a small portion of these trials ultimately “settle” into stable and regular offerings that could be described as business models. Thus we may view digital business models as relatively-established configurations of capabilities and customer-contexts, the jumping-off points from which innovation begins. Digital service innovation is the process by which new services are generated and new business models ultimately crystallize. Figure 3 depicts the conceptual relationship between digital services (which may be tentative), digital business models (abstractions of regular or established service provision patterns), and digital service innovation (the process that links the two). It is the latter process we wish to examine in this study.

![Figure 3. Relationship between digital business models and digital service innovation.](image)

### 6.2 CASE STUDIES

We present here three case studies of digital service innovation, drawing special attention to the constructs introduced in our literature review and framework development. The cases represent a diversity of industries and markets in order that we may induce generalizable propositions about digital service innovation and digital business model evolution.

#### 6.3 CASE STUDY: NIKE+

Nike, Inc. was founded as Blue Ribbon Sports in 1964 by a University of Oregon track athlete and his coach, and began as a distributor of athletic shoes made by other companies. Since the emergence of its Nike product line in the early 1970s, it has become the world’s leading manufacturer of athletic footwear and apparel for a wide range of sports. In a business model framework, manufactured goods like sneakers are value propositions, offerings by the firm imbued with the potential for valuable use by the customer. It could be very easy for managers to assume that competitive success all came down to making the highest-quality product, but Nike is special in that it has never suffered from this myopia. Nike has always seemed to understand that it needs to focus on the subjective experience of value by its customers: basketball players realize value when they can jump higher; sprinters realize value when they can run faster; marathoners realize value when they can endure longer. By paying attention to
the customer experience of value, and designing its shoes and other products accordingly, Nike prospered.

Nike continually experimented with new value offerings. For runners, Nike realized that two important parts of the customer’s running experience were motivation and performance feedback, and it sought ways to serve these needs, even tinkering with the idea of a “smart shoe”. In 1987, it introduced a tentative product called the Nike Monitor, a bulky but wearable device that would use sonar to detect a runner’s speed and distance. The Nike Monitor wasn’t a success but over the years Nike added sports watches, heart rate monitors, and other gear directed at the same type of value experience: letting runners know how they were doing. Around 2004, Nike engineers began to notice that more and more joggers were running with music, and that the Apple iPod specifically was their device of choice. The main roadblock to selling a “smart shoe” or a device like a heart rate monitor had been that it was difficult to get performance data off the equipment and into a form that the customer can use, but with the iPod, here was a digital device that runners carried with them on every run and manually synced up with their internet-capable computer on a regular basis. Nike quickly realized that running, music, and performance data could be combined with the use of the iPod for a superior customer experience that none of their competitors could match, and began developing the Nike+ system with Apple’s help.

Nike+ is simple. The customer purchases a cheap sensor (an accelerometer) and inserts it into the sole of a compatible Nike running shoe. The sensor transmits data wirelessly to the runner’s iPod, so that when he presses the “start” button, the iPod begins recording the time, speed, and distance of the run. When the user syncs the iPod with his home computer, that data is uploaded to the Nike+ website where he can see his performance tracked over time and even share the data with friends. Even though the system really only captures two variables, time and speed, the ability to track one’s own performance improvement over time and compare it to goals has proven incredibly valuable to customers.

When Nike+ users started uploading their personal statistics to the Internet, funny things began happening. Runners were not only interested in viewing their own performance, but also in sharing it with friends, and seeing what others in the community were doing. The result was a powerful new avenue for social motivation to go running. Users could form running clubs to train together with friends in different places, could challenge rivals to friendly competitions, and could participate in virtual events with the whole community. Beginning in August 2008, Nike organized its first virtual 10K race, with 800,000 runners in cities all around the world running independently or in groups and uploading their statistics to the Nike+ web community. Other such events have followed.

Because the Nike+ service is offered for free, and iPod sales accrue to Apple, we don’t know exactly how profitable Nike+ has been for Nike. The sales of the shoe-sensors are probably a tiny fraction of Nike’s overall revenue, but Nike credits Nike+ with building the brand and growing its market share for running shoes every year since its launch. Customers buy Nike shoes not necessarily because they are superior to other brands (competition in this regard is very intense) but because the value-in-use they experience from Nike+ is significantly greater than the value they could realize with another brand’s
shoe and no Nike+. So far, only Adidas has developed a similar offering combining a “smart shoe” with an online service, and it remains to be seen how the competition will develop.

Since launching Nike+, Nike has continued to introduce new features on top of the basic Nike+ service. The user’s online presence now works in conjunction with social networking platforms such as Facebook and Twitter; as each uploaded run is seen by friends, this contributes to the motivation of the runner as well as to rivals in his network. The Apple iPhone and a Nike wristband have been developed as alternatives to the iPod for receiving the shoe-sensor data. An experimental mapping feature is currently being rolled out, integrating Google’s maps (freely available through an open API) and the iPhone’s GPS capability, so that users can map their running routes. Apple has also worked with Nike to develop the music-related aspect of the service. Nike+ now allows users to designate “powersongs” for extra motivation during a difficult run, and to share these choices socially. Over the course of running some 330 million miles, Nike’s customers have uploaded massive amounts of personal-performance data to the Nike+ website, and it remains to be seen what other uses can be found for this data. Health experts in particular are optimistic about how this cornucopia of vital statistics data might be potentially used in a whole new set of digital health care services, once the privacy issues are worked out.

6.3.1 MAPPING THE NIKE+ DIGITAL SERVICE INNOVATION NARRATIVE

We found that diagramming, using the graphical conventions of Figure 3, was a powerful way of making sense of the evolution of the Nike+ digital business model. Figure 4 retells the narrative of the Nike+ case study in the language of digital services and digital business models, capabilities, configurations, and customer-contexts. Chronologically, beginning on the left, we see that the established Nike footwear business model was the jumping-off point for several new service innovations intended to offer customers the value experience of performance feedback, but many of these service offerings were temporary, experimental, and either failed or remain ancillary to Nike’s main business.

About the same time, the customer-context of running with music became increasingly important. Nike tried offering an MP3 player (drawing on a new technology capability) as a service offering for this customer-context, but Apple was so successful in the MP3 ecosystem that customers themselves began two service offerings together: Nike shoes and Apple’s iPod. Recognizing the iPod’s dot-connecting potential for an experimental “smart shoe” idea, Nike integrated the smart shoe and iPod with a website to form a complete Nike+ system. At some point in time, which requires theoretical definition (see section 4), Nike+ graduated from “experiment” status to become a digital business model in its own right. Note that this does not mean that we think the footwear business disappeared; a firm may have more than one concurrent business model. One clue that Nike+ is stable enough to be called a business model is that it is now the jumping-off point for new service innovations, including Facebook, Twitter, and iPhone applications.

We used thin rectangles in Figure 4 to delineate the “boundaries” of the two main companies in the narrative, Nike and Apple. This diagram feature allows us to observe
that the most interesting service offerings draw upon a mix of capabilities developed internally (e.g. the Nike+ web functions), technologies from outside the ecosystem (MP3, new sensors, GPS), and bits and pieces of other companies’ business models accessed through digital platforms or exclusive alliances. What we would call a “value proposition” in one of Apple’s digital business models is treated as a “capability” in the Nike+ digital business model (look back at Figure 2 to see how those relate). Other intrusions from outside Nike that affect the direction of digital service innovation are new customer-contexts, emerging technologies, and customer demands for new types of value.

The overall impression given by the diagram is of a company that continually experiments with adding new service offerings that build on its established business model, as new technologies become available and as new ways for customers to realize value in context are discovered. It also shows a company that freely draws upon capabilities from other companies’ business models (notably Apple’s) to assemble its uniquely valuable configurations. It was a winning configuration, rather than any particular component technology, that allowed one experimental service to mature into a new digital business model. As we study the other two cases, we will continue to use this diagramming technique to observe similarities and differences.
Figure 4. Evolution of Nike+ digital business model.
6.4 CASE STUDY: HUMANA

One example of a strong innovator in the health care arena is Humana, a benefits solutions company, offering an array of health and supplemental benefit products for employer groups, government benefit programs, and individuals. Headquartered in Kentucky, Humana provides health insurance benefits to over 11.5 million customers in all 50 states, including to beneficiaries of Medicare, Medicaid, and Military insurance programs. While its core business model is familiar to anyone who knows the American health care system – it provides health insurance benefits under health maintenance organization (HMO), private fee-for-service (PFFS) and preferred provider organization (PPO) plans – Humana is distinguished by a number of innovative new digital services it has developed in the past few years.

Guided by the vision of serving as a health information hub for its customers, Humana recognized that the missing piece of such a service was getting doctors to interact with a website for self-service. Humana CIO Bruce Goodman said in an interview with the Wall Street Journal: “The difficulty was that a typical doctor’s office has patients from dozens of different health plans. So, each health plan has various degrees of advancement in terms of providing Web capability, right? And then the doctors would have to train their staff, which tends to have a fairly high turnover in the front office, to use all of those different systems. So, we got to a certain point of adoption and we were having a hard time getting beyond that.” To solve the problem, Humana had a conversation with a competitor, Blue Cross Blue Shield of Florida, and proposed the creation of a uniform web portal for all plan providers. The uniform portal would allow doctors to learn a single system and be able to access any patient’s records, even those with small, local insurance companies. The web portal now covers 95% of all patients in Florida and is expanding to other states. In terms of our framework, the portal is a new interface through which Humana reaches doctors to co-create valued services. Once it was in place, they were able to develop new service offerings, including clinical transactions like e-prescribing. These have been highly profitable, doing 600 million transactions and earning $70 million in revenue a year.

Goodman believes that the next big capabilities we need are for doctors to use electronic medical records and for patients to adopt personal electronic health records. Reflecting a service-dominant logic, he understands that these technologies won’t be adopted until patients and doctors are able to see that they can experience subjective value from them. “And frankly until you connect all the pieces and crunch it with data analytics, there isn’t a lot of value to it. Part of [what will drive] adoption is getting everybody hooked up, and then generating actionable information that is useful to everybody in the system.”

Instead of focusing on a future scenario in which all the puzzle pieces are already in place, though, Humana has kept up the pace with service innovations on a small scale. Its innovations in mobile games for health are examples of ways to get customers to happily sign up for electronic services that connect them to their insurance provider. In 2010 it launched the game Colorfall through the Apple iTunes AppStore. This game...
challenges the player to arrange cascading color tokens in the order of the rainbow spectrum; the physical challenge is that to get each color, the customer must find and photograph an object of that color. The value-in-use of this game is not only entertainment but also physical exercise and mental stimulation. A web-based game, FamScape, allows family members and friends to set exercise goals and challenge one another to meet them. The game can connect to third-party devices like pedometers that enable players to earn points for exercise. At this point it’s not clear whether the games are earning money for Humana or whether they’re just experiments, but at any rate Humana is using them to interface with new customers and certainly acquiring lots of potentially-valuable exercise data (much like Nike+) upon which future services could be built.

A new service offering geared toward getting doctors and patients more tightly integrated with the insurance company is Humana’s “medical home” concept being tried out with Medicare Advantage customers in Florida. In the “medical home”, doctors serve as “quarterbacks” for their elderly patients’ whole lifestyles, using technology to manage exercise, weight, nutrition, prescriptions. The doctor serves as the communication hub for specialists and testing centers, with the goal of managing a patient’s wellness instead of waiting for acute emergencies to drive a patient in to the doctor’s office. There is evidence that patients are experiencing substantial value from the medical home concept: hospital readmission rates are dropping; costs for ER visits, hospitalization and prescriptions are falling; blood sugar and cholesterol levels are more likely to be in the optimal ranges, and overall, patients are reporting happiness and satisfaction.

Humana is a profitable and growing company that stands to benefit from the expected industry consolidation as the American health care system changes in the near future. Part of its success is almost certainly due to its active and robust innovation efforts. We see in this case a company that embraces digital business model thinking. Not only does Humana perceive its entire business model, from the digital platforms that enable its service offerings to the subjective value that customers wish to experience, but it also thinks forward to future business models it would like to reach, and innovates step-by-step the new capabilities, platforms, and interfaces that it will need to get there.

6.4.2 MAPPING THE HUMANA DIGITAL SERVICE INNOVATION NARRATIVE

In our first narrative diagram of the Humana case study, Figure 5, we observe some new phenomena unlike the Nike+ case. First, Humana is an actively-innovating company that appears to strike out into blue water from time to time. Its “medical home” concept, for example, builds on Humana’s current business model but does not appear to be triggered by an external development like a new technology or new customer-context. On the other hand, innovative digital health-enhancing games like Colorfall and FamScape do draw on technology platforms from outside Humana’s boundaries but do not really use any of Humana’s existing resources; they are all new as far as the company is concerned.
We found that the shared portal that CIO Bruce Goodman discussed was a good example case for attempting to diagram coopetition – a phenomenon we identified as a necessity in digital business ecosystems. Humana and its competitors forged a new organizing model, a joint venture, to create a prototype web interface that would serve as a common platform for all of their digital services to doctors. At the time of Goodman’s interview, the new web portal was well-established in one state and expanding nationwide. As it was a valuable and unique combination of capabilities with a serious value proposition to benefits providers and to doctors’ offices, and was serving as a launch pad for new services, it had become a new digital business model. Although it was not owned by Humana, but shared, Humana was able to offer services of its own, like e-prescribing, upon the platform.

In order to make some sense of some of the disconnected service innovations we read about in the case, we tried an experiment with the diagram. Based on Goodman’s comments about capabilities needed and future realization of value, we conjectured that Humana’s digital service innovation is anchored by a vision of a future business model, and we added its logic to the diagram, Figure 6. Viewed from right to left, it shows that each of Humana’s innovations makes sense in terms of an envisioned business model. Bit by bit, Humana is working toward creating the envisioned customer-contexts (doctors accessing Humana’s services by self-service web portals), capabilities (electronic medical records, which in turn need a value offering to get patients to adopt them), and configurations (the “medical home” vision). If our conjecture is correct, then we are observing a different way of motivating digital service innovation than was observed at Nike.
Figure 5. Evolution of the Humana digital business model.
Figure 6. Evolution of the Humana digital business model toward envisioned business model.
6.5 CASE STUDY: ZIPCAR

It would be hard not to notice the green Zipcar signs popping up in prime parking spaces at university campuses all over the United States. This Boston-based upstart, founded in 2000, is now the dominant player in the nation’s rapidly-growing “car sharing” market, and expanding by acquisitions into western Europe. Car sharing is a new take on the well-known business model of car rental. Instead of making cars available at airports and other transportation hubs, though, Zipcars are parked mainly around universities and urban downtowns where apartment-dwellers who don’t own cars may be found. And instead of renting cars by the day, Zipcars are rented by the hour. Beginning with a single lime-green Volkswagen Beetle in 2000, the company has grown to a fleet of more than 8000 cars in 50 cities and on 150 college campuses, partly by acquisition and merger with rivals like Flexcar.

Although Zipcar provides an offering (cars) similar to traditional car-rental companies like Enterprise and Avis, the value that customers realize is very different. Zipcar signs up customers as “members” and they pay a small annual fee for the right to access a car at any time they need one for rates as low as $8 per hour. With their membership fee, they are paying for “mobility when and where I need it” – in other words, the ability to occasionally drive somewhere without having to buy, garage, and maintain a car of their own. Zipcar has discovered a set of customers who aren’t satisfied with the value proposition of public transit, yet who cannot reach traditional rental car agencies whose vehicles and staff are generally far from their apartment communities. The Zipcars are located in special reserved parking spaces that the company acquires in prime locations where members can easily hop in and go.

Careful examination shows that Zipcar has innovated far more than just a new customer segment and new payment model, though. One of the foundations of the business is an RFID transponder in each car that detects a member’s “Zipcard” to lock and unlock the doors. This allows the cars to be rented nearly-spontaneously (reservations can be made minutes in advance by phone or through a website) without need of a human attendee. Each car also features an onboard computer that records mileage, hours of use, can locate the vehicle and can prevent it from starting in case of theft. These clever technologies draw on existing infrastructure – ubiquitous internet connectivity, broadband wireless networks, and GPS – to enable almost-entirely automated operations. In the back office, Zipcar has also developed a powerful fleet-management information system that allows them to manage reservations, analyze usage to identify traffic patterns and customer demand for cars, and optimize fueling and maintenance in their fleets.

Once established, Zipcar’s basic IT proved to be the foundation for building additional functionalities and service offerings. One such offering is an iPhone application that allows members (“Zipsters”) to locate an empty car by honking the horn remotely, and to unlock the doors by remote. Another is a service that allows customers to extend a reservation by sending a text message. But interestingly, Zipcar has also built on its embedded systems and fleet-management infrastructure to create another service for
another type of customer: FastFleet by Zipcar offers the same fleet-management software to universities, corporations, and government agencies to manage their own fleets for efficient usage and maintenance. After a successful pilot project at a government agency in Washington, DC, the FastFleet service has been offered nationwide and successfully received.

6.5.1 MAPPING THE ZIPCAR DIGITAL SERVICE INNOVATION NARRATIVE

This case study gives us the opportunity to diagram the digital service innovation trajectory in a startup company. Unlike Nike and Humana, Zipcar’s story doesn’t start with an established business model, but with a pilot project involving a single car. The experimental service began with most of the necessary parts of a digital business model already in place: some capabilities (the car), a configuration (a membership model with hourly rental rates), and most importantly, an innovative value proposition that created significant value to a certain intersection of customer and context. During the startup phase, a host of new capabilities were incorporated into a digital car-sharing service. Without these, Zipcar’s business model would never have been possible. In a sense, this narrative is like Nike’s, where we saw service innovation spurred by the emergence of new capabilities, but in another sense it is like Humana’s, where innovators were actively trying to assemble the puzzle pieces of an envisioned, intended business model.

We mark the point of establishment, where Zipcar went from being a digital service to a digital business model, around the time it merged with its rival Flexcar in 2007. That merger resulted in a basically settled digital infrastructure for the merged company, and established Zipcar’s model as the one to imitate. To get to that point, Zipcar had acquired a couple of capabilities: prime parking spaces (which may or may not be seen as VRIN), and a very effective fleet management system. We would argue that this information system fits the description of “configuration” we used in explicating the digital business model framework: by creating cospecialization and complementarity between capabilities, this analytical and operational IT system makes Zipcar’s combined capabilities more valuable than the sum of their parts. We see that the fleet management system itself was spun off as an additional business model to serve the need of a different kind of customer-context: large organizations that needed help managing their private fleets. A final observation from the diagram is that Apple’s iPod pops up as a capability-contributing business model once again. This illustrates the value-appropriating power of own a business model like Apple’s that is useful to such a wide variety of firms.
Figure 7. Evolution of Zipcar digital business model.
7. FINDINGS

From our examination of the three case studies, we made four observations that suggest questions for future research.

7. 1 DIGITAL SERVICE INNOVATION IS GROUNDED BY DIGITAL BUSINESS MODELS

In the cases that we studied, innovative digital services rarely headed off in entirely new directions. Instead, innovators generally used established digital business models as jumping-off points, and innovated by changing one or two of the business model building blocks: capabilities, configurations, customer-contexts, and value propositions. In the Nike+ case, for example, we saw one line of service innovations motivated by a new value proposition (performance feedback for runners) and another set of innovations aimed at serving an emerging customer-context (runners with MP3 players). In the final case, a new customer-context provoked Zipcar to try out a new service that has become a second important business model for the company.

Reflecting the interconnected nature of digital business ecosystems and the facilitating effect of digital platforms, we saw that in every case new capabilities were incorporated from outside the focal firm’s boundaries. Innovators even “borrowed” components of established business models from players in other eco-systems. The Apple iPhone business model and its keystone App Store, for example, was a jumping-off point for service innovations in all three case studies.

In the cases that might appear to be exceptions, such as Humana’s experiments with health-related computer games, we found that a second pattern of grounding was at work: these innovations were grounded by an envisioned future digital business model. In both the Humana and Zipcar cases, we saw firms assembling the puzzle pieces of an intended business model, step by step. We conclude that a digital business model is an important tool in digital service innovation. Whether it is an abstraction of the currently established state of the business, or a map of an entrepreneur’s vision for the future, the business model keeps service innovations focused and increases their likelihood of resulting in value created and appropriated. This finding suggests a few research questions:

- How is digital service innovation’s grounding in digital business models manifested in the process, language, and technology of innovation? In other words, how can researchers operationalize the concept of grounding?

- What types of digital service innovation can be identified? Does grounding in an established business model lead to different types of innovation than grounding in an envisioned business model?

- How do we theoretically account for the effect of digital business models on innovation and performance? Can we view them as second-order dynamic capabilities that compound the dynamic capability of innovation (Winter, 2003)?
7.2 DIGITAL SERVICE INNOVATION IS MORE EVOLUTIONARY THAN DELIBERATE

In the high-velocity, turbulent environment of digital business ecosystems, innovation is not a differentiator but an imperative. Fortunately, digital platforms and the nature of digital capabilities means that assembling prototypes and delivering value propositions can be done far quicker, at much lower cost, than in traditional industries. As a consequence, unlike the controlled environment of an MBA business planning class, we rarely see examples of firms in digital ecosystems calmly assembling all the parts of a new digital business model in a single step. This didn’t even occur at Humana, which was driven by a clear vision of the future model, or at Zipcar, which was a startup. Instead, innovation in each case happened as a result of managed tinkering in real time, in which experiments and pilot tests are continually assembled, tried, and iterated upon. These services are tested “live”, attempting to create value for real customers in their contexts; they are not just prototypes in an R&D lab. In each case we see dead ends. Some value propositions were unsuccessful (e.g. Nike Monitor), others created value for customers but did not lead to a unique value-appropriating configuration and thus remain ancillary to the main business model (such as Nike’s offerings in sports watches and pedometers). A select few evolve into complete new business models.

Thus, digital business models are more emergent than designed: they represent “settled” patterns of valuable service enactment with “regular” customer contexts. The pattern in fact looks a lot like an evolutionary one: many variations are tried, some are selected and become the new “normal”. It is difficult to define the exact point at which a new service becomes (part of) a business model, but we suggest this rule of thumb: once a service is established enough that other service innovations can use it as a jumping-off point, it can be considered a business model, or part of one. For example, we know that Nike+ has matured into a business model because firms in the health care area are starting to think about new services that could tap into its database of exercise performance. Digital business models thus coevolve together by building upon each other’s innovations over time. The following research questions need investigation:

- How do we establish/identify processes for “managed tinkering”? What managerial competencies are involved?
- How can we identify and conceptualize the positive and negative side-effects of firms innovating “live” in actual customer-contexts?
- Can/should companies innovate with partially-structured services (i.e. missing one or more of: capabilities, configurations, customer-contexts)? What threshold of completeness must an offering meet in order to result in meaningful evolutionary gain?

7.3 “GAME CHANGERS” OCCUR WHEN CHANGES COME FROM OUTSIDE

In addition to the grounding effect of digital business models, and the evolutionary process of digital service innovation, case trajectories were also affected by “game
changers” that appeared to intrude from outside the ecosystem. Zipcar’s business model became feasible when a whole set of new technologies emerged from outside ecosystems, and Nike’s service innovation was literally inspired by Nike engineers looking out their office windows and noticing that their customers had begun adopting the iPod in significant numbers. Because of the turbulent causal texture of digital business ecosystems, these unexpected environmental changes weren’t really predictable and could have led to any number of results. Nike and Zipcar represent cases of companies that made hay of unexpected opportunities, and changed the game for everyone in their respective ecosystems. A few important research questions suggest themselves:

- Are the real game changers the outside shocks, or the ecosystem-affecting innovations by which firms respond to them? What would a process theory of game changers look like?

- How do we identify and distinguish game changers, or potential game changers, from “ordinary” changes in the ecosystem? If they represent frame-breaking discontinuities (c.f. Meyer et al, 2005), what theoretical framework can cope with them?

- What is the relationship between “managed tinkering” and game changing innovations? Do the two forces work in parallel to motivate the evolution of digital business models, or do they interact?

7.4 CONFIGURATIONS, ESPECIALLY DATA ANALYTICS, KEY TO VALUE APPROPRIATION

The observation that each innovator in our study frequently drew upon capabilities owned by other companies, even competitors, or freely accessible to all on open markets, again shows that the RBV-based strategic imperative to own VRIN (valuable, rare, inimitable, nonsubstitutable) capabilities does not translate perfectly to digital business ecosystems. While reliance on building every capability in-house would guarantee that some value could be appropriated from any successful service, it appears that there is far more benefit for firms to incorporate capabilities and customer-contexts from outside their own boundaries. Openness to combining internal, shared, and open capabilities creates so much value-creation potential that it is worth sharing the potential surplus with other firms, and customers.

Instead, value appropriability was achieved by creating uniquely valuable configurations of capabilities and customer-contexts – the central concept of our business model framework (Figure 2). Examples of VRIN configurations included: the sensor-equipped “smart shoe” and website that created synergy between Nike’s shoes and Apple’s iPod; the Zipcar fleet management system that used data analytics to optimize fleet deployment and maintenance, squeezing more value out of the same number of cars; and Humana’s vision of owning and “crunching” the data in electronic medical records organized around a “medical home” concept. In each case, capabilities generally came from outside but configurations were pioneered internally. Many of these configurations
manifested as information systems. This is not surprising, considering that service offerings were often composed of digital capabilities.

We observed that in the Zipcar and Humana cases, data analytics (also called business intelligence) were cited as powerful elements of the business model. And even in the Nike+ case, we noted that firms outside Nike are expressing interest in analyzing its vast database for quantitative insights into health care. From one point of view, analytics represent a capability, but we feel that they fit into the business model framework best in the role of configuration. In business intelligence, the technology alone does very little; the true value of analytics comes from a combination of good data, and managers asking the right questions – and these cannot be acquired by buying a software package. Instead, the ability to capture and analyze operational data for insights into action is an important way of co-specializing assets (for example, Zipcar could adapt its choices of parking spaces to traffic and usage patterns from the data) to create complementarity, or capability combinations with more value potential than the sums of their parts.

This finding leads us to three additional research questions:

- How can we characterize “configurations” beyond the two concepts of complementarity and cospecialization of capabilities? Is there a taxonomy or typology that would help us identify and chart these value-appropriation structures?
- What types of causal models best explain the way digital business models-as-configurations lead to value appropriation? Would a configurational methodology yield different conclusions than a variance or process approach?
- What aspects of data analytics (business intelligence) are most central to value appropriability? Is there a process of analytics innovation that parallels digital service innovation?

8. CONCLUSION AND RESEARCH AGENDA

This special issue’s prompt highlights the emerging service-dominant logic of value creation and challenges the information systems discipline to contribute to our understanding of how it changes innovation. This challenge triggered an exciting journey across disciplinary boundaries as we sought to understand how digital service innovation unfolds. We recognized that contemporary IS phenomena like open innovation and digital platforms have created a situation where value co-creation with customers is often in conflict with the firm’s ability to capture some of that value as profit, and that we needed a framework with which to resolve this tension. From a wide-ranging literature review we developed a digital business model framework that ties together theory on value creation from the marketing literature, theory on value appropriation from the strategy literature, and theory on digital business ecosystems from information systems.
We analyzed three case studies of successful digital service innovators and, using a graphical narrative method, charted the evolution of digital services and business models in each case. We found that digital service innovation is grounded by digital business models, both established and envisioned, but that it proceeds in an evolutionary process frequently incorporating new capabilities and customer-contexts from outside firm boundaries, even co-evolving with components of other firms’ business models in interconnected digital business ecosystems. We found that value appropriability is established by unique configurations of capabilities, but not by ownership of them – a finding that overturns the VRIN concept in the dominant resource-based view of strategy. We showed that the velocity and turbulence of digital business ecosystems make experimentation and constant co-creation of value with customers the primary motivators of innovation as opposed to traditional, defensive strategies.

Our findings show the interdependence of digital service innovation in digital business models, improving our understanding of both. This lights the way to a new research agenda building on our past work on digital business models, and should also prove enlightening to researchers in the service innovation area. Our findings suggest several other important research questions, presented in the previous section, and together they map an exciting new field of study at the juncture of marketing, strategy, and information systems.
REFERENCES


**Selected Nike+ Case Sources**


Fikes, Bradley J. (October 13, 2010). Connected to health: Digital networking tools increase information about our well-being. *The North County Times*.


**Selected Humana Case Sources**


Singer, Stacey. (February 16th, 2010). Humana, MetCare trying new patient-centered medical home concept to cure health-system ills. *The Palm Beach Post BLOGS*.

Sommer, Ron. (November 22, 2010). The Long Term Case for Humana. *iStockAnalyst*.


**Selected Zipcar Case Sources**

Abdel-Razzaq, Laurén. (December 20, 2010). Zipcar drives a lime-green Beetle all the way to Wall Street. *Automotive News*.


ENDNOTES

1 We use the term “digital business ecosystems” in this paper to refer to the emerging technology-intensive competitive environments faced by all types of businesses. The focus is on a new type of business ecosystem, so we rejected the shorter term “digital ecosystems” because readers might think our focus was on technology. We also avoid using “digital business” by itself because that would imply a focus on firm type.