Give Away Your Digital Services

Leveraging Big Data to Capture Value

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Abstract

Consumers are getting used to receiving free services in many different fields, and the popularity of the mobile app industry is feeding this phenomenon. Historically, advertising—a typical two-sided market mechanism—is the primary method that companies relying on a free-to-consumers business model have used to appropriate value in digital environments. But new strategies are needed to make free services sustainable and profitable in the long term. At the same time, companies are gathering a huge amount of data from consumers, especially through mobile apps, by leveraging the sensors embedded in smartphones; this data represents a powerful new source of value. Through a case study analysis, we show how leveraging a two-sided structure can enable companies to capture value from user-sourced data, enabling a sustainable free-to-consumers business model. In this model, users are more than eyeballs to be targeted with advertising; they become data providers, and companies may capture value by using that data to customize advertising messages, leverage e-ethnography to improve their own core offer, serve as fodder for research, or create knowledge for third parties.

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Introduction

The term "freeconomics" was invented to describe the point at which the spread of nuclear energy would make electricity "too cheap to meter" (Anderson 2007). We have yet to reach that point in the energy industry, but a similar scenario is not far from reality in other industries. As Moore's law (Moore 1965) reduces the cost of processing power, storage, bandwidth, and the other technologies that have enabled the digital revolution, computing power, and the services supported by it, is rapidly becoming "too cheap to meter," making it possible for some businesses to offer digital services for free and harvest value in other ways. Facebook, for instance, had more than 1.7 billion monthly active users in September 2016 (Statista 2016a), none of whom paid anything to enjoy its services. Facebook makes money by allowing businesses access to users' newsfeeds, through advertising and business pages. Google and all its services, from the search engine to Street View, from Translator to Google Scholar, operate in the same way— advertisers pay the cost of making those services available to users.

These companies leverage an old business model, dating from the beginnings of the modern newspaper industry: advertising. The advertising-based model is a specific type of two-sided market approach in which free (or almost free) services draw large numbers of consumers, who then become targets for the advertisers that pay for access to those consumers. "Selling visitors' eyeballs" (McGrath 2010) is still one of the most popular value-capture mechanisms in the world of digital services and the main revenue-generation mechanism for the digital giants.

As this approach has proliferated across the Internet and app spheres, customers have come to expect digital services to be free—even those they might pay for in the physical world. For instance, TomTom and Garmin, both manufacturers of popular GPS units, attempted to sell navigation apps for smartphones—and were shut out of the market by free navigation services like Google Maps and Waze (Buganza et al. 2015). New models have been proposed to escape this digital service à free equation, such as freemium models, which mix free basic services with paid premium ones (McGrath 2010; Shapiro and Varian 1999; Teece 2010); in-app purchase models, which give the basic app away but offer users opportunities to enrich their experience with it through paid add-ons (Ghose and Han 2014); and cross-selling models, in which a company offers a free service that supports a physical product, exemplified by Fitbit's companion mobile app to its fitness tracker (McGrath 2010; Matzler et al. 2013). These models offer new ways to capture value from innovations in a world dominated by "free," but none of them fit comfortably into an environment in which customers are increasingly used to not paying for what they get. Thus, the question of whether there is a sustainable way to offer digital services for free, besides advertising, remains important.

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One potential answer to this question lies in the considerable quantities of data that customers generate in using digital services. A number of companies have begun to explore the value of this data. For example, in 2009, Twitter started selling expanded access to its database of tweets to third parties, many of whom garner insights from it through sentiment analysis—deducing a general mood or reaction from the tweet stream (Cashmore 2009; BrightPlanet 2013). The Twitter Political Index, presented during the 2012 US presidential election, is one example of the potential for Twitter's data stream to support powerful insights (Bilton 2012). In this way, the company created a powerful revenue stream, one that accounted for almost 10 percent of revenues in the third quarter of 2015 (Twitter 2015). Google, Facebook, and many others have experimented with similar approaches, capturing economic value from the data generated by users.

All of these companies operate in two-sided markets— markets in which they function as intermediaries between two sets of customers: consumers/users who access the service and advertisers or others who pay for it in exchange for some set of services (for example, advertising or access to data). As physical products are increasingly either fully digitalized or digitally augmented, the combination of these two-sided market structures with immense user-generated data streams suggests a new set of value-capture mechanisms and an entirely new set of opportunities, even for companies not typically recognized as being in the digital industry.

Big Data in Two-Sided Markets

Digital services providers, like many other companies, operate in two-sided markets—markets in which interaction between two (or more) groups is governed by network externalities that affect the value of the goods or services offered. Those externalities can be either direct (an increase in the number of users generates an increase in the value of the goods or services) or indirect (an increase in the number of users generates an increase in the value of complementary goods) (Katz and Shapiro 1985). In other words, as Rochet and Tirole (2006) define them, two-sided markets are "markets in which one or several platforms enable interactions between end-users, and try to get the two (or multiple) sides 'on board' by appropriately charging each side" (p. 645). This kind of market is made possible by the existence of (Evans 2003): i) two or more distinct groups of clients, ii). Indirect network externalities associated with those

groups, and iii) an intermediary who can internalize the externalities,

harvesting value by mediating the interaction. According to this definition, many markets can be considered two-sided, including, for example, payment card systems—the payment platform (Visa or Mastercard, for instance) functions as the intermediary between consumers and merchants—and newspapers—the

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newspaper publisher functions as the intermediary between potential consumers and the merchants who advertise in the newspaper (Parker and Van Alstyne 2005; Rysman 2009).

Filistrucchi and colleagues (2014) classify two-sided markets by what kind of connection the intermediary facilitates between the two groups of clients (**Figure 1**). In transaction markets, such as credit card payment systems, eBay, and Airbnb, the intermediary platform enables a transaction between the two sides. In nontransaction markets, the intermediary platform offers its core product or service to one group and then sells access to that group to the other side; the newspaper advertising model is a non-transaction market, as is Google's advertising model.

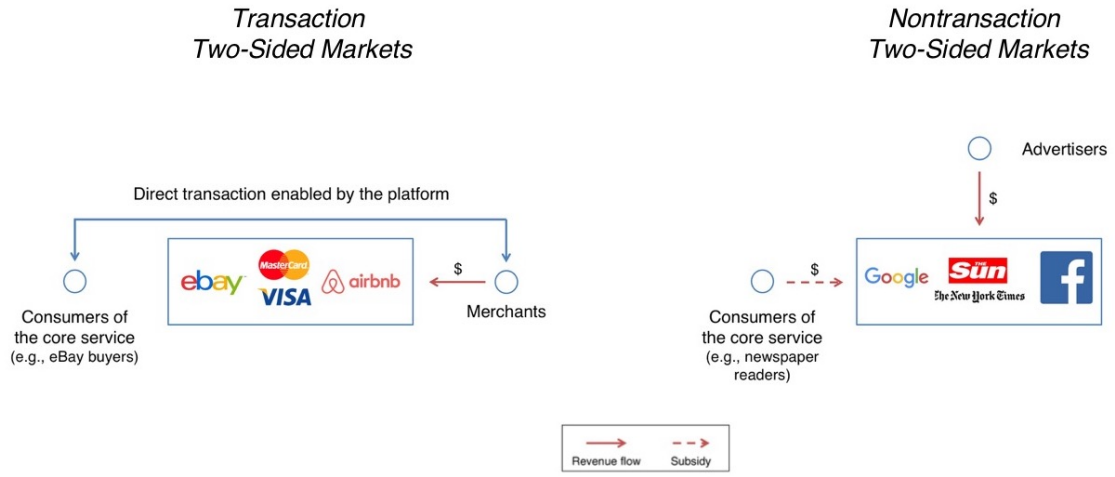

Figure 1 – Transaction and nontransaction markets

Scholars studying two-sided market structures, and primarily nontransaction two-sided markets, have focused mainly on price dynamics, which are quite different in this context than in traditional one-sided markets. Consider, once again, newspapers: the final user is subsidized, paying less than the cost of producing the paper, by the advertisers on the other side of the model. A traditional markup pricing formula would never sustain a structure like this.

Further, the subsidy allows for firms to explore radical pricing models, even giving products away to attract the users who generate value on the other side of the model. Indeed, Parker and Van Alstyne (2000) propose a model that suggests how intermediary or platform firms in nontransaction two-sided markets can raise profits by giving products away; that model suggests that increased demand in a complementary market can cover the costs of investment in the free one. In this model, the subsidized side is the one with the higher demand elasticity, where a price cut can generate a large increase in demand, making the market more valuable on the other side (Rysman 2009). This is the model invoked by many first and second-generation digital services providers; Facebook and Google can charge more for advertising because they draw millions of users who can serve as targets for those ads.

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Data may represent another complementary market for digital firms and even manufacturers whose physical products come with digital adjuncts (like, for instance, Fitbit). The emerging model, typified by Twitter's Firehose data product, relies on the emergence of big data and tools for managing it. Big data is data characterized by five features, the "five Vs"—volume, velocity, and variety (McAfee and Brynjolfsson 2012), as well as value (Leventhal 2013) and veracity (White 2012). Several scholars have highlighted the opportunities big data may afford to improve business process, for instance, by improving the decision support system (Chong et al., Forthcoming; Leeflang et al. 2014; Rust and Huang 2014; Lau et al. 2012; McAfee and Brynjolfsson 2012; Sahoo, Singh, and Mukhopadhyay 2012), increasing sales and customer satisfaction (Chau and Xu 2012; Park et al. 2012), enabling new types of collaboration with customers and partners (Waller and Fawcett 2013), or identifying financial fraud (Abbasi et al. 2012). The advent of big data has also presented opportunities for new business models that harvest the value of large data streams (Brown, Chui, and Manyika 2011) and turn data streams into revenue streams (Van't Spijker 2014; Walker 2015). Consumers can benefit from the economic surplus generated by big data and associated business models through low prices or customized products (Brown, Chui, and Manyika 2011). However, although it is clear that big data can lead to major developments, there is still a huge gap between the opportunities it presents and the current knowledge of the field (Ostrom et al. 2015). Few business models have been described that directly link big data to value capture.

Big data can also represent a major management issue, as companies must understand how to identify appropriate data streams and combine and manage multiple data sources to build advanced analytics models; they must be prepared to transform the organization to integrate big data into processes and approaches (Barton and Court 2012; Boyd and Crawford 2012). Moreover, particularly relevant for companies seeking to access big data as a complementary market, big data presents privacy concerns that companies must address transparently, in their communications with users and in their management of data streams (Michael and Clarke 2013; Gehrke 2012; Wong 2012).

As big data becomes more ubiquitous, companies are searching for ways to capture value from it. Aside from business models that focus on servitization based on data, Twitter's Firehose model demonstrates how third parties operating in nontransactional two-sided markets may use data generated by users to create a new revenue stream. As the volume and range of data types increases, including both intentionally created user data and data gathered from embedded sensors, more companies will be able to engage in this kind of value capture, engaging in two-sided markets to offer services to users at little or no cost while generating profits from their data.

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The Study

The app industry represents an intriguing empirical setting to explore the emergence of big data business models in nontransactional two-sided markets. By the end of 2016, 2.16 billion people will have smartphones (Statista 2016b). As a result, the app industry, which provides applications for these phones, has a huge social and economic effect, changing how companies create and capture value (Wirtz, Schilke, and Ullrich 2010); 90 percent of iOS apps are offered for free (Perez 2013), and many of them collect data from users who access their services, both through direct interaction (for instance, user-entered data on food consumption) and in the background, through sensors embedded in the smartphone (for instance, data on steps taken, run speed, or run distance).

Due to the exploratory nature of this research, we adopted a case study approach, relying on secondary sources for data (Yin 1984). Specifically, to identify which approaches companies may adopt to access the value embedded in user-generated data, we analyzed each app's privacy policy, using an iterative explanation- building approach. That is, as each policy was analyzed, researchers created a list of approaches in terms of potential uses of customer data represented by elements in the privacy policy. We used existing theories to interpret the data gathered and considered multiple cases to highlight different models and increase the validity of our results (Gibbert, Ruigrok, and Wicki 2008; Cook and Campbell 1979).

We focused our research on a category of apps that collects a wide range of data, from user-entered information to data gathered from sensors, providing a stream of genuine, real-time, variegated, and valuable data—health and fitness apps. This category of apps had an estimated market value of $4 billion in 2014, a number expected to increase to $26 billion by 2017 (Boxall 2014). We used Appcrawlr, a mobile app search engine, to identify free health and fitness apps offered through Google Play; an Appcrawlr search conducted on January 27, 2016, produced a list of 149 mobile apps that met our criteria.1 We then eliminated duplicate results and those apps with fewer than 5 million downloads from Google Play at the time of the initial search, since big data effects would likely be negligible under that threshold. We did not consider apps provided by platform providers (for instance, Apple's Health or Google's My Track) because those offerings are part of a larger product service system. Finally, one app was removed from the sample because of a lack of information in its privacy policy describing how the company uses data gathered from customers. Thus, the final sample is composed of 14 apps (**Table Errore**. Nel documento non esiste testo dello stile specificato.**-1**).

We gathered data on our case apps from a variety of sources. Firms' official websites provided institutional product and service descriptions, and Google Play was used to retrieve quantitative information related to apps' popularity (measured by number of downloads) and feature sets. Articles in industry magazines and

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other publications were searched for deeper discussions of case companies' businesses and business models. Finally, the privacy policies were analyzed to understand how companies might employ user-sourced data.

App (Provider)	Ad Revenues?	*Revenues from Users*		
		Premium Offerings	In-App Sales	Cross-Selling
Adidas Train & Run (Adidas)				
Calories Counter (Fat Secret)				
Endomondo (Under Armour)	✓	✓		
Fitbit (Fitbit)				✓
Lose It! (FitNow)		✓		
MapMyRun (Under Armour)	✓	✓		
MyFitnessPal (Under Armour)		✓		
Nike+ Running (Nike)				
Noom Cardio Trainer (Noom)		✓		
RunKeeper (Fitness Keeper)	✓	✓	✓	
Runtastic (Runtastic GMBH)		✓	✓	
Sports Tracker (Amer Sports Corporation)	✓	✓		✓
Strava (Strava)		✓		
Virtuagym Fitness—Home & Gym (Virtuagym)		✓		
Total	4 (28.57%)	10	2	2

Table Errore. Nel documento non esiste testo dello stile specificato.**-1 – Study sample**

Capturing Value from Big Data: Three Strategies

Only four (28.6 percent) of the case apps use advertising to generate revenue in the traditional way (that is, through banners). Even these typically rely on some revenue from users, in the form of premium offerings, in-app sales, or cross-selling of physical products. Interestingly, three apps do not show any source of revenues from ads or users, suggesting that their primary purpose might be related to a specific corporate strategy beyond merely generating revenues (for instance, brand awareness) or have other revenue sources that might be data related.

This last possibility is the focus of this study. Our analysis suggested three possible strategies for leveraging big data, which we've called enhanced advertising, e-ethnography, and data trading. These strategies may be seen as representing an evolution in the approach to big data. Companies may begin by using their data

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to amplify traditional revenue-generation mechanisms such as advertising, then move on to using data to improve internal processes, and finally exploit the value of data directly by making it available to other players. This set of strategies also represents an evolution in the approach to users. In enhanced advertising, users are still primarily eyeballs to be sold; the data simply make the advertising more targeted. Users are a target for revenue-generating activity, as in traditional advertising models, not a source of revenue themselves. In the e-ethnography model, user data is still not a direct source of revenue, but it is used to support activities that generate revenues. Finally, in data trading, the data becomes a direct source of revenues, and users have moved from being a target of revenue-generating activity to a source of the data that generate revenues.

Strategy 1: Enhanced Advertising

Enhanced advertising improves on the traditional advertising-based mechanism by using customer data to help advertisers target their messages. This activity is allowed by privacy policy statements that permit the use of information for advertising, as in this excerpt from Runtastic's policy: "The user explicitly consents to the storage and use of non-personally identifiable information for purposes of in-app advertising or on www.runtastic.com by Runtastic or its partners." That "non-personally identifiable information" allows ads to be contextualized to the moment and targeted to particular user needs or preferences. For example, Runkeeper promises advertisers, "Ads that don't feel like ads. Based on the unique goals of your brand, we'll reach the right audience at the right time" (FitnessKeeper 2016). Leveraging information gathered from users via smartphone sensors, the company offers highly contextualized advertising messages and links to advertisers that make ads look like the answer to users' needs, for instance, rewards for reaching workout goals that link users to advertisers, such as a special discount with an advertising partner. Six companies in the sample have privacy policy provisions that allow them to use data to create enhanced advertising that moves beyond merely selling eyeballs to meeting users' needs and wants, as identified by the users themselves (**Figure 2**).

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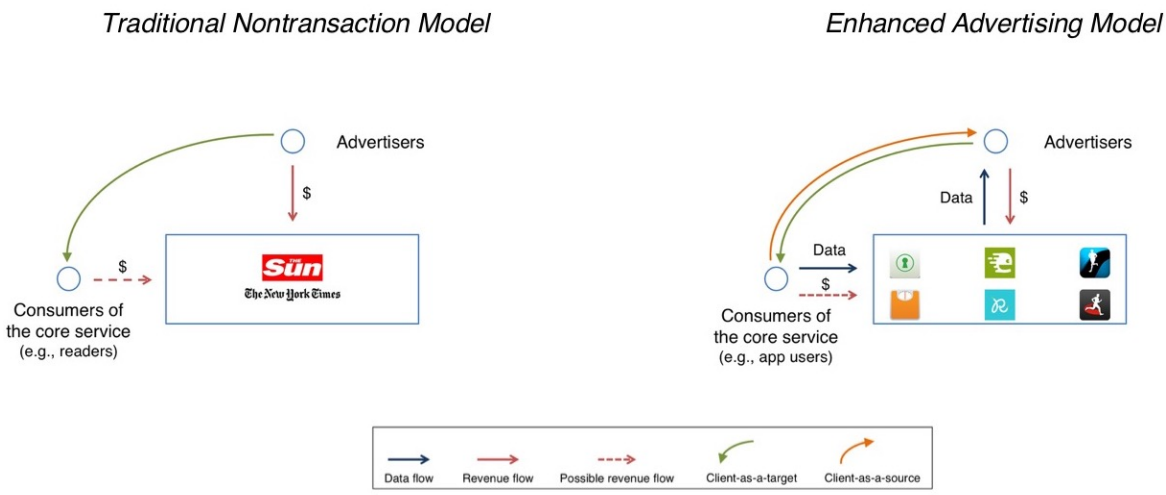

Figure 2 – Strategy 1: Enhanced Advertising

Strategy 2: e-Ethnography

In the e-ethnography approach, companies employ user data to improve their core products or services and to develop their relationship with their customers. Increasingly, customers are finding that user-generated data is allowing them to shape a different kind of relationship with customers, based on a deeper, ongoing engagement. As Stefan Olander, Nike's Vice President of Digital Sport, told an interviewer, "The opportunity that is presenting itself right now is completely different. The relationships we have [with the customer], and this is something we learnt from Nike+ already, are so much more impactful when someone comes back to the brand two or three times a week to sync a run, versus what it used to be which was convince someone that we had something amazing—which we do—then you buy it and you have a great experience with the product but we don't know anything about that experience" (Goetz 2012). In other words, user data is a precious source of valuable insights into users' habits, needs, and interactions with the company's products; user data streams allow for large-scale observation of thousands or even millions of user interactions with a product. Further, these observations are noninvasive, since they are embedded in the user's experience.

Where the app supports a physical product, the benefits can extend far beyond the app itself. Nike uses its Nike+ Running customers to understand how people use its core product—shoes. App users provide a huge amount of information about their workout habits that allows the company to profile its customers and understand critical attributes. For instance, the company knows that men in their late thirties run an average of 37.8 km/week, with an average single run distance of 6.2 km at an average pace of 6:56 per mile. Most people run mainly on Sundays and the most frequently selected "power song" is "Eye of the Tiger."2 All of these insights were gleaned from data gathered through the app. The relevance this data can have for an established company can explain the absence of direct revenue sources for some of the apps we studied—

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these apps may exist primarily to provide support for the core business, rather than to generate direct revenue, by providing data from which the company can glean valuable insights about how its customers actually interact with the physical product.

Another three companies in the sample—Adidas Train & Run, Noom Cardio Trainer, and Sports Tracker—have the capability to leverage data in this way; indeed, according to their privacy policies, they can share data internally. It is interesting to highlight, as one—Adidas Train & Run—is offered by an established company just like Nike+ Running, while the other two (which also leverage traditional revenue sources) offer coaching and tracking services for several sports, which make the gathered data a valuable source to improve their core service (working on the algorithms). Noom Cardio Trainer declares in the privacy policy that the data are used to improve weight loss and to offer a customized experience, while Sports Tracker declares that they use the data to develop their own products and services.

In this model, users are no longer simply targets for advertising; rather, they represent a valuable source of data that can help the company build insight. This strategy does not create a direct revenue flow related to user-sourced data (**Figure 3**). Rather, the data represent a valuable by-product that companies use internally. As in traditional nontransaction markets, the company leverages indirect network externalities, but in this case, the other side of the interaction is not with external parties, such as advertisers, but within the company itself.

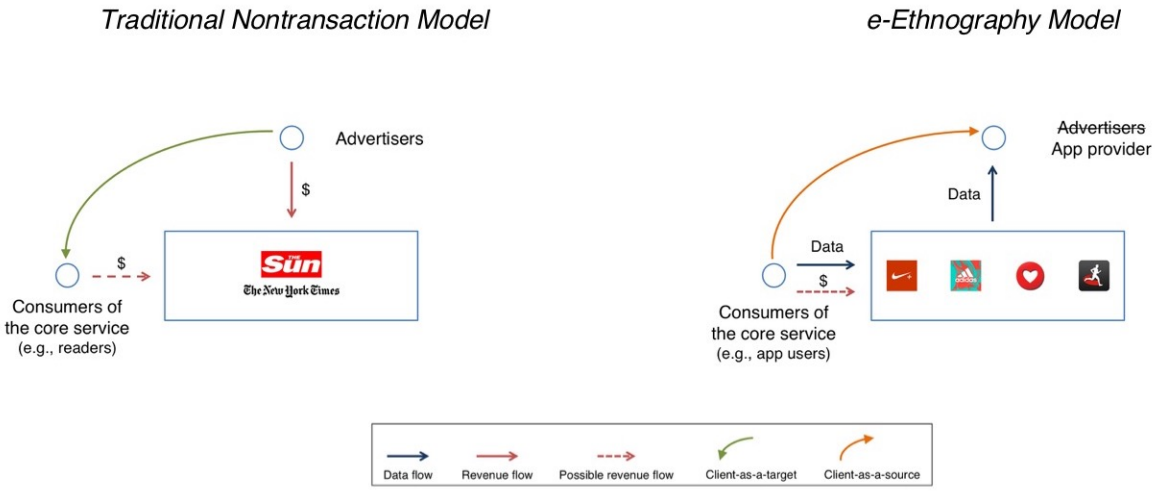

Figure 3 – Strategy 2: e-Ethnography

Strategy 3: Data Trading

Finally, companies can generate revenue from user data in a much more direct way—by selling user data to a third party; Twitter's Firehose is an example of data trading. That data can be used by buyers in a number of ways, to provide services or to support various kinds of research. For instance, Strava, which offers a

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mobile ride-tracking app for bicyclists, has sold data to the Oregon Department of Transportation (DOT), which uses that data to, for instance, identify where bike lanes are needed (Davies 2014). "We were really deficient on the cycling and walking side of data," Margi Bradway, the department's transportation lead, told Wired. Oregon DOT addressed that deficiency, beginning in September 2013, by accessing Strava's Metro database; for a fee of $20,000 per year, the department can see where bikers speed up or slow down, where they stay on the street and where they ride on the sidewalk, and so on. Strava has engaged in similar partnerships with departments of transportation in London, England; Glasgow, Scotland; Orlando, Florida; and other cities, creating a robust revenue stream. The app was designed to help cyclists and runners connect with each other and share their progress. Now, it provides data to local governments, which use it to make cycling safer and provide civic support for cyclers more efficiently.

Strava may be in the lead with this kind of data use, but a number of companies have privacy policy provisions that allow it. Strava's privacy policy says that it may use user-sourced data, in anonymous or aggregated forms, for the purposes the company deems appropriate. A total of 10 apps have similar provisions, allowing them to sell or exchange the data they gather. Behind these apps we can find companies like Under Armour, which now owns 3 of the 14 apps in our sample (Endomondo, MyFitnessPal, and MapMyRun) and seems to be building a suite of services for athletes (Marr 2016), and FitnessKeeper (the provider of RunKeeper), which created the Health Graph to gather data from partners as well (HealthGraph 2014). These two examples show how companies are seeking ways to build large databases and maintaining the freedom to use these data to create value. These examples also demonstrate the ferment around apps' usage of data; while some companies, like Strava, are fully exploiting the potential of their data, others are still exploring the opportunities promised by data.

Selling user data lets companies fully exploit the value of user-sourced data, making it no longer a by-product. In this model, the data is itself a valuable revenue-generating asset—users are a source of data and, hence, a source of revenue (**Figure 4)**.

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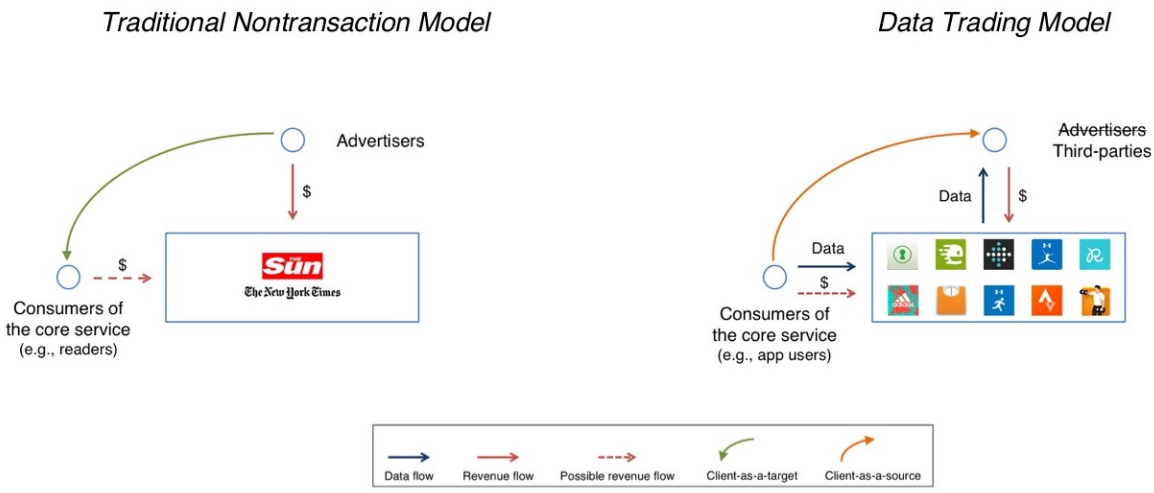

Figure 4 – Strategy 3: Data trading

Combining the Strategies: Insights from Other Industries

Our analysis suggests that users' role in revenue generation in nontransaction two-sided markets is changing. Where once users were strictly eyeballs to be sold—targets for advertising and little more—now, users provide a source of revenue, in the form of data, at least as often as they serve as targets of revenue generation activities. This new role is related to new technological opportunities: smartphones, with their embedded sensors and wide range of apps, can gather a huge volume and variety of data with incredible speed, and the ubiquitous connectivity they provide allows for that data to be collected and aggregated in real time. All of this makes accessing

embedded value much easier. In this new world, the user shifts from being a passive target to providing a valuable active data source.

Companies seeking to capture the value embedded in user-sourced data can pursue three primary strategies. One of them, enhanced advertising, represents only an incremental change from the traditional advertising mechanism, but the others are radically new approaches to non-transaction two-sided markets, transforming users from targets to sources. In e-ethnography, user-sourced data provides insights into customers' behaviors that can feed into new products or into improvement to the app itself. In data trading, user data is a direct revenue source, sold to third parties that can exploit its value.

These last two strategies fit different kinds of companies: e-ethnography is more common in companies that use the app to support a core business, as Nike and Adidas do, while data trading is available to companies that are entirely digital, including startups and smaller companies, and those whose only product is the app. Both of these strategies come with significant privacy concerns. All of the privacy policies we analyzed

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addressed these concerns by specifying that data would be shared only in anonymized and aggregated forms. However, data privacy remains a hot topic among app users; transparency in managing data and user expectations for privacy is a key factor in building strong relationships with users.

These strategies for generating revenue from data have been used in other sectors, such as in social networking. Twitter, for instance, has benefited from aggregating its data (its tweet stream) in a more usable form and selling access to researchers and other companies. The Twitter example illustrates how these strategies might be implemented together, leveraging both the client-as-a-target approach (through promoted tweets and targeted advertising) and the client-as-a-source approach, through its data-trading Firehose service.

Several implementations of these strategies can be found outside the app world. John Deere added sensors to its products to support new features (van Rijmenam 2014), and then used the resulting data stream to get insight into how the products were used in the field. Those insights were then applied to optimize follow-on product generations to improve productivity and user experience. This is an e-ethnography strategy, similar to Nike's, that leverages information gathered from the products themselves and users' interactions with them in the course of providing ancillary services. Waze, a popular navigation app now owned by Google, is engaging in a data trading strategy similar to Strava's, sharing traffic information with departments of transportation (Olson 2014). As more of the world becomes digitized, through the spread of the Internet of Things and through virtualization, more industries will need to consider these kinds of strategies to harvest the value in streams of user-generated data.

Conclusion

Although big data continues to be a subject of much discussion, companies are still struggling to unlock the value embedded in their growing data streams. Our research suggests that big data can support new business models in which users access services for free in return for providing a revenue-generating data stream. User-generated data are particularly powerful in terms of both quantity and quality; companies can use these data streams not only to generate revenues directly but also to build deep understanding of customers' needs and wants, and of how products are used.

As more products incorporate sensors and apps, our work can be applied far beyond the limited context of smartphone apps. As Nike, Adidas, and Fitbit illustrate, big data can be generated, and profitably leveraged, by product manufacturers. Managers seeking new ways to capture value would do well to pay attention to the data they collect from users and the data they could be leveraging.

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