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The Duality of Media: A Structurational Theory of Public Attention

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Digital media offer countless options that compete for a limited supply of public attention. The patterns of use that emerge in this environment have important social implications, yet the factors that shape attendance are not well integrated into a single theoretical model. This article posits such a theory using Giddens's notion of structuration as an overarching framework. It identifies public measures that distill and report user information as a pivotal mechanism that coordinates and directs the behaviors of both media providers and media users, thus promoting the duality of media. The theory is then used to understand evolving patterns of public attention in the digital media environment.

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Digital technologies offer a seemingly endless supply of media that compete for public attention. Commentators have variously celebrated or decried this new world of media, though all seem to recognize that patterns of use will be central to understanding the media's social impact. This article argues that public attention is the result of a structurational process in which institutions and users mutually construct the media environment. Central to this process are two types of public measures. The first, market information regimes, provide media institutions with the data they need to monitor and respond to the marketplace. The second, user information regimes, are new measures that offer consumers tools to navigate the digital environment. All such regimes are socially constructed and potentially biased. Increasingly, though, they determine how things come to public attention.

To explore the forces that shape public attention, this article proceeds in four sections. First, it defines public attention and makes a case that it is an important, but underdeveloped, concept in media studies. Second, it outlines a theory of public attention that is derived from Giddens's (1984) work on the duality of structure and the literature on media industries and audience behavior. Third, it demonstrates the ways in which public measures affect the duality of media systems. Finally, it considers how structurational processes shape three socially consequential patterns of

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public attention: fragmentation, polarization, and the convergence of media supply and demand.

Public attention in a digital media environment

Although the digital media marketplace is constantly evolving, three features of that environment are clear. First, media content and services are proliferating at such a rapid rate that the volume of new material is essentially unlimited (e.g., Anderson, 2009; Lyman & Varian, 2003). Second, media, both old and new, are increasingly available on demand via fully integrated digital networks that allow users to move easily from one cultural product to the next. Third, the total supply of human attention available to consume those products has an upper bound (Webster, 2008a). The widening gap between limitless media and limited attention means it is harder for any offering to attract significant public attention.

The idea that media could eventually overwhelm our ability to consume them is not new. In the early 1970s, Nobel laureate Herbert Simon (1971) described the growing disparity as a "poverty of attention" (p. 41). In a world increasingly dependent on digital media, the poverty of attention has important consequences. Commentators from many disciplines now view attention as a prerequisite for the exercise of economic or social influence (e.g., Couldry, Livingstone, & Markham, 2007; Davenport & Beck, 2001; Falkinger, 2007; Goldhaber, 1997; Hargittai, 2000; Hayes, 2008; Lanham, 2006). Lanham, for example, advised we should "[a]ssume that, in an information economy, the real scarce commodity will always be human attention and that attracting that attention will be the necessary precondition of social change. And the real source of wealth" (2006, p. 46). Moreover, the pursuit of attention is not limited to those with purely commercial or political motives. The authors of "consumer-generated" media often seek fame and fortune that must, in the first instance, be achieved by attracting a measure of attention (e.g., Benkler, 2006; Halavais, 2008; Hargittai, 2008a; Webster, 2008a).

Of course, gaining the attention of any one person is rarely of social significance. Rather, what is loosely called public attention is a more potent and, potentially, tractable manifestation of attention. Some year ago, Neuman (1990) noted the importance of public attention and suggested that "a theory of public attention" (p. 163) could be developed from the literature on advertising effects and public information campaigns. While the term continues to be widely used in academic writing, it remains surprisingly undertheorized. Given its growing importance to both social scientists and media practitioners, I hope to give the concept of public attention fuller consideration.

I begin by offering a fairly precise, if restricted, definition. In the sections that follow, I develop a structurational explanation of how public attention takes shape in digital media environments. The duality I envision is heavily dependent upon public measures that distill and report information about users. These processes encourage certain macrolevel outcomes, structuring the digital media environment itself. The

article concludes with a brief discussion of emerging patterns of public attention and their possible consequences, although a more fully formed theory could certainly elaborate on the effects of public attention.

Public attention is the extent to which multiple individuals (i.e., agents) are exposed to cultural products across space and/or time. For purposes of this discussion, those cultural products are various forms of digital media, be they television programs, news stories, video clips, Web sites, audio files, videogames, etc. In principle, this operational definition could be expanded to other forms of media or cultural artifacts. Exposure is simply a matter of people coming into contact with those cultural products. This can lead to other forms of engagement or media effects without presupposing outcomes. At the heart of the construct is the notion of aggregation through space and time. Public attention is realized across space when many disparate individuals attend to some media offering. Such measures reveal which offerings are culturally salient and provide a starting place to understand public taste, social impact, and the extent to which digital media fragment or concentrate public attention. Public attention also operates across time as evidenced by the way people repeatedly use or avoid media offerings. This reveals how people immerse themselves in various genres of communication, providing another window into cultural consumption and the extent to which digital media may contribute to social polarization. In practice, the dimensions of space and time are intertwined and not always easy to disentangle.

A structurational theory of public attention

Understanding how public attention is attracted to a particular cultural product, or why it accumulates across some set of products, requires a theoretical framework that accounts for the major forces at play in the digital media environment. Giddens's (1984) theory of *structuration* offers a model that encourages us to think of public attention as something that is constantly reshaped by the interaction of people and the media resources they use. This section integrates the relevant literature on media industries and audience behavior into that overarching theoretical framework.

A structurational model has three major elements: agents, structures, and duality. The first two are familiar, if contested, concepts in social science (e.g., Embirbayer & Mische, 1998; Sewell, 1992). Duality is a process through which agents and structures mutually reproduce the social world, something Giddens called structuration. Although I deal with each element separately below, different expressions of agency reverberate throughout. Most conventionally, it is evident in the actions of media users whom I describe in the section on agents. The structures that agents use to accomplish their purposes are not static, but reflect the work of institutionally embedded actors who constantly monitor and adapt to user behaviors (e.g., Battilana, 2006; DiMaggio, 1988). Least conventionally, I argue that social aggregates, as seen through the lens of various public measures, possess a particularly potent type of agency that fuels the duality of media. I begin by identifying the assumptions that underlie each component of the model.

Agents

Agents are the people who use digital media, thus conferring or withholding their attention. Their use of media is purposeful and can, in principle, be performed at a time and place of their choosing. In practice, though, most media use is ingrained in the rhythms of day-to-day life and so has a predictable, recursive quality (LaRose, 2010; Rosenstein & Grant, 1997; Rubin, 1984). Agents know a good deal about the media environment that surrounds them and reflect on how best to use those resources. It does not follow, however, that they know all the causes or consequences of their actions.

Media use is purposeful, or "rational," in the sense that it serves an individual's needs and preferences. Many theories of media choice identify such psychological predispositions as the principle or sole cause of behavior. Depending upon the literature one invokes, media choices are conceptualized as a function of needs (e.g., Rubin, 2002; Ruggiero, 2000), attitudes and beliefs (e.g., Cotton, 1985; Stroud, 2008), moods and hedonic impulses (e.g., Vorderer, Klimmt, & Ritterfeld, 2004; Zillmann, 2000), or simply program-type preferences (e.g., Owen & Wildman, 1992; Prior, 2007; Rust, Kamakura, & Alpert, 1992). Although most approaches recognize that a user's predilections must have antecedent causes, as a practical matter, theorists often take them as given. Some approaches also recognize social factors as conditioning preferences, although traditional economic models typically ignore the social environment as a force in shaping behavior (Becker & Murphy, 2000).

Purposeful though agents may be, their ability to act rationally is "bounded" (Simon, 1997) in two important ways. First, given the vastness of the digital environment, no agent can be expected to know all the options at his or her disposal. Second, media products are "experience goods" subject to "infinite variety" (Caves, 2005; Hamilton, 2004). Individuals cannot fully know the nature of a product or whether its use will provide the desired gratification until it occurs. This is particularly true for newly released entertainment or press reports. Bounded rationality is one reason why media use may not conform to the utility-maximizing behavior assumed in traditional models of program choice (Owen & Wildman, 1992). Instead, agents rely on habits and tools to "satisfice" rather than maximize (Simon, 1997, p. 118). For example, people routinely reduce an overwhelming number of choices to a manageable "repertoire" of preferred sources (e.g., Hasebrink & Popp, 2006; Neuendorf, Atkin, & Jeffres, 2001; van Rees & van Eijck, 2003; Yuan & Webster, 2006). Digital networks now offer agents much more powerful tools for finding content and those may eventually bring user choices into greater conformity with user preferences. Search engines and recommendation systems are discussed below in the context of public measures.

Beyond an individual user's preferences and habits are a closely related set of interpersonal influences. These include the long-established role of opinion leaders in directing group members' attention to some things and not others (e.g., Katz & Lazarsfeld, 1955), various social functions of media consumption including its utility as a "coin-of-exchange" (e.g., Levy & Windahl, 1984; Lull, 1980), and more recent

work on the impact of social networks in determining TV program selections (e.g., Friemel, 2008).

In a digital media environment, the impact of both individual predispositions and interpersonal networks has room to grow. Although we have long expected rational individuals to seek out what they like and avoid what they do not like, the rather limited menu of broadcast media has made it difficult for agents to fully exercise their penchant for *selective exposure*. In an environment with potentially unlimited on-demand media, people are now better positioned to consume a steady diet of their favorites and avoid anything they find objectionable or intrusive. Whether people become sated with those favorites or actively seek diversity are open questions. Interactive digital media also have the ability to extend traditional face-to-face interactions to larger virtual networks, thereby amplifying the effects of interpersonal communication. The so-called social media (e.g., MySpace, Facebook, Delicious, Digg, Yahoo, etc.) often help people coalesce into like-minded communities, which can lead members to media products and messages that resonate with group norms (Webster, 2010). But to do any of these things, agents must rely on structures to accomplish their purposes.

Structures

Structures include a wide array of macrolevel constructs such as language, routines of work and leisure, technologies, and institutions. Giddens (1984) loosely termed these "rules and resources." In this context, the most directly relevant structures are the media resources that agents use to enact their preferences. For the most part, governments and media industries provide the enabling infrastructures, programing, and services.

These institutions have their own motives for providing resources and attempt to manage consumption toward those ends. Their goals might include enlightening the public, which has been the tradition in public service broadcasting; indoctrinating citizens, which has been the practice of totalitarian regimes; or profiting from media consumption, which is the objective in commercial systems.

Money can be made through "dual markets" in which media products are sold to audiences or audiences are sold to advertisers (Napoli, 2003). The former constructs a market by offering media that attract users and is sometimes described as the "pull" method of audience building. The latter, termed a "push" or "interruption" method, constructs an audience by embedding what might be unwanted messages across more desirable content. Because people increasingly have the means to avoid such interruptions, some argue push methods will become untenable (e.g., Hayes, 2008). Nonetheless, for the time being it remains an important tool for marshaling public attention.

The number of media providers has now expanded dramatically with the growth of user generated content. These images and commentaries are typically delivered via social media. Although much of this activity supports fairly conventional interpersonal relationships (Lenhart, 2009), a growing portion shares the motives of

traditional media institutions. That is, the new content providers hope their offerings will enlighten, indoctrinate, or make a profit. Beyond that, they might also seek "benefits to reputation" (Benkler, 2006, p. 43) or simple notoriety. With the exception of those engaged in genuinely interpersonal communication, then, all media providers have a stake in attracting and manipulating public attention. To do that, they must be able to see what media users are doing.

The duality of media

There has been a tendency in the social sciences to explain social life as the result of either structural factors or purposeful, reasoning agents. Similar divisions, emphasizing the primacy of either macrolevel structures or microlevel traits, persist in the literature on media choice (Webster, 2009). Although there have been attempts to acknowledge and reconcile these alternative explanatory frameworks (e.g., Cooper & Tang, 2009; McQuail, 1997; Webster & Phalen, 1997), the mechanisms through which these forces interact and ultimately shape attendance are not well developed in theories of media choice or audience behavior.

In sociology, Giddens's solution to the "objectivist/subjectivist" divide was to promote the idea of duality, that is, structure and agency were mutually constituted. Individuals rely on structures to exercise their agency and, in doing so, reproduce and alter those very structures. Language is often cited as an example of such a duality. Individuals are born into a structured world of language. Although they are free to abandon it, they generally use it to achieve their own ends. Through this reflexive use of language they reproduce and, over time, alter the structures that enable their agency.

In communication, Giddens's work has had its greatest impact in theorizing about the role of information technologies in organizations (e.g., DeSanctis & Poole, 1994; Orlikowski, 1992; Poole & DeSanctis, 2004). In this setting, structurational models focus on how individuals "appropriate" the technologies available to them. Although those appropriations can be faithful to the intent of the designer, they can take an "ironic" turn reflecting the work practices and predispositions of users. Hence, the features of an information technology do not determine how people will use them, rather they provide "affordances" that people choose to exploit in certain ways. Depending upon how those within the organization appropriate a technology it can, over time, either reproduce or alter organizational structures. Furthermore, as organizational structure changes, people will modify the technology, or its uses, to meet their changing needs. This recursive process is what Orlikowski (1992) termed the "duality of technology."

Although it might seem an apt model for describing the structuration of larger media systems, each setting enacts duality differently. In organizations, the appropriation of technology is typically discussed, negotiated, and resolved by users in a "microsocial" process of interpersonal and/or group communication (e.g., Leonardi, 2009; Poole & DeSanctis, 1992). These are usually purposeful, self-aware expressions of agency. In the media marketplace, it is not the existence of deliberating individuals, but of socially constructed aggregates (e.g., audiences, publics, markets, and

networks) that enable duality. These are generally not self-aware bodies that act as a group, yet institutional decisionmakers routinely attribute intentionality to them and behave accordingly (e.g., Ang, 1991; Cantor, 1997; Gitlin, 1985). If institutions react to audiences as though they have a "mind of their own," then audiences possess a kind of de facto agency. This creates structurational processes unlike those that affect the use of technologies within organizations.

But media providers can only respond to such willful audiences if they can see them. It is only when they are rendered visible that audiences become "institutionally effective" (Ettema & Whitney, 1994). A variety of public measures are needed to make this possible. As such, measures constitute another layer of "technology" that intervenes in the process of reproducing and changing the structural features of the media environment. Moreover, institutionally embedded decisionmakers are no longer alone in their need for surveillance. Increasingly, ordinary users rely on a variety of publicly available measures to navigate the digital environment. Without fairly sophisticated forms of data gathering, both institutions and agents are blind and unable to make sense of the digital environment. Public measures, then, are crucial to our understanding of the duality of media.

Public measures and their impact on duality

Sociologists have noted "a flood of social measures designed to evaluate the performance of individuals and organizations" (Espeland & Sauder, 2007, p. 1). Unlike traditional audits, these circulate widely among the affected populations and so have been dubbed *public measures*. University and hospital rankings, for example, help consumers assess their options, guide their decision making and, in turn, affect the institutions they measure. The digital media environment is rife with such measures. There are two major genres. These were created to serve the needs of media providers and media users, respectively.

Market information regimes have long influenced the operation of media industries and governments. According to Anand and Peterson, such regimes "are the medium through which producers observe each other and market participants make sense of their world" (2000, p. 272). At the beginning of the 20th century, the central challenge facing the radio industry in the United States was finding a way to make listeners visible to the institutions that hoped to profit from them. In the 1930s, audience rating services addressed the problem and have been indispensible to the operation of electronic media ever since (Webster, Phalen, & Lichty, 2006). In the United States, and much of the world, these measurement companies are expected to be impartial in the business of attracting, selling, and buying audiences. Ironically, even though market information regimes are created to support institutional objectives, they become the vehicle through which agents, knowingly or not, exercise a powerful form of agency. Without market information, audiences are as immaterial as the airwaves. With it, they become a force institutions can ill afford to ignore. Although such information regimes offer a common "currency" for the relevant institutions,

they are often unavailable to ordinary media consumers and so might be better thought of as quasi-public in nature.

The second genre, which I term *user information regimes,* includes search and recommendation systems. They were designed for ordinary users, although institutions exploit them to supplement market information. User information regimes are a recent development and are more characteristic of nonlinear media systems that allow people to select discrete items of content on their own timetable. Compared with more traditional media, they all offer users some measure of interactivity, whether it is the ability to click, link, sort, retrieve, recommend, comment, buy, or collaborate. Importantly, most also leave an electronic record of their use that can be harvested in various ways and used to produce the many forms of surveillance that constitute user information regimes.

Both market and user information regimes have a number of characteristics in common. All are exercises in collecting and aggregating data. They typically measure the behaviors of media users (e.g., choices, votes, linking activities, etc.) that are otherwise out of public view and dispersed through time and space. These data are then reduced and reported in standardized formats that are easily digested and acted upon. Because they aggregate the actions of ordinary individuals and are often carried out by ''objective third parties,'' they frequently have an air of authority and trustworthiness that carries considerable weight with institutions and agents alike (e.g., Hargittai, Fullerton, Menchen-Trevino, & Thomas, 2008; Sundar & Nass, 2001; Webster et al., 2006). In many instances, they may be the only manifestation of the public attention that media providers so desperately seek. This makes them a potent force in the reciprocal processes that characterize structuration.

Inevitably, though, public measures are social constructs, defined by their makers and subject to whatever theoretical and methodological biases that have gone into the making. They necessarily focus the attention of institutions and users in particular ways and structure decision making within certain bounds. As such, they can bias structurational processes, encouraging certain outcomes and discouraging others. Furthermore, as Esplanade and Sauder (2007) noted, public measures are ''reactive.'' The very existence of the measure can affect the thing being measured. Those who rely on information regimes often understand their importance, reflect on how to use them, and occasionally attempt to manipulate the measures themselves. The construction of public measures, then, is often a political process.

These attributes are essential to understanding how public measures affect the duality of media systems. They are, however, confounded and difficult to deal with in isolation. In an effort to sort them out, I first describe how public measures enable reciprocal causation in both linear and nonlinear media systems. Second, I identify how public measures can contribute to bias in media choice, focusing particularly on the operation of user information regimes. Third, I consider separately the common bias that privileges popularity and question whether this taps the ''wisdom of crowds'' or simply promotes a form of reactivity. Finally, I note the political economy surrounding the construction and operation of information regimes.

Reciprocal causation

The central tenent of duality is that agents appropriate the structural resources available to them and by doing so both reproduce and alter those structures. In other words, structure and agency are mutually constituted in a continuous process of reciprocal causation. Such processes can play out over decades, resulting in long-lived structures and institutional practices. They can also create a kaleidoscope of structures that change from one moment to the next. The following describes instances of reciprocal causation, enabled by information regimes and enacted over different spans of time.

Traditional linear media deliver a stream of content that is constantly informed by the size and composition of available audiences. Among other things, these data explain why "prime time" and radio's "drive time" have justified large institutional investments in programing and promotion. Although individuals can tune in or out as they like, it is clear that linear media use is tightly bound to patterns of work and leisure and is, in the aggregate, highly predictable (Webster & Phalen, 1997). Armed with this information, the media can make reasoned judgments about what to program and advertisers can try to orchestrate who will see or hear their commercials. These practices, which have been fueled by the market information since the earliest days of broadcasting, are ongoing and deeply embedded in the operation of media industries. As people appropriate newer forms of nonlinear media, they may well unsettle established patterns of cultural production and consumption. But that will only happen to the extent that information regimes reveal the change.

Market information is also essential in observing and responding to short-term changes in consumption within established media systems. For example, linear media encourage a routinely observed phenomenon called *audience flow* (Webster, 2006). Those who watch one program or listen to one song are exposed in disproportionate numbers to the succeeding item of content. These patterns are observable only by aggregating user behaviors. Programmers are well aware of such "lead-in effects," track them with audience ratings, and do their best to entice available audiences with material they will find appealing. Again, agents are always free to do otherwise, but many opt to consume what is offered. If this scheduling device works in the media's favor, it will recur. If it does not, it will change. Hence, agents enact their preferences within the structures available to them and, in doing so, both reproduce and reshape those structures, even if they are unaware of the role they play. As long as the media are motivated to attract audiences and can monitor their behavior, this recursive process will continue.

Nonlinear media, too, promote reciprocal causation. Search engines are the most widely used of all the services on the Internet (Nielsen, 2009). One of their principal inputs is data on the linking architecture of the Internet (Cho & Roy, 2004). Web sites, created by both institutions and individuals, often point to other sites by providing a hyperlink. With sufficient computing power, links are fairly easy to monitor and analyze. Although they reveal the existence of pathways rather than actual traffic, they are seen as indicative of consumption, affiliation, and importance (e.g., Adamic, 2008; Finkelstein, 2008).

Google, for example, uses an algorithm modeled on academic citation. It ranks Web sites with the requisite search terms according to the number and importance of their inbound links (Battelle, 2005; Halavais, 2008). Although other search engines use different protocols to locate content, they typically replicate Google's results (Hindman, 2009). One way or another, they tend to privilege popularity and focus attention on a relative handful of sites. Within these systems, once something becomes popular it can be a self-fulfilling prophesy because the site tends to accumulate new visitors and links along the way. The converse is also true. In a system driven by page ranks, even high quality new sites are often doomed to obscurity (Cho & Roy, 2004). Actions, freely taken, are the input for user information regimes that continuously structure and direct subsequent action. It is a process of reciprocal causation that evolves in real time.

Bias in public measures

As with any exercise in collecting, reducing, and reporting data, public measures carry with them potential biases. They may make certain populations or activities visible and obscure others from view. These biases are not necessarily malicious, but they can impel media systems toward particular outcomes. Moreover, as users appropriate the various features of information regimes, their practices may introduce additional momentum in one direction or another. As these biases "scale up" from the microlevel actions of agents to macrolevel patterns of public attention they have potentially significant social and cultural consequences.

I will deal with two kinds of bias in separate sections below. First, as already noted, reigning search algorithms tend to focus public attention on the most linked sites at the expense of other alternatives. Pointing users to the most popular stories or products is common to many protocols. So much so that I will return to discuss this bias once additional forms of recommendation have been considered. Second, within traditional market information regimes, the potential for bias has been long noted and is, not infrequently, the subject of political struggles within the affected industries. Examples of these will be discussed in the section on the political economy of public measures. The remainder of this section focuses on user information regimes that generate recommendations. These typically employ one of the two strategies, aggregation across social networks and directing consumption with collaborative filtering.

One of the striking features of social media is their ability to bring obscure stories or images to public attention. These often spread through social networks powered with digital technologies and are variously described as cascades, contagions, or, depending on the context, viral marketing (e.g., Centola & Macy, 2007; Sunstein, 2007; Weber, 2007). Social network analysis suggests that the widespread dissemination of information is aided by "weak ties" (Granovetter, 1973; Watts & Strogatz, 1998), which bridge otherwise disparate individuals and groups. Whether simple information cascades can be triggered by a few influential people or are essentially random events that bring things to public notice without much regard to their quality is unresolved (Gladwell, 2000; Salganik, Dodds, & Watts, 2006; Watts & Dodds, 2007).

If social media supported these processes as nothing more than person-to-person communication through digital networks, they might fall short of the definition of information regimes. But people now pass along media and commentary with tools that provide powerful multiplier effects. Social news sites (e.g., Digg, Slashdot, Reddit, Mixx, etc.) aggregate recommendations from their users and rank order the results for others to see. Bookmarking or file sharing sites (Delicious, YouTube, Flickr, etc.) will similarly point users to the most recommended or viewed items. Social networking sites (e.g., MySpace, Facebook, LinkedIn, Twitter, etc.) can automatically highlight media among large networks of acquaintances, including many with weak ties. Even online versions of traditional media encourage this activity. Newspapers now point to their most popular stories, which seem to constitute a "public endorsement" of their merit (Thorson, 2008). Many articles also feature a row of icons that will flag the piece to your preferred social medium.

The social networks described above, like more traditional groups, seem to coalesce around certain norms, values, or affinities (e.g., Hayes, 2008; McPherson, Smith-Lovin, & Cook, 2001). Web sites like Facebook help organize friends into homophilous groups. Social news sites like Digg cater to those of a particular ilk. If group members are inclined toward selective exposure it is likely that the group's attention will be focused on things that resonate with the interests and predispositions that characterize the network. These modes of recommendation may bias consumption in the direction of ever more agreeable entertainment and information. In the extreme, they can promote processes of polarization discussed in the last section of the article.

A tally of votes or views across social networks are not the only kind of recommendation that directs public attention. Institutions are using the data generating potential of interactive media to develop powerful tools of surveillance and recommendation. The most sophisticated of these are called *collaborative filtering* systems. These run proprietary algorithms that track an individual's expressions of interest, purchases, rentals, downloads, etc. and compare them with those of other users who demonstrate similar profiles. On the basis of that comparison, the objective is to recommend other things a person "like you" might enjoy. Some content providers use this technology to further refine recommendations beyond simple popularity contests (e.g., Flickr, Reddit, TiVo, etc.). Many Internet retailers (e.g., Amazon, iTunes, Netflix, etc.) are also well known for their use of collaborative filtering.

Collaborative recommendations have their own biases. Their purpose is, at the very least, to promote user loyalty and often to encourage another purchase or download. Even though many users are aware of the institutional motivations at work, recommendations might still be welcomed. If so, this form of push audience building should thrive. The power of recommending institutions to suggest just the right thing at just the right time is critically dependent on the scale and scope of their data gathering operation. One needs large volumes of server-collected information to refine behavioral and contextual recommendations. If these data can be wed to additional information describing the users (lifestyles, preferences, affiliations, etc.), targeting and appeals can be refined even further (e.g., Turow, 2006). One way or

another, though, agents provide the grist that feeds the mill, and what they do or say affects the structure of the environment for fellow agents. The fact that so many user information regimes depend upon these ways of analyzing and reporting data raises a fundamental issue about such public measures.

The wisdom of privileging popularity

The recommendations provided by search engines, social networks, and collaborative filtering systems, solicited or not, have become indispensible tools for navigating ever larger swaths of the digital media marketplace. In one way or another, all tend to privilege popularity as a guide to consumption. Search engines tally inbound links. Recommendation systems point to the items with the most votes, hits, or purchases, if not across the entire population then within niches populated by people "like you." Although this is not the only way to decide what to attend to, on the surface it makes good sense. But should it?

Social commentators and users alike often take comfort in these systems because they appear to embody the *wisdom of crowds*, the notion that many ordinary decisionmakers can produce collective judgments superior to experts (e.g., Anderson, 2006; Sunstein, 2006; Suroweicki, 2004). But even if one accepts the premise, user information regimes often fail to meet the prerequisites for producing good decisions. According to Surowiecki (2004), wisdom is achieved when large numbers of diverse individuals make decisions or predictions independently. Unfortunately, most user information regimes violate these principles.

First, recommendations are often made on the basis of small, homogeneous groups of people. Not only are members of social networks, affinity groups, or devotees of a particular blog probably homophilous, but for many such groups, the number of active participants is small. Hayes (2008), for example, argued that themed communities are optimally sized at fewer than 500 individuals. These recommending bodies often do not have the diversity that is essential for producing wise judgments, nor does collaborative filtering correct the problem. Although the best systems sit astride vast stores of data, they are required to do so because few people are ultimately useful in making a recommendation. That is, filtering algorithms search for and preferentially weight your "closest peers" or "nearest neighbors" (Adaomavicius & Tuzhilin, 2005). These often constitute just a tiny portion of the people in the database.

Second, none of the user information regimes described above promote the kind of independent decision making required for optimal recommendations. Search engines offer users summaries of what others have performed, effectively guiding subsequent decision making. As we have seen, this can promote a calcified system in which popular sites accumulate more links, whereas new sites remain obscure (Cho & Roy, 2004). Aggregating and reporting what other visitors to a Web site have performed or what members of a social network recommend introduces powerful signals about social desirability for those who follow (e.g., Salganik et al., 2006; Stroud, 2008). If autonomous judgments produce the best outcomes, contagions and cascades are anathema to reaping wisdom of crowds.

Many observers of digital media have noted that the "filters" people use to manage the abundance of the marketplace will be pivotal in harvesting its riches and/or realizing its socially destructive potential (e.g., Anderson, 2006; Benkler, 2006; Sunstein, 2007). The user information regimes described above are the most potent and pervasive of these filters. These regimes would be considerably more trustworthy if they stood apart from the structurational processes that they broker. Unfortunately, like other public measures they are reactive. They not only monitor and report popularity, they help create it. This is why some media providers work so hard to manipulate measures. In fact, "optimizing" search engine results is a thriving cottage industry and defeating schemers is an on going chore for measure makers (e.g., Halavais, 2008; Resnick & Sami, 2007). But even without these aberrations, reporting popularity often begets popularity. This is, if nothing else, a powerful systemic bias.

The political economy of public measures

Information regimes, themselves, change with technologies and shifting institutional imperatives. These changes are not taken lightly by the affected parties. Each new regime makes agents visible in a different way, privileging some and potentially disadvantaging others. Significant changes can redefine the audience and restructure the media environment itself (e.g., Napoli, 2010). For instance, at its inception the prevailing market information regime in U.S. television focused primarily on the measurement of households rather than individuals. This produced a dearth of timely and reliable demographic information about viewers. Although such market information served the interests of major broadcast networks, it was increasingly problematic for advertisers and aspiring cable networks who wanted to target more narrowly drawn segments of the public. In the late 1980s, Nielsen introduced "peoplemeters" as the national standard for audience measurement, which produced the desired demographic information. This change in methodology meant that advertisers could quantify more finely grained market segments. It also helped make specialized cable networks viable (Barnes & Thomson, 1994), which, in turn, fragmented public attention. Similar phenomena have been reported in the music industry and book publishing (e.g., Anand & Peterson, 2000; Andrews & Napoli, 2006).

The fortunes of content providers, media institutions, and the general public rise and fall with these changes, and stakeholders are not above playing politics with the process. For example, in 2002, Nielsen began introducing "local peoplemeters" (LPMs) into major U.S. markets in favor of older, less desirable, diary measurement. Despite the fact that LPMs featured the same technology that the national measurement service had been using for 15 years, the move provoked a political firestorm. In fairly short order, a new public interest group, called "Don't Count Us Out" (DCUO), charged that the peoplemeters severely undercounted minority viewers and would, therefore, jeopardize programing aimed at those audiences. Behind the scenes, News Corporation, believing it would lose money with a change to LPMs, spent nearly $2 million to bankroll DCUO, organized news conferences, ran inflammatory ads, and operated telephone banks (Hernandez & Elliot, 2004).

After congressional hearings and a good deal of posturing by politicians, the LPMs were introduced in large markets. But it is a cautionary tale of the perils that attend even a modest change in how public measures are constructed.

Political actions affect not only the implementation of new information regimes, but the day-to-day operation of established regimes as well. Recently, Amazon.com was forced to publicly recognize a "ham-fisted cataloging error" that eliminated the sales ranking of several thousand books, making them harder to find via search. Thousands of Twitter users protested. Bloggers picked this up as a topic of discussion and threatened boycotts. Amazon hastily apologized and promised to fix the "glitch in our systems" (Rich, 2009). As public measures become increasingly central to the operation of the digital media environment, these skirmishes, large and small, will surely be more common.

Emerging patterns of public attention in the digital environment

The structurational processes I have described will encourage public attention to evolve in certain ways. I will consider three trends that have both hopeful and troubling implications for society. These involve the fragmentation of public attention, the ways in which publics might polarize around media, and how changing public measures could themselves encourage a convergence between what agents want and what they obtain.

The fragmentation of public attention

The explosive growth of media technology, coupled with the ability to monitor consequent patterns of media use, has fragmented audiences across an ever-increasing number of outlets (e.g., Anand & Peterson, 2000; Barnes & Thomson, 1994; Webster, 2005). Armed with whatever market information is available, each competitor does what it can to attract public attention. This escalating competition has been the bane of older commercial media and state broadcasters who once dominated the public sphere, if for no other reason than there were so few alternatives. Observers of this phenomenon have widely differing opinions about its social significance. Although some fear the loss of a common cultural forum and shared political knowledge (e.g., Katz, 1996; Prior, 2007), others celebrate the "ultimate fragmentation" wrought by "infinite choice" (Anderson, 2006, p. 181).

Although audience fragmentation is a well-documented and continuing phenomenon (e.g., Anderson, 2006; Napoli, 2010; Webster, 2005), it has limits. There is persistent and convincing evidence that cultural consumption of all kinds is still dominated by "hits." The use of movies, videos, Web sites, music, etc. is invariably described by power laws in which a handful of popular offerings dominate attendance (e.g., Adamic, 2008; DeVany, 2004; Elberse, 2008; Huberman, 2001). Moreover, the most abundant media (e.g., Web sites) have audiences that are far more concentrated than those of less abundant media (e.g., radio stations) (Hindman, 2006; Yim, 2003).

Part of the explanation is that digital networks privilege older nodes, which tend to accumulate inbound links. As the network grows, incumbents profit (Huberman, 2001). Beyond incumbency, perceptions of quality or relevance seem to drive attendance. Traditionally, these perceptions are affected by advertising, brand reputation, expert opinion, or simple word-of-mouth. In digital environments, however, public measures of quality and relevance are increasingly influential. As Lessing noted: ''The *New York Times* used to have the power to say who was the most significant. A much more democratic force does that now'' (2008, p. 61). That force often leads people to the most popular offerings, at least within categories, which again accumulate advantage (e.g., Cho & Roy, 2004; Salganik et al., 2006). So, the very tools that are frequently touted as a way to find the obscure and esoteric can actually concentrate public attention.

On-demand media are, potentially, even more susceptible to concentration than linear delivery systems. Anderson (2006), himself, noted that the change from CDs to downloadable music, coupled with personalized recommendations, has allowed users to select the ''best individual songs'' from albums and skip the ''crap'' in between (p. 22). Identifying the best, however, can be more about contagion than quality. Salganik et al. (2006) have demonstrated that increased user information promotes ''winner-take-all'' patterns of song selection. Unfortunately, winners are unpredictable and powerfully affected by the idiosyncratic choices of early adopters. It seems likely that other on-demand media will be subject to these bandwagon effects. In any event, infinite choice does not lead inexorably to ultimate fragmentation.

The polarization of public attention

Polarization describes a tendency for subsets of population to concentrate their attention on a homogeneous assortment of media products or outlets at the expense of exposure to more diverse offerings (Webster & Phalen, 1997). This behavior is in keeping with notions of selective exposure and raises the possibility of people consuming only ''like-minded'' media. Such niches have been labeled enclaves, gated communities, sphericules, echo chambers, and cyber-Balkans (e.g., Gitlin, 1998; Sunstein, 2007; Turow, 1997; Van Alstyne & Brynjolfsson, 2005). In the extreme, they portend a society not only devoid of a common public sphere, but polarized into isolated, even hostile groups.

Unfortunately, studies of fragmentation tell us very little about polarization. Fragmentation typically describes how total attendance is distributed across media. Polarization shows itself in what individuals do across time. For example, a fragmented audience might indicate that each person consumed a little bit from a great many, diverse sources. Alternatively, it might indicate that each person settled into his or her preferred niche and stayed there. Only the latter would suggest polarization. The question is, how do people use the resources at their disposal?

What research there is suggests growing fault lines in the culture. Prior (2007) has argued that the growth of cable TV has polarized news consumption. In the past,

even those with little interest watched the news because it was the only thing being broadcast. Now, those viewers can avoid the news. Conversely, people interested in news now watch large amounts via cable news networks. On the basis of these patterns of consumption, two public spheres seem to have emerged, one that possesses scant political knowledge and one that is well informed. It is less clear at this point whether the knowledgeable sphere is, in turn, divided along lines of political ideology (e.g., Adamic, 2008; Bennett & Iyengar, 2008; Hargittai, Gallo, & Kane, 2008; Hollander, 2008; Horrigan, Garrett, & Resnick, 2004; Prior, 2007), although that seems a distinct possibility.

Language and *cultural proximity* are also powerful determinants of media use (Straubhaar, 2003). Within the United States, the growing availability of Spanish-language programing has effectively segregated Hispanic and non-Hispanic audiences (Ksiazek & Webster, 2008). Only a few with sufficient multicultural fluency seem to move between those environments. If we were to imagine the world as one large public sphere, it would almost certainly organize itself into various "sphericules" (e.g., Gitlin, 1998) defined largely by language and expressed in patterns of public attention. With the growth of major international production centers catering to different cultures, it will be interesting to see how these spheres evolve (e.g., Curtin, 2007).

A flowering of spheres or niches is not without its benefits. Jenkins (2006) lauds the emergence of fan communities. Fraser (1996) has argued that "subaltern counter-publics" need discursive arenas apart from the public sphere (Fraser, 1996) and Katz has noted that a well-designed participatory democracy should have multiple spaces for deliberation, including "generalized media dedicated to the polity as a whole, and specialized media dedicated to the citizens' need to know what like- or right-minded others are thinking" (1996, p. 23). Whether this mix of generalized and specialized media functions in a productive way depends to a large extent on how people move among those spaces.

Two factors are likely to govern the ultimate outcome. The first goes to each individual's appetite for diversity in cultural consumption. Heretofore, the limited number of media choices caused institutions to produce and users to consume a broad, if bland, diet of "lowest common denominator" offerings. With infinite choice, will most agents turn out to be "cultural omnivores?" (Peterson & Kern, 1996). Or will their penchant for selective exposure, broadly defined, cause them to retreat into enclaves of agreeable ideas and amusements? If the latter is more prevalent, public attention will be increasingly polarized around various "taste cultures" (Gans, 1999). The second factor is the extent to which public measures exacerbate or mitigate these individual tendencies. Although some systems offer recommendations by grouping content of a type (e.g., Pandora), most reduce social data and point users to what other people like them prefer. Either way, it can be a recipe for sameness. This is consistent with Sunstein's (2007) concern about filtering technologies that promote polarization. The only countervailing force seems to be a systemic bias in the direction of popularity. Whether the persistence of hits will provide meaningful shared experiences for the culture, or an adequate substitute for general interest

media, is far from obvious. Studying the "media repertoires" that people create for themselves would shed further light on prospects for cultural polarization.

A triumph of convergence

Media duality is a process that reconciles the desires of agents with structures that accommodate those desires. The efficiency with which that happens is critically dependent on the nature and availability of public measures that aggregate information about agents. So it is worth considering how public measures are themselves changing, how they will be used, and how that might affect society.

Two related developments in measurement are in the offing. First, digital media leave traces of their use. Network servers, digital set-top boxes, and mobile devices are being harnessed to produce user information (Webster, 2008b). As a result, surveillance will be more precise, timely, and varied than the measures of exposure that have been the staple of market information regimes (Napoli, 2010). Second, measurement, which has historically been medium-specific (Webster, 2008a), will track media use across "platforms." In combination, these will give media providers greater insight into what attracts public attention and media users better tools to find what they want. Over time, this suggests a convergence of media supply with user demand. Agents, structures, and measures all contribute to this "triumph of convergence."

Purposeful, reasoning agents are drawn to search and recommendation systems that are most responsive to their needs and desires. The success of new user information regimes, whether it is Google, Netflix, or Twitter, seems driven by who can offer people what they want, when they want it. For more customized service, people often reveal personal information (Turow, 2006). With those data, even next-door neighbors using the same search term might be directed to different places. Each, in all likelihood, will be a better fit to the searcher.

Media providers will exploit these systems as well. The topics of conversation on social media are quantified to assess public interests and appetites. The search terms people enter are aggregated and used to guide the production of "demand" media (Roth, 2009). In addition, media, old or newly minted, can then be more easily targeted to specific users. Today, regulars at Amazon.com get personalized recommendations. Tomorrow, TV viewers will be served an ad tailored to their specific interests (or vulnerabilities). The "inefficiencies" of broadcasting and traditional advertising are gradually disappearing.

This convergence is not without countervailing forces. The social, technological, and market mechanisms that will move us in this direction are subject to their own biases and failures. Organizational and occupational cultures may resist the imperative to seek public attention (e.g., Boczkowski & Peer, 2008). Commercial media can certainly be expected to invest more heavily in content and services aimed at large or otherwise desirable markets (Baker, 2002). So whether the poor or other marginalized groups get the media they want will depend to some extent on whether their preferences comport with those of other, better served, taste publics. *Digital divides* will also persist. Despite tremendous growth in the use of digital technologies,

access is still not universal (Hargittai, 2008a). In addition, even those with access may not have the skills to easily find the content and services they want (Hargittai, 2008b). These factors could make the effects of the digital environment differentially felt. Over time, though, as digital media become more pervasive and the systems that power them more "user friendly," the distance between supply and demand will shrink.

But will people demand the right things? The answer depends on making normative judgments and is necessarily subjective. I suspect most economists would approve of these developments, whereas proponents of a "social values" approach would be more willing to violate individual desires to achieve a "higher good" (e.g., Entman & Wildman, 1992). The changing face of news illustrates the problem. There is considerable evidence that competition in the digital marketplace has led to a "softening" of news (e.g., Baum, 2002; Delli Carpini & Williams, 2001; Hamilton, 2004; Zaller, 2003). Still, there remains a "choice gap" between the supply of hard news stories favored by professional journalists and the soft news stories that people elect to read (Boczkowski & Peer, 2008). Information regimes are likely to close that gap in favor of soft news for two reasons. First, editors can now see what types of stories are actually read. If they are motivated to capture public attention they will increase the supply. Second, the users themselves can often see what stories are attracting attention, providing additional clues about what might be interesting, or at least good fodder for water cooler conversations. Such public measures tend to drive traffic to the most viewed stories (Knobloch-Westerwick et al., 2005; Thorson, 2008). Whether increased consumption of soft news is bad because it reduces political knowledge, is good because it increases incidental learning, or is just a sign of "rational ignorance" is debatable (e.g., Baum, 2002; Hamilton, 2004; Patterson, 2000; Prior, 2003).

In any event, it will be harder for media systems to simply trump demand and enforce exposure to things people are not predisposed to like. If "giving people what they want" will govern the digital media environment, we should do a better job of understanding the factors that shape their desires and actions. The model I have proposed envisions a dynamic process, one that is powerfully affected by our ability to monitor what other people are doing. These systems have the potential to enrich or impoverish the culture. But, for good or ill, they are the forces that will shape public attention.

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