A TECHNICITY OF ATTENTION: HOW SOFTWARE 'MAKES SENSE'

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In this essay, I develop an understanding of a *technicity of attention* in social networking sites. I argue that these sites treat attention not as a property of human cognition exclusively, but rather as a sociotechnical construct that emerges out of the governmental power of software. I take the Facebook platform as a case in point, and analyse key components of the Facebook infrastructure, including its Open Graph protocol, and its ranking and aggregation algorithms, as specific implementations of an attention economy. Here I understand an attention economy in the sense of organising and managing attention within a localised context. My aim is to take a step back from the prolific, anxiety-ridden discourses of attention and the media which have emerged as part of the so-called 'neurological turn' (see Carr, 2012; Wolf, 2007).[1] In contrast, this essay focuses on the specific algorithmic and 'protocological' mechanisms of Facebook as a proactive means of enabling, shaping and inducing attention, in conjunction with users.

This article addresses the capacity of attention not as a type of spectatorship, but rather as a mode of participation that is subject to a form of 'governmentality' (Foucault, 1991). Following Foucault, governmentality refers to the rationalities that underlie the 'techniques and procedures for directing human behaviour' (Foucault, 1997: 81). In other words, the concept refers to the mentalities or modes of thought that are immanent to 'government', understood as the 'conduct of conduct' (see Rose et al., 2006). Following work on the 'technological' aspects of government (see Lemke, 2001; Miller and Rose, 2008), this article provides an account of how Facebook operates as an implementation of an attention economy directed at governing modes of participation within the system. Specific governments may entail different rationalities used to guide the conduct of people (see Foucault, 2007). I argue that the technical rationalities – what I refer to here as

technicity – which are used to govern participation on Facebook, are realised in at least three different ways: 1) an automated 2) anticipatory and 3) a personalised way of operating the implementation of an attention economy on Facebook.

Inspired by Alexander Galloway's (2004) critical work on Internet protocols and Susan Leigh Star's (1999) call for taking infrastructures seriously, my analysis of Facebook focuses on the specific infrastructural arrangement of participation as materialised in the Open Graph protocol and underlying algorithms. To do so, I rely on autoethnographic observations of the Facebook platform, and a reading of the technical inscriptions and affordances involved in the composition of the Facebook infrastructure.[2] I draw on both specific technical documents and popular commentary related to the Open Graph protocol and algorithmic logic of Facebook as a way to ground the analysis in the specificities of the medium itself. Such a medium or software specific approach relies on the growing body of scholarly work in 'software studies' concerned with the governmental effects of code and software (Chun, 2011; Fuller, 2008; Kitchin & Dodge, 2011; Mackenzie, 2006). As such, I am interested in exploring how software, through protocols and algorithms, has the capacity to govern and manage users. Specifically, I use the concept of technicity as a way to understand how specific material arrangements such as Facebook enable, capture and augment awareness and participation in relation to users.

The topic of attention has always been important for media and communication research. In fact, one may claim that in many ways the field of media studies developed as a direct consequence of academic concerns over the relations between media technology and attention. Questions concerning the capture, retention and forms of attention have been an important part of media theory since the mode of 'distraction' was identified as central to understanding cinema as a mass cultural art form (Benjamin, 1999; Kracauer, 1995). As a result, attention has been a key theme in everything from film and television research, news and journalism to public relations (see Dayan, 2009; Newman, 2010).

Yet there is a tendency within media studies to conceptualise attention solely as a faculty of perception, where attention is more or less reduced to the notion of visual attention (Wise, 2012: 165). This emphasis on perception and visual attention arguably stems from the ways in which attention is commonly understood in the

psychological and cognitive sense. According to psychologist Harold Pashler:

> Two primary themes or aspects characterize the phenomena people allude to with the term attention: selectivity and capacity limitation [...] One is that conscious perception is always selective. Everyone seems to agree that, at any given moment, their awareness encompasses only a tiny proportion of the stimuli impinging on their sensory systems [...] The second phenomenon to which causal usage of 'attention' alludes is our limited ability to carry out various mental operations at the same time. (1998: 2)

In line with Pashler's characterisation, attention can be understood as the process of *selecting* information for further mental processing, and/or as a mental capacity that describes the degree of *focus* directed at something.

It is perhaps not surprising that a discourse of media and attention in the age of the Internet, with its hyperlinked structure and abundance of available information, has been concerned with how networked power may lead to a lessening of the cognitive capacity for directing attention. It is specifically in regard to the Internet that findings from recent neurological research have been brought to bear, with N. Katherine Hayles claiming that these show there to be a 'generational shift in cognitive styles' between 'deep' attention and 'hyper' attention (2007: 187).[3] The ubiquity of information enabled by the Internet, coupled with the notion of the brain as a limited information-processing machine, has furthermore provided the basis for what some scholars have described as a new type of 'attention economy' (Goldhaber, 1997; Franck, 1998). The notion of the attention economy has been used to designate the increased competition for people's attention in an age of information overload. When information increases, the attention to make sense of it decreases. Given this kind of information environment, the fight for consumers and their attention becomes more critical. As a result of a complex market system where scarcity is not bound to money, but rather to time and attention, efforts to attract this currency intensify. With some notable exceptions (Lazzarato, 2006; Lanham, 2006), media research on attention has adopted the prevailing and dominant views on attention as they are articulated within psychology and neuroscience.

The question lingers, therefore, of how a conceptualisation of attention as distributed, organised and endowed with value would operate, if we as media researchers were to start with the medium itself, as opposed to taking our point of departure as what fMRI scans tell us about the brain. By shifting the focus in this manner, I do not mean to say that humanities scholars should be unconcerned with the ongoing developments within cognitive science and psychology. Nor do I wish to deny that attention should be seen as a property of human cognition. Rather, I suggest that something is needed to complement the notion of attention as a purely cognitive property, and note the lack of an analytical tool that may help us understand how attention is rooted in and constrained by the medium itself. To fill this gap, I offer an account of 'technicity', understood as the 'co-constitutive milieu of relations between the human and their technical supports' (Crogan & Kennedy, 2009: 109), as a means of analysing attention as it arises out of the software-subject continuum of Facebook.[4]

Therefore, in this article I will not answer the question of what attention *is*, but rather show how software has the capacity to produce and instantiate modes of attention, specific to the environment in which it operates. Importantly, though, the productive power of technology, as it is signified by the concept of technicity, does not operate in isolation or as a unidirectional force. It should, rather, be understood as a relational force. Taking such a perspective, attention can be seen as an emerging property of sociotechnical relations, requiring an understanding of the technical means or government through which attention is able to emerge and take form in particular ways. In the next section I shall therefore provide a description of the Facebook platform and a technical explanation of how Open Graph works. I argue that it is important to look at the details of the infrastructure in order to be able to understand how digital media platforms generate and manage attention. Thus, in the last section of the article I will turn to the specific modalities of attention that emerge as a result of the interaction between users and the specific material arrangement of Facebook.

Arranging attention: The case of the Facebook platform

In 2007, Facebook launched the 'Facebook platform'. Access to valuable user data was provided and third-party developers were offered the opportunity to incorporate Facebook into their

applications. In many ways, the launch of the platform signalled a first step towards Facebook not merely becoming the most popular online social networking service, but also a model for the infrastructure of the social web itself. By opening up its core to applications, Facebook provided access to what it calls the social graph – 'the real connections people have' (Geminder, 2007). During the second *f8*, Facebook's annual developer convention in 2008, Facebook introduced 'Facebook Connect', a product that made it possible for users to register on external websites using their Facebook ID.

During the fourth *f8* in 2010, Facebook released what Chief Technology Officer Bret Taylor recently described as the most profound change to their platform since its launch in 2007: the Open Graph protocol (Taylor, 2011).[5] Designed to facilitate the connections between people and things, Open Graph consists of a protocol, an application programming interface (API) and social plug-ins, including the now ubiquitous 'Like' button. The Open Graph protocol describes a way to build a semantic map of the Internet.

Technically, Open Graph is modelled on RDFa, a W3C recommended standard for marking up a webpage in order to be able to encode data in a universally recognisable way (see http://ogp.me/). For instance, a website such as the Internet Movie Database (http://www.imdb.com/) can be semantically linked up to Facebook's core service by inserting additional meta-level mark-up code into the HTML source code of the IMDB site, which functions as a form of cross-reference. This mark-up code turns external websites and digital objects into Facebook graph objects, understood as entities made legible by the Facebook platform.

Mathematically speaking, graphs are topological structures consisting of nodes (points or objects in the graph) and edges (the lines connecting the nodes). From a graph perspective, Facebook consists of many different kinds of nodes and edges. In its simplest, nodes refer to individual users and edges to the so-called friendship relations between users. These human relations are only a small part of the graph constituting Facebook. Nodes, or graph objects, may also include businesses, events, books, songs, movies, celebrities etc. For these nodes to mean anything to Facebook, they have to be made meaningful. From a graph perspective we could say that the meaning of a node is determined by what it is connected to, the sets of relations existing between different nodes. What is important to

understand is that these connections or 'edges' linking different nodes – for example between a Facebook user and a business website – are technically arranged and governed by software.

The Open Graph protocol allows Facebook to track and process user data across the web, through the implementation of the 'Like' button and other social plug-ins. These plug-ins function as small 'hooks' connecting various nodes to the Facebook platform. So, what happens when a user clicks the 'Like' button? First, a connection between two nodes in the graph is established. Let us say that I 'like' the movie *The Matrix* on imdb.com. The action of liking gets translated into a piece of data on Facebook, where *The Matrix* is now archived as one of my favourite movies. In addition, the action of 'liking' generates a story on my personal profile saying 'Taina likes a link', along with a post of the actual link and picture of the movie. User actions thus follow the user, as opposed to the actual webpage on imdb.com, for example. This is important in at least two ways: it makes it possible to aggregate data about the user, and provides a persistent link between the user and anything she marks as 'liked', such as a movie, an artist or a place, whenever such things appear in different contexts on the web.

Essentially, Open Graph constitutes a centralised architecture that generates value by decentralising social action. Through this protocological infrastructure, Facebook is able to map out the connections, or 'edges', created on and off Facebook.com. Social plug-ins function as 'edge creating devices'. 'Like' buttons and other plug-ins allow Facebook to track and record the data traffic between different nodes in the system, and feeding it back to the centralised databases to be stored and processed. 'Edges' form the basis for managing attention in and through the Facebook platform, in the sense that it becomes possible to target and tailor content to specific users based on knowing what else they are connected to. Here, it becomes apparent that attention is not just about individual cognition, but rather a relational construct that emerges out of the interactions between the technical support and the various nodes in the system.

In the attention economy of the web as a whole, where user attention is a valuable commodity due to the vast information and products available (Goldhaber, 1997), Facebook has become a key actor in the competition for the number of page impressions for a given website. It has been observed that 'the average media site integrated with Facebook (with the 'Like' button or other plug-ins)

has seen a 300% increase in referral traffic' (Sullivan, 2011). A crucial concept for understanding the idea behind Open Graph is what Facebook refers to as the social context. 'Social contexts' are the people and friends who have already interacted with a piece of content with which a user interacts. Through Open Graph, Facebook makes it possible for external websites and brands to socially contextualise the content they display. So when visiting IMDB, or another website that has integrated with Open Graph, users will be able to see how many people and which of her friends have liked or recommended the content. According to Facebook, when social context is provided, the amount of engagement goes up dramatically (Facebook Engineering, 2011). For example, the jeans brand Levi's, as one of the first brands to integrate with Open Graph, has reportedly seen a '40 times increase in referral traffic from Facebook after implementing the "Like" button in April 2010' (Sullivan, 2011).

In the type of attention economy promoted by Facebook, the value of information increasingly hinges on friends. As Gerlitz and Helmond (2011) have argued, there seems to be a move away from the link economy based on the authority of links regulated by search engines, to a 'Like economy' regulated by the wisdom of friends. While Facebook has become an important mediator for brands in the competition for attention, the way Facebook has positioned itself is less about the quantity of page impressions than the apparent ongoing engagement of recognisable users and their network of friends. As I shall argue, this shift from measures of page impressions to engagements with users' network interactions constitutes a move from a public to personalised attention economy.

The Facebook platform constitutes an 'assemblage', in the sense that it brings together various heterogeneous elements to produce and distribute flows of attention (see Latour, 2005). The Open Graph protocol, the API and the 'Like' button cannot function effectively independently of each other. Together however, these infrastructural and medium-specific elements provide a foundation for the organisation and management of users and their connections. The Facebook platform has thus become an infrastructure that works invisibly in the background to shape forms of sociality. As Edwards points out, infrastructures always 'promote some interests at the expense of others' (2002: 191). I argue that the infrastructure of Facebook is built around the logic of creating, capturing, and processing attention. Attention is not merely about users' perception, but also a result of what users do, the intensities of

participation and the nature of connections forged. It would thus be limiting to view attention as only located in a human brain. Rather, devices increasingly also capture, record and pay attention to us. Facebook not only captures attention in terms of recording already-existing data embedded in links and clicks, but also helps to shape attention by suggesting the types of content that deserve users' attention.

One of the important repercussions of the 'Like' button lies in the potential of turning the action of liking something into a story on friends' Facebook News Feeds. Whether my action of liking *The Matrix*, to continue using the example from above, is considered relevant or important enough for my network of friends to see is essentially algorithmically determined. The *EdgeRank* algorithm is the sorting mechanism that ultimately decides *what* is to be shown on Facebook users' News Feeds and *when* it is to be shown. Filters have, of course, long been integral to the management of information and attention through information technology. The psychologist Herbert Simon, who conceptualised the 'attention economy' in a 1971 paper, suggests that the design goal of information processing systems should always be to only provide users with the information that they need to know.

This is the programmatic purpose of the EdgeRank algorithm. It selects and ranks the information that it calculates users need to know. Herein lies the power of the algorithm in a digitally-mediated culture: to 'enhance' the plethora of collected data in order to 'identify patterns and trends', and to use this information to 'profile, model, predict and simulate people and situations' (Kitchin and Dodge, 2011: 103). EdgeRank augments, supports, and governs attention by simulating the cognitive function of attention, as a process of selecting information. The 'art of government' underlying EdgeRank can be said to hinge on what Rancière has called the 'distribution of the sensible […] defining what is visible or not in a common space' (2004: 12-13). According to Rancière, 'the distribution of the sensible reveals who can have a share in what is common to the community based on what they do and on the time and space in which this activity is performed' (2004: 12). Seeing algorithms in this way points to the ways in which software embodies a politics (see Winner, 1986). The politics of algorithms and their governmental power can be seen in the ways in which algorithms are 'making decisions […] about who to deal with and how to deal with them' (Beer, 2009: 989). The power of EdgeRank,

then, pertains to its 'gate-keeping' function – it decides what information to present to which user and in what ways.

As the name suggests, EdgeRank is a ranking algorithm, designed to pass judgement on the relative importance of 'edges'. The higher the algorithm ranks a piece of content in terms of significance, the more visible that shared content becomes (see Tonkelwitz, 2011). Attention can thus be encoded as information. As users continuously connect with new nodes (e.g. photos, movies, webpages, other users), novel connections are forged on an ongoing basis. By updating the social graph – that is, by adding connections within the schema – all sorts of activity happens on Facebook. When a user comments on a friend's photo, for example, that user makes a connection or generates an edge from him or herself to the friend's photo. Evidently, News Feed only displays a subset of stories (or edges) generated within the system.

Every time connections are forged, Facebook assigns a value to that edge to determine how interesting the story would potentially be for particular users, and whether or not it should be displayed in a friend's News Feed. EdgeRank, or the value of a connection on Facebook, is based on the calculations of three main factors: affinity, weight and time decay. For instance, if one user frequently checks another user's profile, the 'affinity' between the first user and the latter is ranked higher. This is used within the calculations of the algorithm as it generates the first user's News Feed and makes it more likely that the second user will feature within that feed. 'Weight' refers to the type of 'edge', that is, whether the connection established between two nodes constitutes a 'Like', a Comment on someone's photo, or an uploaded video. Social media marketing firms have suggested that Facebook 'weighs' comments as more substantial than a 'like', and that visual media content including photos or videos are more strongly weighted by the algorithm (Walter, 2011). 'Time decay' simply refers to the age of the 'edge'. As with other modes of attention economy, such as the curation of search results, Facebook regulates access to information based on 'relevance' metrics that prioritise popularity. However, while the authority of a link on Google is shaped by the accumulation of inbound links and as such depends on public attention, popularity measures such as 'affinity' in EdgeRank testify to the importance of personalisation. That is, if a user does not show an interest in the pictures of a particular Facebook friend, the system will assume that the user has no interest in this contact at all. The operational logic of EdgeRank clearly attests to the notion of attention as an emergent

property of the interaction between technologies and users. What users encounter on Facebook is result of the co-constitutive milieu of relations between humans and their technical supports. EdgeRank shows that it is not spectatorship that is of importance when it comes to managing attention in digital culture but rather the amount and nature of user participation.

During the most recent *f8* conference in September 2011, Facebook introduced further and significant changes to the platform and the ways in which attention is organised. These changes included a completely new profile design called the 'Timeline'; a real-time feed called the 'Ticker'; an updated version of the Open Graph protocol, with a greater emphasis on applications; and a new algorithm called 'GraphRank', responsible for managing user interaction with applications. Whereas the 2010 version of the Open Graph allowed for connecting to the rest of the web by 'liking' it, the updated version apparently allows for connecting to 'anything one wants in any way one wants' (Zuckerberg, 2011). No longer confined to liking things, Facebook introduced new verbs such as 'read', 'watch', and 'listen'. Now users can share the fact that they are listening to music or reading an article, instead of simply sharing something they 'like'. The most significant change however lies in what Facebook calls 'frictionless sharing'. Users no longer need to explicitly click the 'Like' and 'Share' buttons, or copy and paste links into their status updates. Frictionless sharing refers to authorising a Facebook 'app' only once in order to let it automatically share a user's interactions every subsequent time she 'reads', 'listens', 'run', 'watches', 'cooks', etc. through that particular app.

Through the 'Ticker', the real-time feed in the right-hand column of the Facebook homepage, users are now able to see a constant stream of information about what their friends are currently doing on Facebook or with Facebook-connected apps. For example, as a result of Open Graph-enabled 'frictionless sharing', every time a user listens to music using the Spotify application (and has authorised the app to communicate with Facebook) a story is published on the Ticker informing that user's friends that 'X is listening to Y'. With a new emphasis on seamless application integration with the Facebook platform, new kinds of activities are increasingly given priority and weight on the News Feed. In order to sift through and organise the proliferating user activity with apps, Facebook introduced the GraphRank algorithm, which is responsible for measuring and finding all the 'interesting patterns' that emerge from the uses of apps. The function of GraphRank 'is to figure out what

activity is most interesting' to a particular user (Taylor, 2011). Adding to the already heavily-personalised News Feed, 'GraphRank is designed to give more prominence to engaging activity[…] GraphRank isn't a global score, but a personalised view of you and your friends' taste' (Taylor, 2011). GraphRank is specifically tailored to aggregate app interactions and display these through various summaries or reports. While Facebook remains interested in users' specific interactions with objects, GraphRank as an attention economy shifts the focus away from a 'Like'-centric and conventional object-oriented attention economy (in the sense that attention is understood as an increased awareness towards select phenomena in the present) towards a trend-centric and anticipatory attention economy based on patterns and aggregations of past behaviour in order to predict future interests. In order to elaborate on this, and the increased customisation and personalisation of attention, I now turn to a conceptualisation of 'technicity' as a means to help frame an understanding of how Facebook's infrastructure articulates a specific attention economy.

Toward an understanding of the technicity of attention

Media technologies play a crucial role in the formation of attention, both enabling and constraining awareness. As the philosopher Bernard Stiegler suggests, 'whatever a given society's form may be, one of its most distinctive features is the way in which it forms attention' (2010: 19). Digital media have profoundly broadened the scopes of awareness in terms of expanding users' spatiotemporal registers. A useful way of thinking about the technical conditions of possibility for attention is the concept of 'technicity'. Broadly speaking, technicity can be thought of as a theoretical concept for the emergent forms of relations between technologies and living bodies. While technicity has been theorised in a number of ways, the concept is often credited to the work of Martin Heidegger, Gilbert Simondon, and Bernard Stiegler. As a result, as James Ash points out, technicity has at least three meanings: 'as a persuasive logic for thinking about the world; as a mode of existence of technical objects; or as an originary condition for human life itself' (Ash, 2012: 189).

To speak of attention in terms of technicity offers a way to understand how processes and practices of attention are grounded in a sociotechnical milieu. Technicity understood as a kind of 'technical mentality' (see Massumi, 2009; Simondon, 2009) points

to the ways in which technologies embody 'mentalities' or modes of framing the relations between living and nonliving processes in order to achieve certain ends. Here, I suggest that technicity can be thought of as a mode of governmentality that pertains to technologies. How then can we begin to understand the articulation of software and users on Facebook as an implementation of an economy of attention? I will turn to this question in the remainder of this essay by focusing on what I take to be three particular characteristics of the technicity of attention on Facebook: automated attention management, a way of managing attention that is above all anticipatory in nature, and a move from 'public' to 'personalised' attention economies.

Automated attention management

Increasingly, the techniques put in place to assign meaningful value to information operate on the level of what Nigel Thrift (2004; after Clough, 2000) has called the 'technological unconscious'. This form of unconsciousness can be understood as the powerful operations of software putting its mark on the conditions of existence, where living and nonliving processes are increasingly being programmatically addressed, correlated, and anticipated in unseen and unknowable ways. This unconsciousness is however not to be understood as imaginary, but rather in terms of the actual computational processes that run in the background, beneath and beyond what is perceivable to users via the interfaces of the computer. On Facebook, software sits in the background, 'paying attention' to user activity. It records, stores, and processes the data, constantly tweaking its mathematical models relative to how the data and hence the graph changes. The ways in which software is increasingly employed to process data in near real-time in order to 'distribute the sensible' – what is visible or not in a common space – can be seen as a mode of governmentality based on 'automated management' (Kitchin and Dodge, 2011). According to Kitchin and Dodge, automated management is the regulation of people and objects through processes that are automated, automatic and autonomous (2011: 85). Faced with an algorithmically sorted social networking system like Facebook, users do not merely browse the content that *they* find interesting; the 'interesting' content increasingly finds them.

The development of the Facebook platform, beginning with the 'Like' button and fully actualised with GraphRank, paradoxically makes social media less participatory through the notion of

'frictionless sharing'. When the user must no longer explicitly push buttons, paying attention shifts from an active to a more passive mode. In this sense, one could argue that the conventional 'object-oriented' way of conceptualising attention as a cognitive capacity directed at a specific object needs to be rethought, in an age of digital culture where software is capable of registering massive amounts of behavioural data 'without any active involvement, decision to initiate or even awareness on our part' (Hansen, 2012: 53). In other words, this apparent shift from spectatorship towards participation as a measure of attention need not even be tied to intentional or active participation as in explicitly clicking a 'Like' button. Rather, as the development of Open Graph for apps and 'frictionless sharing' attests, every user action is turned into a potential attention signal, in terms of conveying information about behaviour, marking a shift from an attention economy based on active/explicit to passive/implicit participation. The new Open Graph protocol creates an attention economy based on the leveraging of users' passively-created activity data. As more and more services become connected to Facebook – through easy-to-add HTML mark-up, for example – life becomes ever more measurable and thus governable.

Anticipating attention

Through the means of automated management, Facebook is always already oriented towards the future. As Facebook-engineer Bosworth (2007) suggests, in a rather anthropomorphic way, the News Feed algorithm sifts

> [...] through the enormous volumes of information about our friends on Facebook and picks just the best pieces to show us. While we eat it is keeping track of whom we seem to be keeping an eye on recently as well as remembering whom we have cared about in the past [...] it needs the information to do a better job picking stories because it thrives on people finding its stories useful and entertaining.

It is this always already anticipatory logic of the decision-making software that significantly drives the technicity of attention in digital culture. According to Bernard Stiegler, anticipation is formed through the relationship between present and past experiences that

have been externalised into specific material forms (2010: 18). The data-driven logic of Facebook makes the platform what Stiegler terms 'mnemotechnic' – a form of 'technical remembering' – that allows for a mode of government that has the capacity to take into account the probability of subjects' actions (see Stiegler, 1998; Lazzarato, 2007). Algorithms are anticipatory in their very 'operational logic' (Wardrip-Fruin, 2009: xi), which means that anticipation is inscribed into the very mechanics and rules of the system. This is evident in the basic control-flow statement used to set up the calculable pathways: a program will execute a certain section of code only if certain conditions are met. Otherwise, it takes an alternative route, which implies that particular future circumstances are already anticipated by the conditional construct of the if-then statement. The ways in which algorithms operate is thus reminiscent of what Ben Anderson calls an 'anticipatory action', which constitutes a 'seemingly paradoxical process whereby a future becomes cause and justification for some form of action in the here and now' (2010: 778). Importantly, the way in which attention is managed on Facebook is not just anticipatory, in prompting participation, but rather a form of self-perpetuating anticipatory action that seeks to realise its own future.

In this sense, the introduction of GraphRank as the rationale for an attention economy could be seen as a self-fulfilling prophecy, as it seeks to actualise its predictions through its representation and mechanisms to reward participation. The GraphRank algorithm continuously surveys users' interactions with Facebook-enabled apps in order to find the most interesting patterns. Once these patterns are found, they are fed back to users via the News Feed. Consequently, even more users will apparently act in the way that the algorithm predicts. The operational logic of the Facebook algorithms thereby works endlessly to produce a desired social order that these algorithms have themselves predicted in the first place. Attention is both a measure for predicting the future and something that prevents another future from happening. Every action taken by users on Facebook or Facebook-connected apps contributes to support the trend-centric logic of Facebook. For Facebook, it is not the one song you listened to this morning on Spotify that is important. What is important is whether you listen to this song *every* morning, or how many other songs by the same artist you have listened to. The aggregate of these individual actions is what is important, as the pattern that emerges out of repetition and difference is what conditions predictability. At the same time, users'

various clicks, 'likes', and sharing on Facebook inhibit other possible futures from happening.

Attention is thus used as a mechanism to both predict and inhibit the future, corresponding to what Lazzarato describes as the 'actualisation of power relations' through processes of integration and differentiation (2006: 174). The process of integration, following Lazzarato, explains how power relations gradually, step-by-step, become actualised through a logic of aggregation. This, too, is the goal of GraphRank, which seeks to calculate the trajectory of an object by aggregating bits of information into larger patterns or tendencies. On the other hand, as Lazzarato points out, 'the actualisation of power is not only integration, it is also differentiation: power relations are exercised to the extent that there is a difference between forces' (2006: 174). This is the logic of GraphRank: as a direct response to user actions, it gives you more of what you have already paid attention to, at the expense of difference. This algorithmic logic is thus subject to a kind of performativity, as a 'formula that progressively discovers its world and a world that is put into motion by the formula describing it' (Callon, 2007: 320).

From public to personalised attention

In contrast to the discussions of whether Facebook is a public or private sphere, I want to suggest that Facebook should be understood as a 'community of those that in fact have nothing in common' (Lingis, 1994). Although I use this expression in quite a literal sense to denote the ways in which the heavy personalisation of Facebook makes every user an island in and of herself, one could argue that Facebook in many ways constitutes a sort of community of belonging that is stripped of any common sense of identity (a discussion that has been prominent within political philosophy for some time). In many ways, it makes sense to conceptualise Facebook not as a community founded on the idea of a collective or shared identity but rather as the relations formed across multiple identities that share only the fact that they have nothing in common (see Agamben, 1993; Esposito, 2010). Facebook prides itself as being the world's largest social network – a 'community of friends'; however, every user on Facebook is in fact separated from everyone else. No two News Feeds, profiles, or networks of friends are alike. As we have seen, EdgeRank and GraphRank are fundamentally geared towards generating a personalised view, tailored specifically to the 'likes' and tastes of individual users. These algorithms

constitute important attention selection mechanisms conditioned by user data and the 'wisdom of friends'. Since 'linking' web content has been rendered as content for News Feeds by the Open Graph protocol, friends' endorsements have become an important factor in shaping what is considered 'newsworthy' in the context of Facebook's algorithmically curated News Feed.

Yet the logic of this algorithmic curation of information on Facebook does not follow the principle of public attention associated more typically with the function of media (Webster, 2011). There is simply no 'public' to be addressed, because everything on Facebook is filtered in terms of the identity of specific users. This is evidenced by the ways in which EdgeRank changes what it shows to specific users on the News Feed based on their behaviour. As with as any other information filtering and processing system, EdgeRank works by collapsing bits of information into comparable numbers to create calculable relations and differences. However, there is a slight difference between the News Feed, as a personalised attention economy, and other 'algorithmic cultures'. Whereas a system like Amazon.com, for example, is driven by the logic of *users like you* – designing user identity based on how many other people like you have paid attention to a certain book – Facebook hinges on the notion that *nobody is like me*. If everything in Facebook is tied to the user, the value attached to specific information and forms of interaction is specifically adapted to the needs, interests and preferences of the individual. In anticipation of generating more activity and engagement on the platform, Facebook customises visibility by measuring and monitoring what are calculated to be meaningful relationships. Whether we are talking about Open Graph as an infrastructure for providing 'social context' or the pervasiveness of the 'Like' button, every user action is inevitably 'glued' to and associated with friends' tastes and likes. After all, as Facebook engineer Bosworth has suggested about the News Feed, it 'knows who we keep an eye on and who we have cared for in the past' (2007).

Conclusion

In this essay, I have argued that the capacity for attention in digital culture needs to be understood as a relational construct between users and their technical supports. Arguably, who or what is paying attention online, and to whom and with what effect, is not easy to detect in an environment of automated decision-making agents.

However, as the conceptualisation of governmentality implies, attention governs and is governed in concrete material contexts and assemblages. Protocols, algorithms and buttons do not merely mediate modes of paying attention but also shape the conditions of the sensible. The techniques and procedures used to direct users' conduct and attention on Facebook involve assigning ranks to different nodes and edges; aggregating data into meaningful patterns; lowering the barrier for authentication systems in third-party apps to enable 'frictionless sharing'; and the marking-up of external webpages so as to support the automated management of people and objects. An exploration of technicity thus highlights the ways in which attention emerges from a given constellation of technical elements and living bodies.

In this article Facebook has been used to examine the ways in which attention is articulated in a medium-specific context. Deliberately disregarding the current focus on brain scans in media studies, this essay has addressed some of the ways in which attention is organised around 'technologies of government'. Rather than drawing upon data from brain scans to support an argument about the co-constitutive nature of attention, I have attempted to 'scan' the medium through a reading of the Facebook infrastructure. In so doing, my speculative scan focuses on the development of the Open Graph protocol and ranking algorithms, to demonstrate how attention is managed by Facebook to propagate a certain social order of continued participation. I have thereby suggested that there is a need to put greater emphasis on the ways in which attention is actually put to work, not just rhetorically, as part of popular media discourse about the media's effects on our brains, but through an engagement with its technicity – how software 'makes sense', how it is productive of new ways of attending to the world.[6]

Notes

[1] See Munster, A. (2011) 'Nerves of data: the neurological turn in/against networked media'. *Computational Culture: A Journal of software studies*, 1, for a good discussion on the neurological turn.

[2] Autoethnography means that the descriptions and interpretations

of the functional aspects of software are grounded in self-experience. This is a commonly used approach within Internet research, which emphasises the dual role of the researcher as both an in-and outsider. According to Leon Anderson, analytic autoethnography takes personal experience with the phenomena of study as empirical data to gain insight into some broader set of social phenomena. See Anderson, L. (2006) 'Analytic Autoethnography'. *Journal of Contemporary Ethnography* 35 (4): 373-395.

[3] N. Katherine Hayles talks about the shift from 'deep attention' to 'hyper attention'. She argues that we are in the midst of a generational shift in cognitive learning styles. She writes: 'Deep attention, the cognitive style traditionally associated with the humanities, is characterized by concentrating on a single object for long periods (say, a novel by Dickens), ignoring outside stimuli while so engaged, preferring a single information stream, and having a high tolerance for long focus times. Hyper attention, by contrast, is characterized by switching focus rapidly between different tasks, preferring multiple information streams, seeking a high level of stimulation, and having a low tolerance for boredom' (2007:1).

[4] While I am not explicitly using technicity in the sense of 'originary technicity' as developed by Derrida and Stiegler, the position I take in regard to software is sympathetic to the metaphysical view on the aporetic relationship between humans and technology. Accordingly, technology and the human are mutually co-constituted. See Frabetti, F. (2011) 'Rethinking the digital humanities in the context of originary technicity'. *Culture Machine*, vol.12, for a valuable discussion on the concept of originary technicity.

[5] More information about the Open Graph protocol and its specifications can be found at http://ogp.me and http://developers.facebook.com/docs/opengraph

[6] 'Makes sense' in this context is meant to express the notion that software is productive of sensation and awareness. 'Sense' is used as a synonym for meaning and the senses/sensible that both allude to concepts of attentiveness and awareness.

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