Digital Mapping, Technological Information, The Device Paradigm and Focal Practices

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This paper considers the critique of digital geographic information by the philosopher of technology Albert Borgmann. In *Holding On to Reality* (1999), Borgmann differentiates three types of information: natural, cultural and technological. Natural information is defined as information about reality: for example, scientific information on the movement of the earth or the functioning of a cell. This is information that was created in order to understand the functioning of reality. Cultural information is information that is being used to shape reality, such as engineering design plans. Technological information is *information as reality* and leads to decreased human engagement with fundamental aspects of reality (Borgmann 1999; Mitcham 2004). Significantly, these categories do not relate to the common usage of the words 'natural', 'cultural and 'technological' rather to describe the changing relationship between information and reality at different stages of socio-technical development.

Within his analysis of technological information, Borgmann pays special attention to technological geographical information and the applications of Geographical Information Systems (GIS). For Borgmann, GIS epitomises technological attempts to encompass reality by capturing the endlessness of reality in bits and bytes. Technological geographical information is being utilised in the human efforts to make reality transparent and precipitous. Indeed, the ongoing development of data capture techniques, combined with the increased capacity to store and manipulate geographical information, can be interpreted as an attempt towards improved ability to capture reality in ever greater detail.

Such detailed geographical information is already being used as reality. For example, in agriculture, the analysis of soil samples and crop models is used to decide on pesticide application. The pesticide application is loaded into Global Navigation Satellite System (GNSS) guided applicators, which then release the substance on the ground (Berry 1998) guided by geospatial data on soil fertility, topography, etc. In the social realm, the analysis of geocoded reports of crime incidents is used to decide where police officers will be deployed (Chainey & Ratcliffe 2005).

Yet, even at this level of analysis, where the GIS is used as a 'model' of reality or assists in making operational decisions on human activities, reality is too slippery to be captured and contained. As Borgmann notes, with each piece of geographical information captured and tamed inside digital computers come a host of questions. There are uncertainties that cannot be resolved (Couclelis 2003), and the semantic interpretation of the computerised objects is not a trivial task (Fonseca et al. 2002). The volume of the data forces automatic processing, where only tiny samples are scrutinised carefully by a human while the rest is trusted to be accurate. The more detailed the data set, the thicker the fog that obscures the relationships to reality.

The problems of detailed geographical information pose limits to what it is possible to express with a GIS, as far as reality is concerned. As Borgmann concludes: "If you imagine yourself in control of a perfect GIS, nothing any longer presents itself with any authority. Anything might as well be an impediment to inquiry." (p. 177). Furthermore, because many information layers were created in automatic processes as noted above, the viewer is likely to be the first conscious being to actually

scrutinise the values of the census output or the classification of a specific pixel. By contrast, consider the regional geography accounts of the past, where the geology, geomorphology and society were described through the use of natural information in books, using words and carefully selected and drafted maps and diagrams. Here, although the information is partial and subjective, at least we know that it can be linked to reality authoritatively.

Borgmann's analysis of information technology should be framed within his 'Device Paradigm' (Borgmann 1984), which, in brief, identifies the problem with modern technology as the way in which it disconnects means from ends and, in some cases, demolishes meaningful social and human practices, such as the family gathering for an evening meal which is replaced by TV dinners. These deeply meaningful social activities are termed 'Focal Practices'. For more discussion on Borgmann's analysis, see Higgs et al. (2000) and Verbeek (2002).

Borgmann's perspective of GIS (and wider geographic technologies) is pertinent to the understanding of how digital mapping is carried out and changes over time. The emergence of community/crowd/user-generated digital maps is changing the formulae somewhat (Haklay et al. 2008). Projects such as OpenStreetMap (Haklay & Weber 2008) are exhibiting a complex relationship between the contributor to the mapping product and the user of the map in terms of their understanding of the information.

For the mapper, who is commonly interested in her local area and walks through it to record specific objects, the process of mapping is an example of natural information in Borgmann's classification. In a project such as OpenStreetMap in which mappers state that their affiliation to the project is linked to the project's goal, which is the production of a freely available accurate digital map of the world (Budhathoki et al. 2010), this is especially true, although there is some evidence that people who update Google Map Maker are also doing so because they identify an error in the map in their local area. The process is about creating an empirical representation of reality in digital format. The process is one of identifying a road or amenity in reality and creating a representation of it using the coordinate information from a GPS receiver or by identifying objects on detailed satellite images and describing them. Moreover, for the mappers themselves, the process of mapping can become a focal practice. While a very small minority of the total volunteer mappers attend meetings, for those who contribute significantly to these projects, face-to-face meetings and discussions about the practice of mapping are significant and meaningful events. Arguably, even the unruly and often impolite discussions on the projects' 'Internet Relay Chat' (IRC) channel or on mailing lists demonstrate the level of meaningfulness that the activity plays in the life of the mappers.

Yet, the outcome of this very situated, engaged and sometimes emotional mapping process is paradoxical. Instead of the production of more natural information, to the people who use this information there is an increase in the level of technological information. Especially in the era of 'big data', it is common to see analysis of information from systems such as Twitter or FourSquare presented as a reality of what happens in real time (although it represents a highly biased tiny minority of the total population). The maps of Google and OpenStreetMap arrive to the hand of most users after extensive computational processing, in which they are mixed with other data sets, renders in various cartographic representations and sent to the device that the users use. The maps are inherently unstable and, while we rely on them as a reality (e.g. when following SatNav directions), they are mutating all the time in ways that are never disclosed. We are therefore in a

situation in which Borgmann's analysis still holds and, for the vast majority of digital map users, the maps went through a transformation and became opaque technological information artefacts, while for a tiny minority they are meaningful and significant.

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