In a World of Data Signals, Resilience is Subsumed into a Design Paradigm

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A government department. A hospital. An early warning and disaster response center. A university. An individual going about daily routines. A city council. A think tank. Over the past three years I have witnessed the use of information dashboards across these different scenarios. Once the stuff of expert systems, information dashboards have become a regular instalment of organisational and, increasingly, personal life. I have been studying these dashboards as a way to think about data in use and especially as this relates to decision making. Dashboards bring together and visualize different measures of data, typically on a single screen. There are many ways that this can be done, with a mixture of charts, maps, gauges and more bespoke techniques; and they can be used for different purposes, from quick 'overviewing', to regular monitoring or data analysis and exploration (Few, 2013). While dashboards and dashboard-like displays have been used in some contexts for over 50 years, recently this use has greatly expanded.

To study these displays is to take a specific methodological gambit in relation to ongoing discussions of big data or 'datafication' (Kitchin, 2014; Mayer-Schönberger & Cukier, 2013). It is to focus on data in use, at the point of decision making, where it can be acted upon. This methodological decision backgrounds as much as it reveals, but what it reveals is, I think, worth dwelling upon. The study of dashboards makes visible an emerging epistemological condition, even a paradigm, what I call the *data signal*. But before detailing what this data signal is, and what it has to do with a discussion of design and resilience, I need to make a detour into the field of economics and an older type of signal, price.

While economists study any number of things, a large portion of economics as a discipline concerns the study of markets. Most markets are comprised of things that are bought and sold. This process of buying and selling is usually reliant on price, which communicates a notion of value and helps mediate exchange. How price contributes to the organisation of buying and selling in a market, as well as how it relates to value, is by no means straightforward (Çalişkan, 2010). Within one strand of liberal economic thought, though (what critics describe as 'neoliberal'), price serves a very important political and organizational function within a market. It isn't simply that price communicates value, but rather price facilitates widespread organisation or 'coordination' in a system that does not rely on a central point of decision making. In a popular essay, the Austrian economist Friedrich von Hayek put it like this: "[I]n a system where knowledge of the relevant facts is dispersed among many people, prices can act to coordinate the separate actions of different people…" (1945, p. 526). Price communicates signals about changing conditions within a market and these 'signals' inform the decisions of buyers and sellers. As market actors encounter prices and make economic decisions in relation to them, these decisions are thought to be reflected in the (future) price and its fluctuations. It is through this relation to price that the distributed preferences of individuals could be registered. For Hayek and other defenders of market economies this

function of price is essential. Price coordinates, but it does so by taking everyone's decentralized decisions about buying and selling into account:

> The peculiar character of the problem of a rational economic order is determined precisely by the fact the knowledge of the circumstances of which we must make use never exists in concentrated or integrated form but solely as dispersed bits of incomplete and frequently contradictory knowledge which all separate individuals possess. (Hayek, 1945, p. 519)

The neoliberal critique of centralised planning is based in the perceived incapacity of centralised planners to access the situated knowledges of individuals – an incapacity that a properly functioning price mechanism is thought to overcome. The political claim that markets are a superior form of social organisation is dependent on this function of price (as signal and organising mechanism).

As a signal, price has a specific set of qualities. Insofar as they materially transmit quantities of information, price signals operate on the lower thresholds of the semiotic spectrum. They form part of the materiality of what Umberto Eco called the 'sign-function' (1976), but offer little themselves in terms of signification. Price signals go up and down or remain steady, and these states can vary in duration. Price signals thus communicate through their relation to change over time, and the situation in which they appear. The amount of information contained in them is fairly limited (up, down, steady, duration), such that on their own they rarely have explanatory power. Price signals do not impose a course of action on their interpreters – they are not commands, orders or rules – and instead require decisions to be made. The open-ended nature of the price signal, the fact that it does not compel action, is the basis of its attraction to liberal economists. It is, in fact, central to the production of (economic) freedom or what Michel Foucault more skeptically described as 'liberogenic' devices (2010, p. 69). Price *signals* are found wherever there are prices (and markets) and thus, price signals are thoroughly distributed entities. This means they operate on the scale of individuals, or rather individual exchanges, and the scale of the whole market simultaneously. The signaling function of prices mediates this relation between the individual and the market. The ideal of the market, mediated through price signals, is a population of individuals making situated decisions which results in the allocation of resources with no central command.

As noted, neither prices nor markets typically function in the way proposed by neoliberal or neoclassical economics (Çalişkan, 2010; Schumpeter, 2010). The persistent appeal of markets, and their price signals, however, is the capacity of price signals to operate on this micro level, to take account of what Hayek called 'the man on the spot' (1945, p. 524) and to communicate or coordinate that 'on the spot' activity with other times, places and resources. The activities of each 'man on the spot' influence the movement of price, which creates signals for other market actors, and so on. The idea of a planned economy is replaced with the coordinating mechanism of prices and distributed decisions based on fluctuating signals. While the price signal is presented as an

economic phenomenon, it forms a core component of a general theory of governance. Any number of criticisms have been launched at the neoliberal economic project, but very few have done so on the basis of the calculation of signals (Brown, 2015; Dardot & Laval, 2014; Davies, 2016; Foucault, 2010; Mirowski, 2014, 2015). Reenter the data signal.

Those who attend to dashboards are observing data signals, or rather, they are observing data for signals. The materiality of these signals, how they are generated, transmitted, stored and processed, differs significantly from how Hayek wrote about price. Data signals *are* distributed and they do travel and move between scales, but they rely on large scale infrastructure to do so, or what Jennifer Gabrys has described as 'planetary computerization' and the 'becoming environmental of computation' (2016, p. 267). These signals vary; they are diverse and multiple. While some dashboard formats may be shared across an organisation, and many dashboards will present data that can be found on other dashboards, dashboards are designed to bring together the signals required for a particular context or situation and thus what is displayed often differs from one person to the next. Data signals signal different things to different users with different dashboard configurations. There is no 'market' to which a data signal refers, but rather a world encoded or 'entextualised' (Castelle, 2013) as data points – call it world-as-data-warehouse – from which any number of signals can be extracted.

Data signals share price signals' capacity to register or 'sense' individual distributed activities. These could relate to economic exchanges – which generate transactional data – but any number of other activities can be encoded. A body at rest, a surgical procedure, movements of a river, available car parking spaces in a city, applying for a driving license, the 'sentiment' of social media comments – the empirical sources of data signals are degrees above that of prices.[1] Indeed, the entirety of price signals is now a mere subset of data signals. While data signals are distributed and travel, as material signals, across any number of information systems and communication infrastructures, they are formatted into dynamic centers. A dashboard is a centralisation of data signals. But because data signals can be centralised through any number of dashboards (and related intelligence systems), and because they are generated from 'the spot' (if not necessarily the Hayekian 'man') or more appropriately 'where the action is' (Dourish, 2004), they reconfigure the relationship between centralised 'planning' and supposedly unplanned market dynamics. The promise of data signals is that they give a planner (or decision maker) access to the movements of 'the spot', to 'where the action is', while simultaneously distributing this access through their representation in dashboard formats (a distribution which is not uniform or standardized and thus may be an important site of political contestation in future).

While the data signals displayed on dashboards operate on different temporal rhythms, all are geared towards the present, or rather the possibility that a decision will be made 'now'. Translated into representations on the dashboard, some signals make a claim upon realtime temporalities

[1] These are a selection of signals taken from the different scenarios of dashboard use I opened with.

(even if this temporality is always a 'construction' and subject to the mediation and speeds of computation), while 'presentness' is also achieved through the juxtaposition of different data representations (a graph, table, gauge, map, and so on) such that a user must attend to and interpret their relations. As signals, and similar to price signals, these forms of data remain on the lower threshhold of signification; this is the basis for their 'addressing' a user *as decision maker*. In other words, a dashboard will not tell a user what to do. Their function is to gather and present distributed signals.

Hayek was explicit about approaching markets as information processors which parse innumerable micro-exchanges and reflect this processing work through price (1945). Data signals, which rely on the widespread distribution of computational actors, always need an interface for turning signal into sign, that is, for making decisions (Nake, 1994). Despite great variance in their materiality, data signals are always geared towards a cognitive milieu. As a pioneer of human-machine interface design put it, computer interfaces are for 'augmenting human intellect' (Engelbart, 1962). Through data signals, this augmentation now acts on a planetary scale, sensing tiny variances in state or the smallest of actions, and with a view to instantaneity. Data signals establish *massively augmented cognitive presents*. This has serious ramifications for approaches to economics, but goes far beyond economic considerations.

It has been noted that the discourse and practice of resilience has parallels with that of neoliberalism (see the introduction to this issue, and also Chandler, 2014; Walker & Cooper, 2011). What is shared is a certain *laissez-faire* disposition, whereby both the market and the forces of nature must be left to take their course. This eschewal of planning, of the strategic intervention, marks both as anti- or post-modern. Both positions must not be mistaken for taking no action or letting things be, more generally. It is now common wisdom that governments have spent the last 40-odd years proactively creating the conditions of markets (and competition) across all areas of life (Brown, 2015; Dardot & Laval, 2014). This cultivation equally requires constant regulatory attention if markets are to function in ways resembling their economic ideal. For its part, resilience equally makes possible any number of interventions – new architectures and infrastructures, new government policies and commercial opportunities, new disaster procedures, new approaches to community, and so on.

With the rise of the data signal, economic, urban and ecological ways of knowing and acting are converging. The representation of patterns of employment or of weather begin to resemble one another. Indeed, they can be brought directly into relation if desired. They converge in the same epistemological frame (of dashboards) and respond to the same signal-ontology. This epistemological frame, made possible by the planetary scale signal-ontology, is no longer one of letting things take their course – the question of planning is once again on the agenda.

But, and by way of conclusion, the emergence of the data signal does not imply a revival of modernist planning. Instead, modernist planning is replaced with a design paradigm. Design comes to the fore as a set of concrete practices but also as the governing epistemology of any situation where the data signal is in operation. Without speculating on the future of neoliberal governmentality, the design-data signal nexus is post-neoliberal in theory and practice. Having long internalised the critique of planning, designers prefer iterative approaches and often work through heuristics. Overarching design principles are matched at the level of practice with things like design patterns – repeatable implementations to commonly occurring problems. In the realm of the digital, design is primarily concerned with the creation of 'experiences' for populations of users (Benz, 2014; Garrett, 2010). These experiential users are 'where the action is' and also what design explicitly acts upon.

While data signals are generated through large-scale infrastructure and thus are reliant on engineering, the efficacy of the signal is not primarily an engineering question. Whenever human activity is the basis for the generation of data signals, we are in a design paradigm (and experience or interaction design, specifically). Equally, the points at which data signals are translated into signs and thus made meaningful and 'actionable', are ones where design holds sway. On both ends of the data signal, teams of designers (user researchers, developers, product designers, visualization specialists, and so on) fine tune the interactions and experiences of human-machine 'configurations' (Suchman, 2006). The data signal is increasingly a matter of design and the quality of signals reflects the competency of designers. To the extent that resilience comes to rely on data signals, it too is subsumed into a design paradigm. Resilience thinking becomes design thinking. In this new scenario, the challenge for resilience thinking is not simply to design good signals – which may further perpetuate a naïve form of 'smart' resilience – but to accommodate the limits of this data signal-ontology and its design epistemologies. Resilience cannot become one designed user experience among others.

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