Emergent Graphics: Graphic communication as a systems change agent

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Graphics, whether you call it design or communications, is a system that has emerged at various times from various societies and through various media, but with a common mode of practice. We communicate using visual means (oh, so many diverse means). And we carry out these communications in ways that are diverse in the visual codes that are applied, but commonly with a small range of intended outcomes: to explain, to demystify and to reduce the complexity of socio-cultural systems too baroque for the citizen to operate without help. Sometimes, these systems are markets, sometimes cities, but graphics are there to help.

While these operations have frequently been exploited to explain the ways of government to the governed and then to sell merch' to them, too, it doesn't have to be used that way. The practice of graphics is a process that is agnostic as to the thing being communicated: in 1919, El Lissitzky promoted the Russian Revolution, and in 1924, it was Pelikan Ink. The practice of graphics can move beyond servicing vested interests and be a powerful tool in engaging in dialogic design to address global problems.

The paper uses Meadows' (1999) *Leverage points, Places to intervene in a system*, as a structure to consider the clustering of graphic communications practice around certain functions of communication and control, with the intention of using its accumulated practice as a lever for large-scale social change.

KEYWORDS: graphic communication, leverage points, emergent social systems, complex adaptive systems

RSD TOPIC(S): Cases & Practice, Sociotechnical Systems

Introduction

This paper proposes that graphic communication—as it is currently conceptualised and practised, as a field and a subject—is an emergent system, an organisational schemata (Bartunek & Moch, 1987), that has evolved to engage multiple other systems, with the intent to reduce social complexity for stakeholders engaging with factors present in complex social and cultural systems.

It is not a novel observation that as time passes, social systems tend to become more complex as an organic function of their operation (Spencer, 1860): accreting social structures, artefacts, ideas and codes (culture) through the daily actions of their members. Social systems become so complex that acting in the system becomes incomprehensible without secondary systems that explain the primary ones. These schemata, '… when pressed against experience, give it form and meaning.' (Bartunek and Moch, 1987).

From Cuneiform's origins as an accounting tool, which became the genesis of modern writing systems, to information graphics mapping obscure social relationships to allow populations to engage with democratic processes, this paper suggests that graphic communication as a practice is:

- ➔ An emergent construct that acts to reduce social complexity …
    - ◆ taking the deep complexity of social systems and …
    - ◆ reducing that complexity using codes from the stakeholder's boundary critique …
        - to frame the possibility of social action.

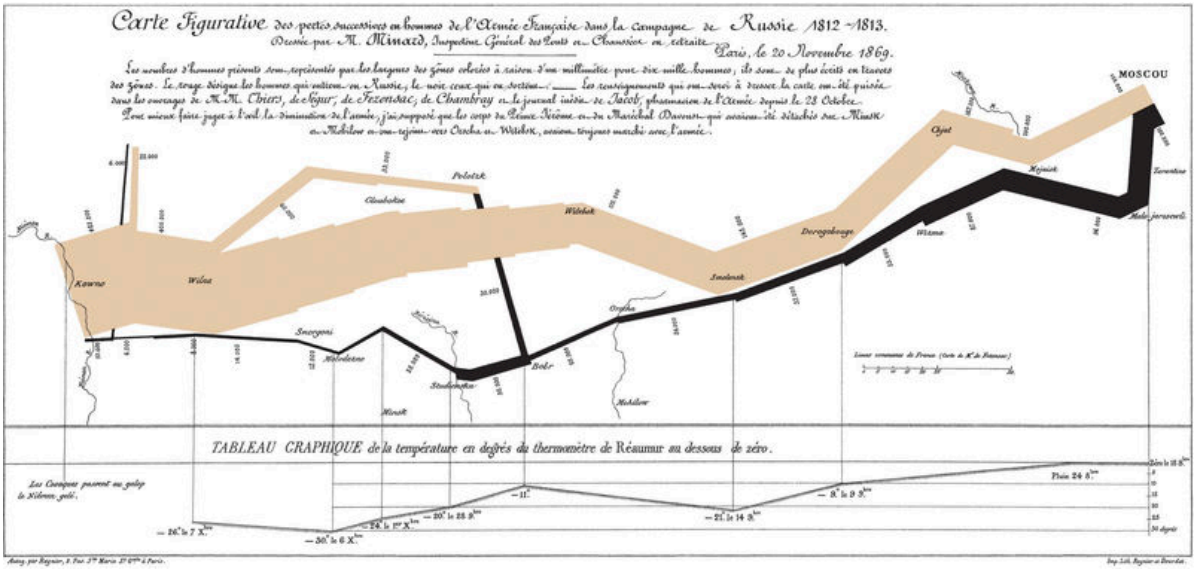

Figure 1: Minard's 1869 graphic of Napoleon's 1812 Russian campaign: reducing a complex time-based sequence of loss of life into a comprehensible graphic.

Figure 2: Brownell's flag of South Africa: reducing a set of complex narratives around liberation and national identity into a simple design.

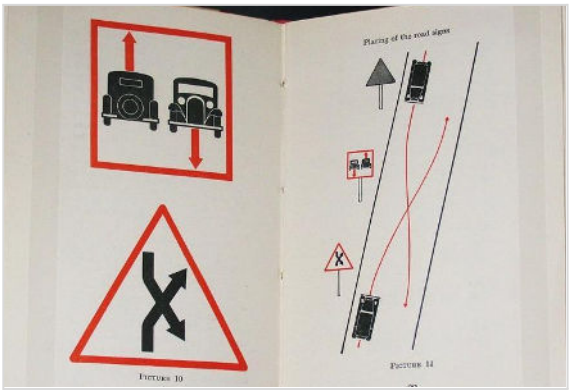

Figure 3: An example of the Isotype pictorial language, designed to reduce the complexity of the world to enhance democratic engagement.

Graphics as an emergent system

Outsiders looking at Graphic Design and Communication will frequently confuse the tools we deploy: software, printing presses, websites, and user interfaces: with the practice (and to be fair, so do some practitioners). However, from the earliest days of the field, graphic communicators have primarily engaged in a process of bringing together elements from a number of other systems and engineering finalised artefacts that reduce social complexity in the cause of communications clarity.

By way of an example, if we look to the origins of the field's relationship with print, we can see Peter Schöeffer (Gutenberg's print master and arguably the first modern art director) dealing with:

- Extant cultural systems in 'the book', composed of:
    - Historic production systems inherited from the scriptoria.
    - Systems of visual culture in the layout of the book, which is to say, the cultural expectations of what a Bible would look like:
        - the structure of the page
        - the decoration (in this context, the imagery)
        - the setting of the text
        - the form of the letters
        - the spacing and arrangement of the letters
    - the binding of the book
    - the sales and distribution of the book
- While also dealing with totally novel technologies and applications
    - Struck moulds and hot metal type, designed to look like hand-rendered type…
    - with built-in spacing (kerning, word spacing and leading)
    - handling novel inks in combination with novel paper stocks
    - new technicians to operate the new technologies…
- and existing technicians, operating old technologies (woodblock prints), applied in wholly new ways.

As Eisenstein (1980) notes:

> Behind every book which Peter Schoeffer printed stands a published manuscript …. The decision on the kind of letter to use, the selection of initials and decoration of rubrications, the determination of the length and width of the column, planning for margins … all were prescribed by the manuscript copy before him. … That there were new features and they were exploited needs to be given due weight. Despite his efforts to duplicate manuscripts as faithfully as possible, the fact remains that Peter Schoeffer, printer, was following different procedures than had Peter Schoeffer, scribe. The absence of any apparent change in product was combined with a complete change in methods of production, giving rise to the paradoxical combination noted above, of seeming continuity with radical change. (p. 51, with a quote from Lehmann-Haupt, Peter Schoeffer, pp. 37-8)

This emergent blend—of cultural codes and technical systems—being drawn together for a specified communications purpose, with a specified user culture as the target, was the defining characteristic of graphic practices in the 1450s and still is (Barnard, 2013, pp. 57-61).

In terms of applications for this practice, historically, graphic practice has been applied as a complexity reduction (Downs, 2007) designed to promote commercial values and extant power structures (Barnard, 2013; 61: Williams, 1980), but this is not inherent in the practice itself. The practice is quite distinct from the application, Engineering would represent a good analogy: it has produced many terrible things, but it has the capacity to do good. The practice is one of consideration of the multiple factors named above through the lens of the target community's boundary critiques (Ulrich, 2005), with the community's involvement (in an ideal case) to communicate into and direct change. Historically, this typically meant reducing the complexity of a complex social system to support the status quo; however, a parallax view of graphic practices allows these operations to be equally capable of redrawing the world as it is.

Changing access to media systems in the form of digital culture and systems, combined with a better understanding of the emergent properties of graphic communication, can

redraw the field's boundary critiques in ways that dismantle harm-causing social structures instead of promoting them.

A brief note about terms

This paper takes a specific, pragmatic position in relation to systems theory by talking about Graphic Communication and not Graphic Design. 'Graphic Communication' says what it is and what it does. The term is broad enough to work for animated illustration, information graphics, videography, UX/UI and print. At the same time, graphic design is frequently read as sets of historic print-based craft practices, which tend to exclude practices, production factors and, indeed, system interactions with other fields.

The paper follows Rand (2014) and Bonsiepe (1994) in arguing that communication of information is the core objective of all graphics functionality: that central quality to be addressed in order for the design to be judged as effective. (van de Waarde, 2014; Kalman, et al., 1994). In speaking about graphics, Rand (2014) notes:

> Graphic design –
> which evokes the symmetria of Vitruvius
> the dynamic symmetry of Hambridge,
> the asymmetry of Mondrian;
> which is a good gestalt;
> which is generated by intuition or by computer,
> by invention or by a system of co-ordinates –
> *is not good design*
> *if it does not co-operate*
> *as an instrument*
> *in the service of communication*.
> (p. 9) [author's emphasis]

In proposing that Graphics is a system, Ackoff's (1981) description is a good place to start and has the benefit of being brief:

> (1)The behavior of each element has an effect on the behavior of the whole.
> (2)The behavior of the elements and their effects on the whole are interdependent.
> (3) However, subgroups of the elements are formed, each has an effect on the behavior of the whole and none has an independent effect on it.
> (Ackoff, 1981: p.15)

In addition and with reference to Schoeffer and the interrelation of graphic practice, culture and technology, it is worth taking Morin's (1992) position of "… holism; which seeks explanation at the level of the totality," and engaging with the practice as a holism that is composed by the systems of the host culture, available technology and the graphic system's history. Graphics is a holism where (after Ackoff, 1981):

- Each element demonstrably affects the behaviour of the whole. Each choice of media, image, type, composition, materiality, location, etc., is intrinsically formative of the work.
- The behaviour of the elements and their effects on the whole are interdependent. For example, it is axiomatic in graphics that there is no such thing as a 'bad font', just one used in the wrong place. Each element is a systems dependency and interdependent on the system.
- This is also true of sub-elements: pages, individual adverts in a campaign, trade dress in a brand, etc. 'Each has an effect on the behaviour of the whole, and none has an independent effect on it.

This reading positions graphics as a specific case of Luhmann's and Latour's work on social systems (Luhmann, 1986, 1995; Latour, 2005), with the addition of work by Maturana and Varela (1987) and Luhmann (1991) on structural coupling and mediation.

> We speak of structural coupling whenever there is a history of recurrent interactions leading to the structural congruence between two (or more) systems. (Maturana & Varela, 1987; p. 75)

Graphic communication has the requisite “history of recurrent interactions” and the “structural congruence” both on the level of practice but also in its role in forming visual cultures, which in turn fuel more graphics.

Luhman (1991) proposed that elements contributing to a social system are engaged with persistent interactions with the environment that surrounds them, including social groups, through structural couplings. In human terms, these persistent interactions are coded in mutually respected ways, and these codes are culture (Luhmann, 1986, 1991). Luhmann suggests that we call elements external to the system and the environment that support structural couplings in media.

An example of graphics-mediated structural couplings via visual language is road signage—a mediation that supports structural coupling between the system (you and your car) and the environment (the socio-cultural world you inhabit and geography and the other road users).

This mediation exists for no purpose but to enable the structural coupling to happen safely and predictably. It is a set of graphic interventions raised to the level of a language, coded in different cultures to achieve the same effect.

Further, Luhman, Maturana, and Varela observe that structural couplings allow the environment to affect the system they host but not to define the nature of the effect: an observable property of the operation of graphic communication. The operant chain of logic for road signage is that an elegantly crafted design intervention (a road sign) changes the behaviour of the user (a driver) in the expectation that it will change their relationship with the system (the road) (Dewar & Pronin, 2023).

In the case of road signage (and most graphic interventions), it is frequently effective – but not universally predictable in the nature or scale of the effect, to the chagrin of designers (see Kay et al., 2014; Vignali et al., 2019; Dewar & Pronin, 2023).

The first part of the proposition is that graphics is a system (or, more properly, a system of systems). The second part is that the graphic system has, through structural couplings, evolved into a change engine for control and communication of its host cultures, reducing social complexity to preferentially direct stakeholders in desired directions, with historic echoes of the current application of Nudge Theory (Leonard, 2008).

Graphic mediation as a leverage operation

This phenomenon of graphic communication artefacts mediating the interrelation of environment and actor is so common and present that individual interventions—a single road sign—are unremarkable to the point of invisibility. However, the linkage is there, affecting the actor's relationship with the complexity of the environment, which in turn tunes subsequent possibilities for leverage operations (Meadows, 1999) through setting up behaviour through semantic priming (Ferrand & New, 2003) for the next communication operation—e.g., the next sign, changing gear, manoeuvring at an interchange. The effect of one graphic communication should not be read in isolation (something of a failing in some graphics research)—the holism of systems of multiple communications, actors, and the environment is where the leverage occurs. The effect of individual graphic prompts may be small, but in common with other social systems, the cumulative effect of these small interventions scales up to effective levels of social steering (Baumgartner, 1986).

If we follow Meadows' (1999) logic that there are more and less effective points to intervene to make system change, we can observe that the most effective leverage points are those that coincide with both current and historic core graphic communication practice.

If we look at the interactions of graphic practices with Meadows' leverage points (Tables 1 and 2), we can see that there is a positive clustering of the first-order (direct control and communication) interactions with the most effective leverage points. At these higher leverage points, graphics practices such as advertising or branding are engaged in direct control and communication operations upon actors and their behaviours. We see sets of practices directly refined to carry out specific change operations. For instance, the advertising–marketing–propaganda triad is a practice directly evolved to nothing else other than change attitudes (see Bernays, 1923; Bernays, 1928; Roberts, 2005; Rand, 2014).

The middle range of Meadows' leverage points is engaged with second-order (system observing) organisations or the self-organisation of actors to carry out a desired operation or change in the schemata being applied. In graphics terms, it equates to operations like Meadows' (1999) structure of information flow, allowing actors to act in

different ways on the basis of new information; an example is the UX/UI–Service design of Gov.UK portals to enable citizens to manage all sorts of interactions with their government.

The least effective leverage points are mediated at a third-order level (relationship mediation and reporting—after Johannessen and Hauan, 1994) with graphic artefacts reporting systems operations to agents, informing them about the current system state so that they can change their relation to the system being observed.

We can see that where graphics are most directly engaging with users, in historical or contemporary terms, they tend to do so at one of Meadows' higher-level leverage points. Where it is employed in secondary or tertiary ways, graphics tend to be operating on a lower-level leverage point.

Graphics in a world in need of change

This observation that graphic communication is the emergent outcome of a complex adaptive social and cultural system, aimed at explaining the complex, reducing that social complexity, and that through that reduction of complexity, preferentially stack all sorts of arguments about individual actor's roles in the system by applying leverage of different kinds has more than theoretical value. By treating graphics as a code-switching system (Nilep, 2006) that targets specific actors to modify outputs, we gain a practice framework that:

1. Allows us to identify those modes and media that are effective in a given cultural system. Treating each design problem afresh as a set of interconnected elements forming a single system allows for elements to be evaluated against their contribution to the final design. This economy of practice is desirable.
2. Allows us to identify those elements that are technically reachable and semantically effective in a system as leverage points. Not all parts of a system are equally readable (as noted by Bernays, 1928), and even if they could be reached, they don't possess the same leverage as other leverage points. As a historic practice, graphics have become normalised as a mass-media practice, while the introduction of data analytics allows us to become a super-focused narrowcast

practice. These effects (as demonstrated in political and social media) show great potential for systems change.

3. Allows us to identify problems so wicked as to be a waste of time to even attempt an address with top-down material responses—but which might be addressed through the willing participation of masses of stakeholders.

Conclusion

Global-level wicked problems require adaptive and complex systems thinking to address them. But then, they require expertise to explain the change and make it seem inescapable and proper. In a world where serious addresses to global climate change have included the addition of megatons of sulphur compounds to the atmosphere and launching moon dust to the Lagrange points, using graphics to drive real socio-cultural change is worth a shot.

So it is convenient that this kind of thinking has been characteristic of graphic communication practice as a historic tool for reducing social complexity and then directing large groups of people in the service of paradigm change: and this time, it will not be the Congregatio de Propaganda Fide, the Red Flag or the Golden Arches.

This evolution of graphic skills needed to engage in dialogic design to resolve both large and small social problems are precisely those skills that are readily available to working designers. While it will be novel for the field, not to say uncharacteristic, to shift its focus from the powerful to the powerless, the actual mechanics of this practice are agnostic as to the end aim. For graphic communicators, directing stakeholders to save the world should be just another job.

Meadows' Leverage Point	Example of graphic practice	Order of System
12. Constants, parameters, numbers (such as subsidies, taxes, standards)	Kinneir + Calvert's national road signage. The graphic reports on road conditions and constants in a way that allows the users to modify their driving patterns.	A passive third-order reporting of physical parameters of the road system – including indications of other road user behaviour. A graphic leading to changes in relationships between strangers – what *Johannessen and Huan* (1994) would characterise as Third-Order Complementary Relationships.
11. The sizes of buffers and other stabilizing stocks, relative to their flows.	The UI design of a fuel tank display in a car is semantically indicative to the type of driving that the car is promoting - a sportscar suggests behaviour that a more sedate car won't - and adaptive to the style of the driver in reporting on the level of fuel. This can make the driver cautious or confident about their ability to reach their destination.	A reactive third-order reporting of the fuel buffer in a vehicle, enabling a range of secondary decision making about driving and driving style, and their vehicle's relationship to the road environment – possibly being what – *Johannessen and Huan* (1994) would characterise as Third-Order Symmetrical Relationships.
10. The structure of material stocks and flows (such as transport networks, population, age structures).	The mappings in advance of the construction of the CrossRail / Elizabeth Line underground railway ran decades in advance of its eventual opening in 2022. This mapping of future of improved links had a causal effect on property development, house prices and local-government planning long before the line opened (*Comber, S. and Arribas-Bel, D., 2017*).	A third-order graphic codings of past, present or future systems states, allows for a range of decision making in relation to a desired system's state.
9. The lengths of delays, relative to the rate of system change.	Live Visualisations of Data Ontologies – e.g. Google Maps or Waze mapping traffic flow in real-time, allowing stakeholders to make informed decisions about their interaction with other system . In 2013 Matthew Somerville used the public data ontologies of the TfL tube status and Google Map data to provide a real-time visualisation of tube train position in relation to provide accurate user data to any connected traveller, allowing them to navigate around problems on the Tube. (*Somerville, 2013*).	A more direct set of second-order operations, where graphic artefacts enable direct stakeholder action based on observations of systems data formatted to be significant to specified groups.
8. The strength of negative feedback loops, relative to the impacts they are trying to correct against.	This sort of second-order operation can be seen in successful anti-drug campaigns - e.g., the Talk to Frank campaign (*White, et al, 2017*), which showed that the 'informal' peer led approach of the campaign was more effective than the 'usual practice arm' of the study.	Graphical second-order feedback loops encourage certain peer-to-peer interactions based on observation of risky behaviour driving negative social responses.
7. The gain around driving positive feedback loops.	In Packaging design, the graphic communication (as opposed to the product design) of specific semantic values expressed in 3D forms, supports marketing operations, and brand values, driving a brand mediated positive feedback loop by encouraging consumption of this specific product.	A graphic second-order feedback loop depending on the observation by other of the visible consumption of semantically loaded packaging artefacts to build esteem – and driving a positive feedback loop of consumption.
6. The structure of information flows (who does and does not have access to information).	Neurath, Arntz and Reidermeister's *Isotype* system is a positive example of graphic's ability to drive system's change by expanding stakeholder access to information about their world. Such coding systems – Information Graphics – serve to reduce the complexity of dense information to levels that allow comprehension in the service of a democratic aim.	A very direct class of graphical second-order operation that allows enables stakeholders to gain access to information that in other circumstances would be incomprehensible to them. A system observing other systems state, in semantically coded ways designed to enfranchise.
5. The rules of the system (such as incentives, punishments, constraints).	Through graphic practices: signage, packaging, adverts, websites, video, visualisation, illustration, mapping and more: graphic communications communicates social imperatives in persistent modes. In this mode Graphic artefacts offer ostensive environmental prompts on behaviour. This is observable in medical posters in most British doctor's surgeries.	Through second-order operations graphics creates and maintains a structure that implicitly reinforces The Rules: a network of prompts about how to act on the road, how to shop, what to consume, how to relate to one another, etc. There is also an interesting argument about existing graphic artefacts forming the 'rules of the system' for future iterations of graphic artefacts.

Table 1. Meadows' Leverage Points 12-5, with graphic applications.

4. The power to add, change, evolve, or self-organize system structure.	Many forms of graphic practices are built around formalized speculative design projects that show potentialities that have not been realized (as in the Elizabeth Line example above). But graphics can also serve to show specific stakeholder desirable systems changes that certain actions on their part can bring: this is often familiar to us through things like, BLM designs, trade union posters, sea-level maps, etc.	This is a set of first-order graphic operations which communicate the existence of place and time where change in a system is possible. What *Dilnot* (2010) calls the 'plenitude' of a political graphic.
3. The goals of a system.	One of the traditional applications of graphic communication - of all sorts - is organising the behaviour of others in patterns that empower the designer's paymaster. Political and propaganda operations - repeatedly transmitting the goals of the system, as a constraint on the range of viable Leverage Point 4's operations that can even be considered - can be seen in news media, corporate media, health and public communication. In political communication scenarios this constraint on possible viable social framings is called the Overton Window (*Mackinac, 2019*).	A first-order set of graphic operations that simply communicate the goals of the system in various visually engaging ways in the hope of control of actors.
2. The mindset or paradigm out of which the system — its goals, structure, rules, delays, parameters — arises.	It might be slightly reductive to simply shout 'ADVERTISING' at this point – but this field of graphics certainly is strongly engaged with the communicating the mindset or paradigm of the system. More accurately it can be said to both communicate the paradigm and miscommunicate the paradigm if that miscommunication is favourable to the client. It would also be fair to add Branding and Marketing to Advertising: but not Propaganda. Although Propaganda shares material, practice and structural commonalities with propaganda, the aim in systems terms is different, which is why propaganda will be discussed below. Where propaganda is aimed at transcending the paradigm, advertising seeks to keep the viewer's attention focused within the paradigm: a point made by Debord in his 1968 work, *The Society of the Spectacle* (*Debord*, 1968).	First-order graphics operations of this sort contextualise, report and explain the paradigm. They carry out an interesting operation: coding the paradigm of the influencer into the boundary critique of the influenced.
1. The Power to transcend paradigms.	In 1964, in the *First Things First Manifesto* Garland (1964) advised graphic designers that: 'We do not advocate the abolition of high pressure consumer advertising: this is not feasible. Nor do we want to take any of the fun out of life. But we are proposing a reversal of priorities in favour of the more useful and more lasting forms of communication. We hope that our society will tire of gimmick merchants, status salesmen and hidden persuaders, and that the prior call on our skills will be for worthwhile purposes.' (DesignFacts.org) Garland's manifesto serves as both evidence that the field of graphics understands its role in reinforcing and reframing paradigms, but also that its boundary critiques need to be redefined in order to change the existing capitalist paradigm. This ability to transcend paradigms is a primary historical function of the field. From the Congregatio de Propaganda Fide onwards; through type design to targets social media campaigns; the field has been engaged in the propagation of new ideas in people's heads. In Garland's terms, it is time to use our skills for worthwhile purposes.	In aim, graphics applied as a propaganda operation, is directly attempting a first-order control and communication function by changing people's boundary critiques, and so changing their paradigms.

Table 2. Meadows' Leverage Points 4-1, showing graphic applications.

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