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Policy Design: a new area of design research and practice.

Jeffrey Johnson and Matthew Cook

Design-Complexity Group

The Open University

jeff.johnson@open.ac.uk

Abstract Policy design is a new area of inquiry that takes the methods and traditions of design into the world of social, economic and environmental policy. Even though they may not know it, policy makers are designing future worlds and implementing these designs in the hope of realising their visions of the future. However, the methods of design are different to the methods generally used in the formation and execution of policy. In design requirements coevolve with the generation and evaluation of new systems. In policy some requirements may be ideologically fixed and pre-empt good overall solutions. Assuming that policy design is indeed an important new area of design there are implications and opportunities for the design community. Since most policy makers have little formal knowledge of design, in the short term designers must engage in policy if policy-as-design is to be formulated in a designerly way. At the same time there is a need to educate policy makers in the theory and practice of design. The combination of research, applications, computer aided policy design, and design education in policy design creates great opportunities for the design community. When policy makers address their policy design task as designers, we can expect better policies with better outcomes

1. Introduction

At its most extreme design is the creation of new things from nothing, from a blank sheet of paper to a blueprint; from a blueprint to a working system and its maintenance. Thus design has three phases: (i) establishing requirements, and the generation, evaluation and selection of hypothetical systems to satisfy those requirements; (ii) implementation of a selected design as a real system; and (iii) maintenance of designed systems into the future. Each of these phases is characterised by interacting cycles of

activity that can make them complicated and unpredictable, requiring human judgment and decisions.

Design has many dimensions that can make it complex (Alexiou *et al*, 2010). Many designed systems are themselves complex, as exemplified by cities, the internet, and the financial instruments that recently destabilised the world economy. The environment of design is complex, where this includes markets, fashion, regulation, standards, and dealing with clients who do not know what they want or what is possible. Design processes are complex where these include manufacturing or construction, supply chains, and managing the transition from blueprint to working system. Finally, design itself is a complex cognitive social process.

Designers manage this complexity extraordinarily well. Although design is often taught within particular application domains such as textiles, architecture, urban planning, electronic engineering, mechanical and electrical engineering the process of design is the same for them all.

We live in a world replete with designed objects and systems. Most of the time we are surrounded by many thousands of objects, each of which has been designed. These include buildings and the rooms we occupy, the furniture in them, the clothes we wear, the documents we read, the many small personal objects such as watches and mobile phones, and so on. The *clipboard challenge* of design involves asking someone to write down as many different designed objects that they can see. Try it yourself now. You will stop long before you have written down all of them because there are too many. Almost all these objects will have been created by professional designers, and their existence and success is due to the application of design methods.

Our thesis is that, although it not usually considered to be so, *policy* is a design domain and those making policy would benefit from education and training on the nature of design and the practicalities of implementation. In other words there is need to recognise a new discipline of *policy design*. This is argued by considering models of design in Section 2. Although there are many variants, for all but the simplest systems it can be argued that design *always* involves identifying requirements for new systems, *always* involves a cycle of generation and evaluation of possible new systems, and *always* involves revisiting the requirements as the system being designed becomes better understood during the process. As explained in Section 3, changing the requirements underlies a coevolution between what designers think is wanted and what designers think is possible. In this context Section 4 introduces policy and gives the example

of designing policy to care for an aging population. Section 5 considers the relationship between design, policy and politics where there are clear differences and similarities between the problem-solution coevolution process of design and of policy formulation, *e.g.* a difference being possible resistance to reformulating policy requirements when this clashes with ideology. Section 6 suggests that that there will be a new Computer Aided Policy Design in the context of *policy* informatics. Section 7 takes a didactic approach to our proposition that policy is a new area of design research and practice, and presents a formal argument in favour. Section 8 gives our conclusions, which include the need for designers to engage in policy, and that great opportunities will be created by the new field of policy design.

2. Models of design

Although there are many variants (see for example Cross, 1985), the simplest model of design involves the identification of *needs* or *requirements*, and the *generation* and *evaluation* of alternative ways of satisfying those requirements. Usually there are many dimensions for judging designs, with no overall optimum for them all. This requires the design problem to be *satisficed* by suboptimum trade-offs between the judgment criteria (Simon, 1969). These could include, for example, the processes available to make the object, costs, physical feasibility, social dimensions, and so on.

Many designed systems are hierarchical, conceived as collections of subsystems that work together to make the whole. For example, a jacket has a front, back, sleeves, buttons, while an aeroplane has mechanical, electrical, computer, seating, and many other subsystems.

In this context the design process involves an abstract concept of 'the new object or system' at the highest level of representation, and more tangible component objects existing at lower levels of representation. In the simplest case the designer devises new ways of combining pre-existing components to make new artefacts. More generally, all the parts required to design a system do not exist *a priori* and some have to be designed as subsystems. The specification for these subsystems comes from abstractions at higher levels and implicit or explicit hypotheses that “if a new component existed with a given specification, then when assembled with existing components in the way specified by the designer, the whole will have the desired emergent behaviours”. Such hypotheses are

effectively *predictions* or *forecasts.* In engineering such predictions are based on scientific principles and numerical calculation. In systems such as fashion predictions of fabric movement dynamics or market success of are made on the basis of more qualitative principles and calculations.

When the design process begins for a completely new object or system there are many uncertainties and unknowns. Design involves making explicit what was previously implicit as the system being designed becomes better formulated and understood. Sometimes this involves accumulating existing knowledge and sometimes it involves creating new knowledge relevant to the project in hand. For example, a candidate design may involve using materials in a way never tried before, and this may involve laboratory tests. Similarly, a candidate design may assume unknown user preferences that require empirical user research.

Seen this way, the generate-evaluate-generate cycle can be viewed as a helix through time, with each generate-evaluate iteration contributing new knowledge on which to base subsequent iterations.

The design of multilevel systems is characterised by the top-down questions of “what might be the conceptual system components, how might they fit together and what might be the emergent behaviour of the system” and the bottom-up question “if these tangible components are assembled in a given way will the new whole have the behaviour hypothesised top-down?” At some stage in the design process the abstract components hypothesised top down meet the tangible subsystems formed bottom up, and the higher level abstractions are instantiated. The result is a fully instantiated description of the new system, or blueprint.

During this top-down bottom-up design process assumptions are often made that turn out to be incorrect as the designer learns more about what they are designing, and the evaluation stage may reject an evolving design. This has costs for the unproductive work done, and to avoid them designers try to identify flawed assumptions as early as possible.

3. The coevolution between what designers think is wanted and what designers think is possible.

Design involves a form of problem-solving that is different from problem-solving in other areas. Very often the stated requirements for a new artefact or system are over-constrained with no solution or under-constrained with too many solutions. For example, the requirements for a new town house

of having four bedrooms and costing less than €100,000 cannot be satisfied in most cities, while the requirements of having two bedrooms and costing less than €1,000,000 has too many options.

In most design projects the requirements are periodically revisited. Some requirements may be found to impose such severe constraints that a design cannot be found that satisfices them in an acceptable way, and one or more requirement must be relaxed or abandoned. But this changes the design problem, which means that design is not just the search for a solution to a given problem, but is also the search for a problem that has an acceptable solution. In other words, design is a process in which the requirements *coevolve* with the generation of possible ways of satisficing those requirements. Design is the coevolution between what the designer thinks is wanted and what the designer thinks is possible.

4. Policy Design

Policy involves creating a vision of the future and taking actions to make it into a reality. In this sense, policy *is designing the future*. More precisely, policy involves imagining new social, economic and environmental structures to make the world as it *ought* to be (Simon, 1969).

In democracies the *requirements* of the population are decided by political processes that give elected politicians the mandate and the money to make changes. Typically the requirements include social provision such as housing, employment, health and education and the way these *ought* to be depends on the values of the ruling politicians and their electorates.

City planning gives an example of policy-as-design for the built environment (Cook *et al*, 2013). Cities are systems that are constantly being designed but are never finished. The same applies to the social and economic systems that must function within this infrastructure.

As an example, consider social policies addressing the problem of caring for an ageing population in England: “For the first time, there are more people aged over 60 than children under 16 in the UK. ... The shift in proportion, composition and attitudes of the older age group has profound implications for public services. … Those whose health has begun to fail also deserve to enjoy life as fully as possible and we need to find new ways to support them. … but the response of public services is often limited. … focused on a narrow range of intensive services that support the most vulnerable in times of crisis. … We need a fundamental shift in the

way we think about older people, from dependency and deficit towards independence and well-being. … Interdependence is a central component of older people's well-being; to contribute to the life of the community and for that contribution to be valued and recognised. … The challenge to respond to the needs and aspirations of a large and growing section of our community is not a marginal one. Much is straightforward and expectations are unexceptional. It is therefore all the more surprising that comprehensive, systematic approaches to older people are still relatively rare. In future, local councils and their partners should expect to be judged on their ability to build communities that support older people to live active, fulfilling lives." (UK Audit Commission, 2004).

The British concept of 'Care in the community' has a long history: "The 1989 community care White Paper marked a watershed in social work for adults in the UK. Its full title—Caring for People: Community Care in the Next Decade and Beyond (Department of Health, 1989)—signified the intention to set the direction of policy for many years. That this was ideologically driven is undisputed: the then Conservative government was determined to introduce the market into public services and the expanding world of social care seemed ripe for marketization. ... Nevertheless, there was broad agreement that significant change was needed. A series of policy reports throughout the 1970s and 1980s had pointed to failures in key aspects of the delivery of health and social care, and the escalating costs of residential and nursing home care were blamed for a soaring Social Security budget. … Further change, ushered in by the 'new' Labour government from 1997 onwards, did not reverse the processes of the market economy of welfare but rather changed the message about what represented quality in service provision and the best ways to achieve this. The argument was that 'modernization'—in the shape of user-centred, 'joined-up' services—was needed if the system was to be 'fit for purpose' to meet the health and social care needs of the twenty-first century (Department of Health, 1998)." (Holloway and Lymbery, 2007).

Today the problem remains that old people are admitted into hospital due to illness or injury, and continue to occupy those hospital beds while they are recovering or after they have recovered. No system has yet been designed and implemented delivering 'joined up' care from a combination of providers including the National Health Services, local welfare services, and members of the community including family and friends, and volunteers. This last group fall under the Conservative Party's *Big Society* initiative: "We are helping people to come together to improve their own lives. *The Big Society is about putting more power in people's hands* - a massive transfer of power from Whitehall [UK Central Government] to

local communities. We want to see people encouraged and enabled to play a more active role in society." (Conservative Party, 2013).

How might a design perspective deliver an affordable and effective system of care for elderly people? First we note the conflicting requirements of providing high quality personalised care at a bearable cost. In this paper the focus will be on the design of new systems. In this a designer would take a *user-centred* approach in which there are no 'average' users, and the users of the system include all those involved including professional staff and unpaid carers and helpers. The term *client* will be used to distinguish those who receive the care from those who provide it. A major classification can be made between those clients who are mobile and those who are not, and clients who have clinical health issues that require medical treatment. The unpaid carers and helpers can also be classified as, for example, spouses and partners, adult children, relations, healthy or unhealthy, own transportation, and so on.

The professionals in the system being designed will have their own chains of command, with some reporting to clinical departments, some reporting to welfare departments, and some reporting to other departments or agencies. These professionals will work together in formal and informal teams and the designer must think through their dynamics. Formal teams may be easier to define but the dynamics of emergent self-organising structures can be very important in systems with unpredictable behaviours. These team structures need to be designed in ways that do not disrupt the *a priori* internal structure of departments and agencies. E.g. ratification of a decision made by a three-person multi-agency team may require three phone calls to the respective superiors, with a high probability of delay due to one or more superiors not being immediately available.

Apart from people, the system being designed will involve locations and equipment. Locations typically include hospitals, nursing homes, and the client's own home, and equipment can range from something simple such as a handrail to complicated things such as a stair lift or a device for getting a person out of bed.

Even for the individual there are many parts to a support system to keep a client at home. Let the collection of relevant parts be written as lists enclosed by angular brackets, for example, <bedroom, bathroom, kitchen>. The system is multilevel, *e.g.* with the bathroom designed as a configuration of <bath/shower, hoist, chair, WC, sink, etc.>. Clearly it is important that the bathroom is well designed for the individual client from an architectural perspective, and it is important that the rooms form a well-

designed unit to facilitate safe and comfortable movement. However, robust social structures also have to be designed.

Generally social structures are combinations of people, spaces and equipment, *e.g.* <bed, client, nurse, water, towels, etc.> for a ‘blanket bath’ in bed. Importantly, if any part of the structure is missing the system breaks down. In social systems the most crucial parts of the structure involve people. For example, if the nurse does not arrive at the house and the helpers present do not have the necessary nursing skills, the client cannot have the blanket bath. System breakdown can be more severe when more people are involved. For example, consider a case review involving the structure <client, spouse, nurse, doctor, equipment specialist> where the equipment specialist fails to arrive. Then valuable resource is lost in the time of the nurse and doctor, possibly causing knock-on failures for other clients. Even though this appears relatively simple at the level of one client, there is the possibility of cascades of failure causing stress and frustration for the professionals, the clients, and their carers.

Good design involves recognising constraints and producing solutions that are robust to component failure. As just discussed, the care system is dynamic involving many combinations of people and things through time. Inevitably parts of the system will fail, for example the nurse may get stuck in a traffic jam, a carer may be taken ill, or a piece of equipment may be faulty. A well designed system will anticipate these failures and have remedial actions to minimise the overall system disruption and maintain delivery of services.

For example suppose the programme of care for an individual involves the combination <client, nurse, physiotherapist, carer>, where this is planned to be instantiated as <Ann, Tom, Gill, Bill; team> but Tom is detained at an emergency with his previous client. Then if information is communicated efficiently and another nurse, Maria, is available, the team can be reconfigured as <Ann, Maria, Gill, Bill; team>. Scheduling the allocation of resources is a well known problem in the design of complex systems, and is increasingly approached through agent-based modelling when the resources are heterogeneous and numerous. This is discussed further in Section 6.

A common problem in social systems is that they are not 'joined up' so that responsibility and authority can be ambiguous and the necessary combinations are not formed. At a higher level of aggregation care at home has to fit into a well-designed administrative structure that makes the connections at all levels. In particular the system has to have sensors to

detect component failure, and it has to be designed to respond to component failure. Where responsibilities are combined between units, the way the system functions and copes with failure has to be codesigned between those units.

5. Design, Policy and Politics

This paper argues that policy design is a new domain of application for design. In a sense this is obvious. Policy involves the creation of *artificial systems* in the sense of Herbert Simon (1969). By definition, artificial systems are designed. The problem with policy as formulated and implemented today is that its practitioners mostly have no education in the theory and practice of design and do not reflect on the systems they create from a design perspective (Schön, 1983).

Of course some policy makers understand very well the part that design can play in policy. For example, the British Member of Parliament, Barry Sheerman, co-chair of the Associate Parliamentary Design & Innovation Group (APDIG) and a member of the Design Council, writes that "Too many people still think that good design means a beautiful table or chair or a new piece of architecture, such as the Shard. There is a whole body of expert design capacity in this country that could help design services, particularly public services... good design, as shown in a new publication from the Design Commission, could help recovery in this country" (Sheerman, 2013). Sheerman is talking about design for policy, which is different to policy for design as illustrated by the European Commission's report on *Design for Growth & Prosperity* (EC, 2012).

Policy design goes beyond policy for design. Policy can be about *anything* and policy design can be about the design of any system. A more subtle distinction can be made about the design of the policy, as opposed to the design of the system which is the subject of the policy.

For politicians ideology and policy may be the same thing, for example "the rich ought to be taxed higher/lower, and this is the policy". Such an approach is not holistic and may overlook the way different policies interact to give the emergent behaviour of the whole, and miss creative design solutions that benefit all stakeholder users. In contrast designers know that requirements may change. Furthermore they know that the process of creating new systems to fulfil evolving needs takes time.

Not all policy is ideological, and often policy makers are looking for the best way to design systems to give the outcomes they and their electorate want. Then policy is usually conducted as *narrative*, or stories about the way individuals and societies work. These narratives form the theoretical basis on which to design social systems and to *predict*, *forecast*, or *anticipate t*he outcome of policy interventions.

A practical understanding that policy makers can take from design is that, when faced with a design problem, it is very rare that the eventual design solution is found early in the process. Designers expect to generate many possible solutions and to evaluate those solutions critically, rejecting many or most of them. Furthermore when designs are implemented it may be discovered that some of the underlying assumptions were incorrect. In this case the design may be modified to accommodate the new knowledge. When policy is seen as design, it is more natural to change the underlying assumptions, even when this goes against ideology.

Experience shows that during implementation some of the assumptions underlying a design were incorrect. Macho politics may inhibit policy makers from admitting such errors, and thereby deny them the possibility of correcting them and designing better policies.

6. Computer Aided Policy Design and Policy Informatics

Computer Aided Design (CAD) has had a major impact across the design domains over the last four decades. In particular CAD allows the dynamics of new systems to be analysed in detail before they are fabricated, supports costs analyses, and facilitates communication by allowing specialists and non-specialists to view graphical representations of systems.

CAD is today essential in the design of mechanical and electronic systems, in architecture and the design of environmental systems, in textile design and manufacture, and many other areas. As Policy Design becomes better understood it too will benefit from the creation of bespoke CAD support. This already happens on a day to day basis in land use and transportation planning through the use of Geographic Information Systems (GIS) and computer simulation. It is certain that new computer-based support, or *policy informatics*, will emerge for policy design.

To illustrate this consider again support for the elderly. It was required to be robust in the face of disruption through the failure of components and subsystems at various levels. Modern telephony makes detecting such

failures much easier. For example, mobile phones can act as sensors with apps that report their location automatically. An information system can know that Tom is not where he needs to be in order to join the team <Ann, Tom, Gill, Bill; team> planned to provide a service at a given time, even if Tom is too busy coping with an emergency to phone in and report it. With this information a system could be designed to locate another nurse, Maria, and reconfigure an alternative structure <Ann, Maria, Gill, Bill; team>. This is just one aspect of the Big Data revolution that will enable the design of new kinds of organisation of socio-technical systems.

The design of many systems involves predictions of their behaviour. Prediction in social systems is different to prediction of physical systems. For example, Finite Element Analysis allows precise predictions of the dynamical behaviour of physical systems. Point predictions are usually not possible in social systems, *i.e.* it is rarely possible to say with certainty that a social system will be in a particular state at a particular time.

The models that underlie prediction or forecasting in social systems are often expressed as narratives rather than mathematical formulae. This is analogous to areas of design such as fashion, interior design, graphic design and even golf course design, where there are rigorous principles underlying the narrative. An outstanding challenge in the science of social systems is the formulation of narrative models that can be implemented within computers, and this is an important area of research for computer aided policy design.

To some extent agent based modelling and computer simulation implement narratives of social interaction and investigate the emergent behaviour of many heterogeneous interacting agents. Such simulations often give unexpected outcomes for given inputs, and in this respect computer simulation is one of the only ways that may be able to forecast the unknown unknowns. In this respect agent based simulation can be seen as a policy analogue to finite element modelling of physical systems.

7. Proposition: Policy is design, and policy is a new area of design research and practice

This paper asserts that policy design is a new area of design. To make this argument explicit we reason as follows:

Thesis: it is true that policy involves design
Anti-thesis: it is false that policy involves design
Synthesis: reject anti-thesis: is it is true that policy involves design
Corollary: policy design is a (new) area of design research and practice

For the thesis we argue that policy involves (i) the identification of requirements, (ii) the generation of new systems to satisfice those requirements, (iii) the evaluation of the new systems, (iv) when designs are rejected cycling back to generate new systems, and (v) compromise between interest groups and stakeholders that involves changing the requirements when acceptable satisficing solutions cannot be found. These are all the characteristics of design.

Against the thesis it can be argued that policy (i) does not involve identifying requirements, which is clearly false – there is no need for policy if there are no unsatisficed requirements; (ii) does not involve the generation and (iii) evaluation of alternative systems, which is again clearly false; (iv) does not involve the generating new policies when others are rejected, which again is clearly false , and (v) does not involve compromise and changing the requirements, but this is central to the art of politics.

The synthesis rejects the anti-thesis leading to an emphatic conclusion that policy has all the elements of design, and is an area that involves design. Whether or not this conclusion is new is a matter of opinion. For more than four decades the journal *Planning and Design* has shown the natural relationship between architecture – an undisputed design discipline – and urban and regional planning where the physical environment is designed in the context of policy. Here at least, *policy design is an area of design research and practice*.

In contrast to saying that policy is the context of design, we say that *policy itself is the outcome of a design process*, and this is true for areas of policy not conventionally considered to be design. For example, financial instruments are designed, medical treatments are designed, housing allocation systems are designed, care in the community involves design, and so on. The design of these systems is currently not informed by design theory and practice, and we believe that the outcomes would be much better if they were. For example, in retrospect it can be seen the design of financial instruments was intended to benefit the banking system designers rather than the public who would normally be considered to be the users of these systems. As another example, in this paper we have sketched the

possibility of care for old people being treated as a design problem.

That it can be contentious to suggest that policy at large is design suggests that this is a new direction for design research and the application of design thinking. This supports our corollary that policy design is indeed a new area of design research and practice.

This conclusion presents an exciting challenge to the design community. Policy design is a new area that currently engages few design theorists or practitioners outside the area of environmental planning. Most policy makers come from intellectual traditions that do not embrace design and do not make policy using the methods of design. This suggests the possibility of a proactive programme to take the theory and knowledge of design into the policy making realm. In one or two decades it may be common to hear policy makers in town halls and ministries discussing the formation of policy in design terms. We believe that this will result in policies that are better designed and more fit for purpose than the failed policies we see in many areas of social, economic and environmental policy today. This is an important opportunity for the discipline of design play a leading role in the design of the future.

8. Conclusions

In this paper we have argued that policy design is a new area of inquiry that takes the methods and traditions of design into the world of social, economic and environmental policy.

Although there are many variants we have given a characterisation of design that always involves the identification of requirements and cycles of generation and evaluation of ways of satisficing those requirements. Furthermore it is common to revisit and change the requirements during the design process. This means that design is a coevolutionary process between what the designer thinks is wanted and what the designer thinks is possible.

Even though most of those involved do not know it, policy makers are designing future worlds and implementing their policies in the hope of realising their visions of the future. The methods of design are different to the methods generally used in the formation and execution of policy. In design requirements coevolve with the generation and evaluation of new systems to satisfy the requirements. In policy some requirements may be

ideologically fixed and pre-empt good overall solutions to societal problems.

Designers have led other disciplines in the application of computers to solve real problems and a new era of Computer-Aided Policy Design is already emerging under the heading of policy informatics with important opportunities for design.

Assuming that our thesis is correct, and that policy design is indeed an important new area of design there are implications and opportunities for the design community. Since most policy makers have little formal knowledge of design, in the short term designers must engage in policy if policy-as-design is to be formulated in a designerly way. At the same time there is need to educate policy makers in the theory and practice of design. The combination of research, applications and education in policy design presents great opportunities for the international design community.

When policy makers address their policy design task as designers, we can expect that better policies will be created with better outcomes.

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