Institute for Innovation and Public Purpose

The economics of change:
Policy and appraisal for missions, market shaping and public purpose

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The UCL Institute for Innovation and Public Purpose (IIPP) aims to develop a new framework for creating, nurturing and evaluating public value in order to achieve economic growth that is more innovation-led, inclusive and sustainable.

We intend this framework to inform the debate about the direction of economic growth and the use of mission-oriented policies to confront social and technological problems. Our work will feed into innovation and industrial policy, financial reform, institutional change, and sustainable development.

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The economics of change: Policy appraisal for missions, market shaping and public purpose

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Abstract

Policy makers are increasingly embracing the idea of using industrial and innovation policy to tackle the 'grand challenges' facing modern societies. To do so requires a fundamental reappraisal of the role of the public sector that goes beyond the traditional 'market failure' framework derived from neoclassical welfare economics to a 'market co-creating' and 'market-shaping' role. Such policies may have significant spillover effects and involve structural changes to the economy. This report explores the implications of this approach for policy appraisal and evaluation. We argue that market-shaping, 'mission-oriented' policies should be evaluated on three levels: enhancing user experience and engagement; expanding technological frontiers; and broader macroeconomic multiplier effects. To do this, governments need to embrace and experiment with new tools and methodologies focused on user needs and dynamic – rather than allocative – efficiency. These include techniques from service design research that focuses on user experience and co-creation practice; and strands of evolutionary economics that focus on shifting and shaping technology and innovation frontiers and managing complex systems under conditions of uncertainty.

Keywords: public policy; cost-benefit analysis; welfare economics; evaluation; innovation policy; mission-oriented policy; market failure

JEL codes: D61; D78; H40; H43; H50; L52; M48; 032; O38

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1. Introduction

Policy makers are increasingly embracing the idea of using industrial and innovation policy to tackle the 'grand challenges' facing modern societies. Examples of challenge-led policy frameworks include the United Nation's sustainable development goals, the European Union Horizon 2020 research and development programme (Mazzucato 2018) and the UK's 2017 Industrial Strategy White Paper (HM Government 2018). But while the shift towards challenge-led policy is becoming more tangible, a key question is whether existing policy tools – from conceptual frameworks to evaluation methodologies and data analytics – enable or in fact constrain such a shift. Indeed, perhaps the main danger for challenge-led policy making is that it will be used as a new label for 'business as usual'.

To avoid this, a fundamental reappraisal of the role of the public sector is required that goes beyond the traditional 'market failure' framework derived from neoclassical welfare economics to a 'market co-creating' and 'market-shaping' role (Mazzucato 2016). This new role would enable shifting not only the rate but also the direction of economic growth; and a shift in focus from marginal improvements in allocative efficiency driven by notions of 'value for money' to a broader notion of public value creation driven by public purpose. Such a change in policy focus requires a different kind of analytical framework for policy appraisal and evaluation that is able to capture the dynamic aspects of market shaping or what we have called 'mission-oriented' policy (Mazzucato 2017). This may involve spillover effects and structural changes to the economy.

This paper examines some of the key elements of this analytical framework. We argue that mission-oriented policies should be evaluated on three levels: enhancing user experience and engagement; expanding technological frontiers; and broader macroeconomic multiplier effects. To do this, governments need to embrace and experiment with new tools and techniques, from service-design research that focuses on user experience and co-creation practice and strands of evolutionary economics that focus on shifting and shaping technology and innovation frontiers, to managing complex systems in contexts of uncertainty. In this report we illustrate our arguments by drawing on case studies from the UK, but our proposed policy framework has universal applicability.

The remainder of the report is structured as follows. Section 2 examines the intellectual roots of the dominant market failure theory and compares it with a market-shaping approach based on public value, including a discussion of existing approaches to public value arising from the public administration literature. Section 3 examines the approach to budgeting, policy appraisal and evaluation in the market-fixing and market-shaping approaches and Section 4 considers the implications for macroeconomic policy, in particular fiscal policy evaluation. Section 5 concludes.

2. From market failure to market shaping: approaches to policy

2.1 Policy as 'fixing' markets

The dominant approach to public policy has its origins in neoclassical microeconomic theory and welfare economics. This approach emphasises the idea that, given certain assumptions, individuals pursuing their own self-interest in competitive markets gives rise to the most efficient and welfare-maximising outcomes (Samuelson 1947; Mas-Colell et al. 1995: 539-40). Efficiency is understood in a utilitarian sense, whereby an activity is efficient if it enhances someone's welfare without making anyone else worse off (so-called Pareto efficiency). Under these conditions, the role of government intervention should be limited to addressing instances where the market is unable to deliver Pareto-efficient outcomes.

Such 'market failures' arise when there are information asymmetries, transaction costs and frictions to smooth exchange, or non-competitive markets (e.g. monopolies) or externalities, whereby an activity harms another agent not directly connected with the market transaction (e.g. pollution). In addition, certain goods, such as defence or clean air, cannot be provided by the market directly because they are non-excludable and non-rival (if one person consumes it, it does not prevent another from consuming it). These are known as 'public goods'.

In the 1960s, 'public choice' theory considered how the actions of agents (voters, bureaucrats, politicians) involved in policy could be considered from an economic efficiency perspective, whereby those agents, including government agents, were assumed to be self-interested (Buchanan and Tullock 1964). While in markets the existence of competition and the profit motive tends to enforce efficient decision-making, in collective decision-making processes (i.e. politics and public administration) the same disciplining framework does not exist. Policy making is thus subject to capture by certain interest groups, in particular those most able to influence policy makers due to reasons of power or money. This is particularly the case because rational voters have little reason to take an interest in political decisions since most voting decisions have only a very tiny impact on the voters' lives: the 'problem of collective action' (Olson 1965). In public administration, the lack of competitive pressures leads to 'bureau-maximising' behaviour, whereby departments and agencies look after their own survival rather than the 'common good'.

Public choice theory argues that even where there are clear examples of market failure, it is not always the case that government intervention would result in a more efficient outcome. Rather, there could also be 'government failure', whereby decisions aimed at improving welfare make things even worse than they would have been under conditions of market failure (Le Grand 1991). For policy appraisal and evaluation such an approach creates a bias towards inaction. If the default assumption is that the market will find the best outcome, even if it does not the overriding concern is that government intervention may worsen existing outcomes and the default prescription for government policy is to maintain the status quo. There is a danger that analytical frameworks become focused more on justifying and measuring the non-failure of public policies rather than the attainment of wider policy goals.

The market failure perspective also creates a particular orientation towards innovation, industrial policy and structural economic change. While certain elements of innovation policy, in particular early-stage R&D, can be considered to be public goods and thus a case for public policy provision can be justified, in the main it is assumed that the private sector is the more efficient

innovator, possessing greater entrepreneurial capacity and better able to take risks given the pressure created by competition. In contrast, the state is viewed as risk-averse and in danger of creating government failure if it becomes too involved in industrial policy by 'picking winners'. Its role is to level the playing field for commercial actors – mostly through supply-side inputs such as better skills or the removal of market frictions – and then get out of the way.

At the macroeconomic level, the market failure approach argues for limiting the role of the state to mitigating the impact of the natural business cycle generated by free market economies, so fiscal and monetary policy should be focused on countercyclical interventions via adjustments to public spending, taxation and interest rates. To prevent these policies becoming subject to government failure, an externally imposed rules-based framework is advisable, with discretionary interventions undesirable (Blinder 2004). Thus fiscal policy is constrained by the 'discipline' of budget deficit targets, and central banks have inflation targets and are operationally independent of governments and thus short-term political capture.

It should be noted that some eminent economists have rejected the market failure justification for policy intervention since the concept that markets by themselves lead to efficient outcomes is dependent on conditions – perfect information, completeness, no transaction costs or frictions – that have never been empirically demonstrated (Coase 1960; Stiglitz 2010). Rather, markets are *always* incomplete and imperfect, and hence not 'constrained Pareto-efficient', i.e. they are never in a situation where a government (a central planner) may not be able to improve upon a decentralised market outcome, even if that outcome is inefficient (Greenwald & Stiglitz 1986). As already shown by Kenneth Arrow (1962: 623), while a market failure approach can be utilised to understand why private firms underinvest in R&D, it is not so useful in guiding public investment in R&D because of the inherent uncertainty involved in the outcomes from such investment. Indeed, Arrow called for alternative approaches to analysing public investment and policies for innovation.

The market failure justification also implies that pure private markets/private goods can exist independently of public or collective action. Again, however, there are very few examples of such phenomena, calling into question the usefulness of the dichotomy between public vs private or state vs market. Indeed, many government interventions enable markets to function or create and/or shape markets through legal codes, antitrust policies, university scientists and physical infrastructure (Nelson 1987, p. 550).

Despite these criticisms from within the economics field, by the 1980s public choice theory and welfare economics became the dominant approach to policy. One manifestation was New Public Management (NPM) - or 'New Public Administration' in the US - which arose in the 1980s and 1990s and attempted to minimise government failure and enhance public sector efficiency by introducing market disciplines (Lane 2002). These included the introduction of efficiency targets – and related performance pay systems for civil servants – to mimic profits; decentralisation and proliferation of new at-arms-length agencies (running on efficiency targets and performance pay systems); opening up public services to competition from different private providers; and outsourcing and privatising certain services. It also gave rise to a culture of impact assessment that relied on cost-benefit analysis, productivity measurements and various indicators, indexes and ranking systems to measure policy success or failure (Kattel et al. 2013).

2.2. Policy as co-creating and shaping markets: a mission-oriented approach

Today, it is increasingly recognised by policy makers that the major challenges facing capitalist societies – the transition to a low carbon energy system, refashioning the welfare state to deal with an ageing population or creating affordable homes in the world's fast-expanding major cities – cannot be reduced to 'externalities' or 'public goods'. This means the dominant analytical framework and its tools is not fit for purpose.[5] These grand challenges are more like complex design problems that require radical innovations and multiple areas of the economy to alter their trajectory. In fact, they mandate a different approach to economic growth. Policy makers today are seeking smart, inclusive and sustainable growth – in other words they are recognising that economic growth has rate but also a *direction* (Mazzucato 2016). To create a new direction – such as green energy – requires the creation and shaping of *new markets*, not just correcting existing market failures. Such change requires new efforts by both private and public actors, as well as an important role for civil society.

The role of the state is key here since it is the only institution with the power to shape markets and direct economic activity in socially desirable directions – 'missions' – to achieve publicly accepted outcomes (Mazzucato 2013, 2016; Vogel 2018). The evolution of technological change has historically required active public investments across the entire innovation chain, from basic research to applied research, early-stage finance to firms willing to innovate, and procurement policies that have resulted in the ability of small, innovative firms to scale up. These investments have created new technology and innovation frontiers for private companies to move towards and seek new competitive advantages (Nelson and Winter 1974; Mowery 2011). In this context, industrial and innovation strategies become key pillars to achieve transformational societal change – in particular, by identifying and articulating new *missions* that can galvanise production, distribution and consumption patterns across various sectors (Mazzucato 2017, 2018). Furthermore, the organisations involved in these mission-oriented investments have themselves been structured – including in terms of policy appraisal and evaluation – in ways that support the achievement of those missions, from DARPA in the US to the KfW[6] in Germany (Mazzucato 2013; Mazzucato and Penna 2016).

A key success of past innovation policies has been to set a clear direction for problems to be solved (e.g. going to the moon and back in one generation) that then required cross-sectoral investments and multiple bottom-up solutions, of which some inevitably fail. Too much top-down can stifle innovation and too much bottom-up can make it dispersive with little impact. Missions should thus be broad enough to engage the public and attract cross-sectoral investment; and remain focused enough to involve industry and achieve measurable success. By setting the direction for a solution, missions do not specify how to achieve success. Rather, they stimulate the development of a range of different solutions to achieve the objective. As such, a mission can make a significant and concrete contribution to meeting a Sustainable Development Goal (SDG) or Societal Challenge.

To illustrate, take SDG 14: 'Conserve and sustainably use the oceans, seas and marine resources for sustainable development'. This could be broken down into various missions, for example 'A plastic-free ocean' (Figure 1). This could stimulate research and innovation in methods for clearing

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[5] Edler et al. (2016) provide a comprehensive overview of impact evaluations (studies, methods, results) in innovation policy.
[6] Originally called the *Kreditanstalt für Wiederaufbau* or Reconstruction Credit Institute.

plastic waste from oceans or in reducing the use of plastics, innovation in new materials, research on health impacts from micro-plastics, behavioural research and innovation to improve recycling or drive public engagement in cleaning up beaches. Each of these areas can be broken down into particular 'projects'.

Figure 1: *A mission-oriented approach to cleaning the oceans (Mazzucato 2018: 24)*
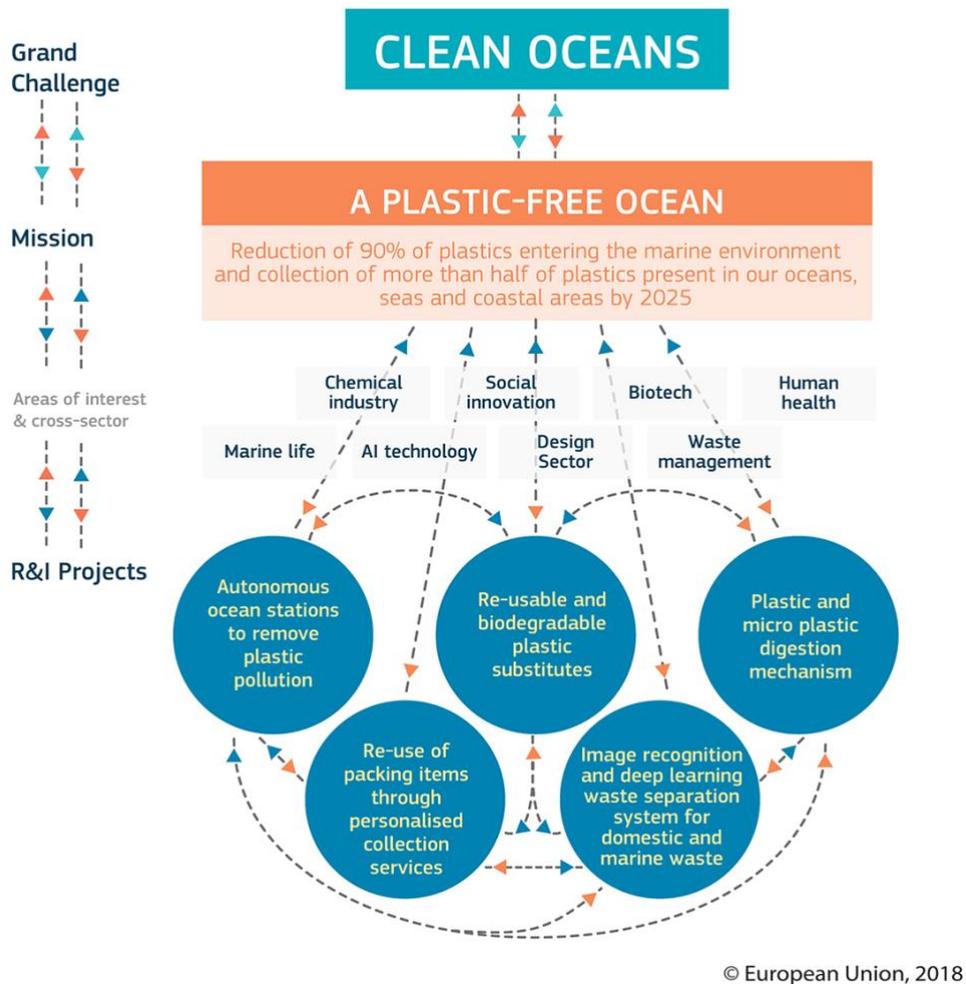
In one sense, all public services have the ambition to solve complex problems or challenges. For example, public waste collection and sewage systems arose out of the mission to eradicate diseases such as cholera. However, in reality implementation of public policies tends to be more about getting the processes right (e.g. following laws, regulations and procedures, political agreements of the day and so forth) and having the inputs for these processes available (e.g. finances, human resources). This is because public policies deal with areas where outcomes can be and are easily contested (e.g. what exactly leads to economic growth or diminishing crime?) (Mintzberg 1996).

Particularly for modern day governments, this means that coordination between various policy fields has become perhaps the most 'wicked' issue in policy making. The reasons for this can be found in what we can call the complexity paradox of modern public policy: the more complex policy issues are, the more compartmentalised policy making becomes. Thus, mission-oriented policies aimed at creating and shaping markets pose a need for new capabilities in the public sector: from leadership and mission-selection processes to new forms of citizen and stakeholder

engagement, to better coordination practices between public sector 'silos' and new appraisal and evaluation techniques.

The market-shaping, mission-oriented approach to policy cuts through the problematic state-market dichotomy that dominates much discussion on economic efficiency and value, with its origins in the market failure theory and its critique. Market shaping is not only about public investment strategy, but also needs to include the wider institutional features of markets, from the regulatory framework (e.g. environmental standards) to the supply of skills, to the creation of demand for new products and services (e.g. through procurement). However, in order to coordinate such varied activities and policies, public policy appraisal and evaluation need to be based on a wider understanding of the value public policies can create. Avoiding government failures is clearly not a good way to coordinate a wider set of policy actions.

2.3 Rethinking public value

Although the underlying assumptions of market failure theory are widely contested, including by many economists themselves, it has remained the dominant theoretical framework to guide policy as no coherent alternative has been developed (Bozeman 2007). Scholars of public administration have reacted to the dominance of NPM regimes in two ways: first by attempting to develop frameworks that substitute the 'consumer' for the 'citizen' and thus bring politics/democracy back into the process of public sector decision-making; and second by embracing the 'service design' approach and its focus on user- research and experience.

With the former approach, public value is conceptualised as a 'third way' beyond 'traditional' Weberian hierarchal bureaucratic management and NPM regimes. Public value is theorised as a means of reconciling the tension between democracy and bureaucracy – the basic idea being that public servants must be accountable both to politicians and also to the wider public/consumers of services, the so-called 'authorisation environment' (Moore 1995). The implication of this approach in regard to measurement is that the public itself must be an active participant in the measurement of public value. Indeed, there are ideas for 'participatory evaluation', particularly in the context of grand challenges. Examples are opinion polls, stakeholder workshops, 'consensus conferences' and citizen's juries. Similarly, economists have also attempted to 'monetise' public value via techniques such as contingent valuation (Cowling 2006).

However, there is little consensus on which of these forms of engagement is most accurate or useful. There is also a concern that the public tends to hold contradictory views on certain issues at the same time; that views can change over time; and that there is a danger that such an approach actually undermines standard democratic processes and power imbalances (Feldman & Khademian 2002; Rhodes & Wanna 2007).

Finally, measurement is also complicated by the fact that public value creation tends to occur at the end of the value 'chain', e.g. when people's lives improve (outcome rather than output), potentially many years after the policy was enacted. This contrasts to the private sector where the value can be seen to be created upstream at the point of purchase of a product.

The user experience-focused strand in public administration research and strategic design practice looks at value creation in public services. This is important in the context of modern day

missions that often include key public service delivery elements (e.g. ageing society, health and other similar challenges cannot be tackled only through investments in R&D) and thus the focus on user experience should be an essential component of policy evaluation. Discussions of value creation in public services focus both on co-creation of services and on user experience of public services (Voorberg et al. 2015; Clarke and Craft 2017). The combination of these approaches is perhaps best exemplified by the 'strategy is delivery' slogan of the UK's Government Digital Service (GDS), and by its activities and success (see box 1) (Greenway et al. 2018).

In terms of evaluation, a user-centric approach means focusing on intensive user research (e.g. ethnographic research in urban areas before undertaking regeneration projects in order to avoid increasing inequality and loss of urban density and diversity), big data analytics (e.g. granular analysis of online service uptake and use in order to increase effectiveness of service use) and social experiments. Such approaches can also be seen as 'participatory evaluation' processes where citizens are actively engaged and where evaluation itself is part of service design (through prototyping and other agile tools of development). A key challenge for these approaches to service design and evaluation is how to take into account conflicting values and create spaces for contestation. On the other hand, these approaches are also key tools for policy experimentation and stakeholder engagement.

Box 1: The Government Digital Service and 'strategy is delivery'

Digital transformation in the public sector is a notoriously complex task that often ends up costing more than anticipated and delivering worse services to the public. For instance, in the UK, the National Health Service's ambitious scheme for creating electronic patient records was eventually written off at an estimated cost of £9.8 billion. What's more, government IT procurement is often 'failure by design': all parties involved realise that large-scale IT solutions are outdated the day they are rolled out, which creates an automatic need for the next large contract.

The Government Digital Service (GDS), launched in 2010, was intended to break up the oligopolistic market of government IT procurement, decreasing the huge costs related to it and radically changing service delivery by creating an agile culture of service design that focused on user experience. This entailed attracting top design and software talent to the government and rethinking what was measured and evaluated, and why. At the outset, GDS director Mike Bracken was asked to make savings targets the main KPI for the new agency. He refused to do so and instead implemented lower level, user-focused KPIs, aimed at creating a unified user experience through the gov.uk web domain (and its underlying infrastructure) and using agile service design processes (fast prototyping, constant user research). By doing so, the GDS saved the government £1.7 billion, diversified the IT supply chain (instead of a handful large vendors, UK government now procures from roughly 3,000 smaller companies) and created an award-winning domain.

Importantly, the GDS focused not only on creating something new, but also taking offline existing poor-quality online services and preventing cumbersome solutions from being deployed. And it did so quickly and with low costs: for instance, the prototype for gov.uk was created in 12 weeks and it cost £261,000. The GDS created a culture of openness by frequently blogging about its activities and plans. Its evaluation framework, rather than being driven by fixing market failures and cost-benefit analysis, focused on creating public value in a clearly defined way – high quality online navigation of government services by re-writing, re-designing and re-thinking more than 600 needs people have of government, and building a performance platform that allows live tracking of the digital side of these services.

Sources: Mike Bracken; Greenway et al. 2018; Birkinshaw and Duncan 2014.

We propose a new synthetic approach to public value that is *collectively* generated by a range of stakeholders, including the private sector, the state and civil society. The market and the economy itself, under this approach, are viewed as an *outcome* of the interactions between these sectors, following Karl Polanyi's (1957) notion of the 'embeddedness' of the economy in society and culture.

This 'collective public value' approach also has roots in classical political economy where the notion of 'value' was actively debated rather than assumed to be tied to market exchange. Thinkers such as Ricardo, Mill and even Adam Smith recognised that unfettered markets were often inefficient, prone to capture by special interests and could have negative distributional outcomes without ongoing intervention by the state. In particular, these thinkers recognised a distinction between productive *profits* and economic *rents* that represented unearned income deriving from arbitrary control over resources.

The primary role of taxation, for example, rather than internalising externalities caused by identified 'market failures', should be to tax away rents accruing from the monopolistic ownership of factors of production, in particular land (Ryan-Collins et al. 2017, pp. 37–64). In the classical view, rents did not accrue from market 'imperfections' as in market failure theory, but from the inherent imbalances in economic and political power that characterised dynamic capitalist economies. The focus in the collective public value approach is on the economic and political

processes, institutions and conditions that enable public *value creation* – and equally on how to counter public *value extraction* – across sectors and economies (Mazzucato 2018b).

Public value in this conception builds on the idea of markets as embedded in society and on a public purpose-focused service approach in the public administration and strategic design literatures and practice. Public purpose(s) would include cultural enrichment (see box 2 for an example related to public broadcasting), a more even distribution of wealth and income, ecological sustainability, affordable shelter and health care and the creation of good quality jobs. These may sound somewhat obvious, but it is clear that modern capitalist markets not guided by such purposes are not delivering them effectively (Mazzucato and Jacobs 2017). Mission-oriented policies can thus be viewed as an example of market-creating and market-shaping policies that should be appraised and evaluated in the context of collective public value. We examine appraisal and evaluation frameworks in the next section.

Box 2: The BBC and collective public value

The 'crowding out' argument is a based on a framework which sees public services in general, and the BBC in particular, as a means of last resort. Their role is not to compete (in the production of higher quality goods and services), but rather to limit their activity to addressing market failures. Market failures arise if there are positive externalities such as public goods or negative externalities such as pollution. But the use of market failure theory here is misplaced as it does not capture the BBC's leadership role in the UK's incredibly vibrant culture industry – producing high quality affordable services, with a strong notion of public value that goes beyond a notion of public good. The assumption is that there is an existing market and if the BBC takes a larger chunk of it, or one not tackling a particular public good problem, there is less left for the private sector. This leads to criticisms that active public organisations like the BBC not only crowd out but also stifle innovation.

The kind of public value that the BBC has produced cannot be captured by the narrow economic definition of the *public good*, which assumes an existing market which is 'fixed' by the public sector due to under-investments by the private sector. Yes, the private sector tends to under-invest in non-commercial areas, but this does not mean that the public sector cannot go and transform areas that are normally considered to be commercial (e.g. soap operas and talk shows). Precisely in order to reach a wider audience and have social impact, a public broadcaster can and should reach out with transformational messages through traditional channels. Otherwise the risk is that it remains in a small elite corner of the market, as is often the case in other countries. In other words, public value is a more dynamic concept than public good, focused on the process by which value is generated in social and collective ways (Mazzucato and O'Donovan 2016, 145).

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3. Appraising and evaluating mission-oriented public policy

3.1 The limits of budget constraint/cost-benefit analysis approaches

One of the key challenges in applying a public value-based framework in policy making is how to relate it to budgetary processes. Current public policy discussions tend to start from existing fiscal constraints (how can we pay for it?) rather than from policy goals and desired outcomes (Kelton 2011). Typically, as discussed in section 2.1, governments attempt to discipline spending by adopting fiscal frameworks that target a certain ratio of borrowing relative to previous years or GDP. This approach neglects two important facts. Firstly, deficit spending may have economic multiplier effects that enable growth to increase at a faster rate than borrowing, hence reducing the debt-to-GDP ratio (further elaborated in section 4); and, secondly, unlike households or firms, governments with sovereign currencies and central banks cannot become bankrupt since ultimately they are the currency issuer rather than taker, as with the private sector (Wray 1998).[7]

Given this, a more coherent framework for government spending – not least in regard to market shaping, mission-oriented policies – is the 'functional finance' approach whereby fiscal policy is focused on achieving desired public purpose outcomes (e.g. full employment at stable prices), unconstrained by considerations over the relative size of the government deficit (Lerner 1943). The latter should instead be viewed as an indicator of where in the economy demand is coming from. This will fluctuate depending on the confidence of the private sector and the business and financial cycle.

Examples of using outcomes-based approaches to policy and in particular to budgeting show that such approaches open up policy making to wider bottom-up engagement and enable the breaking down of existing silos between government departments. The re-organisation of Helsinki city government into four divisions is a useful example (City of Helsinki, 2017).

Influenced by the market failure framework, constraint-driven budgetary processes are complemented by policy appraisal techniques that are usually based upon a static form of *ex-ante* cost-benefit analysis (CBA). Costs (including the costs of potential government failure) are usually defined by their opportunity cost, i.e. the value which reflects the best alternative use a good or service could be put to (include a do-nothing/business as usual option) with market prices usually the starting point for the analysis (HM Treasury 2018: 6).[8] Policy evaluation, after the policy intervention, then seeks to verify whether the estimates were correct and whether the market failure was addressed.

To enable market-type price comparison of interventions whose return will vary in terms of time, CBAs typically make use of a 'discount rate' that reflects the time preference of users of the service for having money now rather than in the future. After adjusting for inflation and discounting, costs and benefits can be added together to calculate the net present value (NPV)

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[7] Although in modern economies central banks are generally prohibited from directly financing governments, a central bank can always ensure a market for sovereign currency-denominated government debt at a desired rate of interest since there are no limits to the quantity of such debt it can purchase via money creation on a secondary market (Terzi 2014).
[8] We refer in this section to the UK's *The Green Book: Central Government Guidance on Appraisal and Evaluation* (HM Treasury 2008) to provide illustrative examples of the market failure analytical framework. There will, of course, be variation across countries, but *The Green Book* is widely recognised as one of the leading appraisal and evaluation guidance manuals in the field, adopted by many other governments.

for different policy options. Recognising the problem of externalities, some attempt has been made in recent years to incorporate the wider costs to society of particular policy actions, e.g. through monetising certain social or ecological externalities in a 'social cost benefit analysis' (SCBA) or 'social cost effectiveness analysis' (SCEA). However, the overall framework remains rooted in the idea that creating a 'market price' for interventions will enable the most accurate decision to maximise welfare and public value. CBA and NPV are mostly aimed at *preventing* costly government failures; by their very nature, they cannot tell us very much at all about *proactive* market creating and shaping.

In addition, appraisal guidance typically encourages a strong focus on adjusting for risk. For example, the UK Treasury's *The Green Book* recommends applying specific adjustments for 'optimism bias', which is the 'the proven tendency for appraisers to be too optimistic about key project parameters, including capital costs, operating costs, project duration and benefits delivery' (HM Treasury 2018, p. 6). Risk analysis and sensitivity analysis involving the estimation of 'switching values' – the values an input would need to change in order to make an option no longer viable – are often key parts of business case appraisal.

CBA is not well suited to innovation and mission-oriented policy making for a number of important reasons:

- CBA relies on meaningful estimates of costs and benefits. Meaningful estimates can be impossible to make when costs and/or benefits are unquantifiable and subject to fundamental uncertainties (e.g. in relation to the existence of future technologies or the characteristics of future markets).
- CBA considers each potential policy measure on its own merits, but when a system is changing, its behaviour is generally dominated by the collective effect of the interactions between its components, rather than by the behaviour of those components individually (Kunc 2012). Understanding this effect usually requires modelling how the system will evolve over time. CBA cannot achieve this since it assesses all future costs and benefits from the perspective of a single point in time (discounting to give a NPV).
- The market failure framework justifies action only to the extent that it addresses a failure. This falls short of what is needed when the aim is to create a new market or to change the direction of travel of markets' evolution. In mission-oriented policy making, the aim is not to 'level the playing field', but to 'tilt the playing field' in the desired direction) (Mazzucato 2017).

The Green Book recognises that CBA is not appropriate in all situations. It notes that:

> 'Social CBA and Social CEA are "marginal analysis" techniques. They are generally most appropriate where the broader environment (e.g. the price of goods and services in the economy) can be assumed to be unchanged by the intervention. These techniques work less well where there are potential non-marginal effects or changes in underlying relationships.*'* (HM Treasury 2018: 21)

This limitation is of crucial importance. Market-shaping policies, such as missions, aim to accelerate innovation, creating new technologies and radically changing the prices, availability and existence of goods and services. Their central purpose is to transform underlying relationships, a wide range of prices and the broader environment (OECD 2015).

Underlying the market-fixing approach is the notion that markets can be understood as self-correcting or in a state of partial equilibrium, which justifies the 'all else equal' static approach. In contrast, underlying a market-shaping approach is the Keynesian concept of uncertainty and the idea that the economy shifts between different equilibria or disequilibria over time. Indeed, capitalist economies may be best viewed as prone to generating instability rather than stability (Minsky 1986).

By always comparing the policy intervention to the status quo and emphasising short-term risks, CBA approaches encourage decision-makers to prefer small-scale, marginal interventions (Allas 2014: 89). Yet there is considerable evidence that innovation systems exhibit increasing returns or an 'S-curve'-type effect, where shifting incentives across multiple sectors may be more likely to achieve such increasing returns (Mazzucato 2017). So, arguably, if there is to be any bias around innovation policy it should be *in favour* of large-scale interventions. Furthermore, the strong emphasis on risk assessment/optimism bias is likely to mitigate against the creation of a mission-oriented approach where failure is viewed as a learning process integral to the achievement of important technological breakthroughs (Mazzucato 2013).

3.2 Static vs dynamic efficiency

More broadly, budget-constrained, CBA-type analyses derived from market failure theory are concerned with allocative or distributive efficiency, which involves making the best use of (fixed) resources at a fixed point in time. Dynamic efficiency involves making the best use of resources to achieve changes over time and so is concerned with innovation, investment, improvement and growth – including, perhaps most importantly, the creation of new resources (technologies) and shifting technology frontiers (Huerta de Soto 2009).[9] 'Decarbonisation at least cost' (or 'at most gain') is an example of a dynamic efficiency objective. Missions are, by definition, concerned with dynamic efficiency, since they aim to accelerate innovation and transformational change.

When allocative efficiency frameworks are applied to dynamic efficiency problems, the analysis risks are either irrelevant or actively unhelpful[10] (see box 3).

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[9] There is no single universally agreed definition of dynamic efficiency. However, the concept has a long history in economic thought, and a wide range of sources agree that it relates to the capacity of the economy for innovation, growth and effective change over time (Huerta de Soto 2009). It can also describe the efficiency of policy measures in achieving these effects. One definition that goes against this consensus involves achieving an 'optimum' balance between short-term and long-term economic interests (Abel et al. 1989). For our purposes, this definition should be rejected, since a) it is in fact allocative efficiency by another name; and b) under conditions of uncertainty where there is no known finite range of possibilities, the concept of 'optimality' is meaningless (Arthur 2014).

[10] This point is recognised in the literature. de Soto (2009) writes: 'dynamic efficiency analysis makes it possible to perform an evaluation which leads to a much clearer and in many cases much different position than the one which usually follows from a mere static efficiency analysis.'

Box 3: Decarbonisation and dynamic efficiency

Taking the problem of decarbonisation as an example, this can be illustrated in relation to the assessment of tax, subsidy and regulatory policy options:

a) **Taxation:** Many economists have recommended a common carbon price across all sectors of the economy, stating that this is required for achieving least-cost decarbonisation (LSE 2011, Policy Exchange 2018). If the objective were to maximise allocative efficiency, this would be correct. But least-cost decarbonisation is a dynamic efficiency problem. The level of carbon pricing that can significantly influence investment decisions, rates of innovation and the behaviour of market systems varies greatly between sectors: whereas in the power sector a carbon floor price of £18/tonne has been instrumental in accelerating the demise of coal (Howard 2016), in the auto sector an effective carbon price of £300/tonne has had a much more limited effect on the transition away from petrol and diesel vehicles (Watson 2012).6 Dynamic efficiency can be increased by setting carbon prices in each sector that are somewhere close to a threshold that is likely to act as a tipping point in system behaviour, such as the cost differential between clean and fossil alternatives. Applying a carbon price indiscriminately would prevent any such focus, so this recommendation is actively unhelpful.

b) **Subsidy:** Subsidies for the deployment of clean technologies such as renewable power generation and electric vehicles have been effective in reducing the costs of these technologies, growing the markets for them and accelerating innovation, strengthening the comparative advantage of countries that have led the way. Allocative efficiency frameworks such as CBA can justify the use of these measures based on the value of avoided carbon emissions, but they exclude from consideration any benefits relating to innovation, cost-reduction and future competitiveness. Consequently, the value of these measures is underestimated and, in situations where industrial competitiveness is the primary aim, the allocative efficiency analysis becomes largely irrelevant to the policy decision.

c) **Regulation:** In allocative efficiency frameworks, regulation is generally seen as a negative unless it corrects a market failure. In contrast, from a dynamic efficiency perspective, well-designed regulation can be an important positive. Its potential to drive innovation and investment is widely recognised by participants in the construction sector (UK Green Building Council 2018). Agent-based modelling and evolutionary economics have provided empirical and theoretical explanations for this effect: when placed under constraints, agents devote more of their effort to exploration and less to exploitation (Holland 2000).

Analytical frameworks that support the understanding and pursuance of dynamic efficiency have evolved from evolutionary economics (Schumpeter 1983 [1911]; Nelson and Winter 1974) and are already in use within some governments and international organisations. An example is 'systems thinking' (Meadows 2008), which explores and develops effective action by looking at connected wholes rather than separate parts and is focused on the identification of feedback loops. The interaction of reinforcing and balancing feedbacks is the main determinant of how a complex system behaves over time (Sterman 1994). In the UK government, the technique has also been used by the Department for Education (2011) in developing policy on child protection, by the Government Office for Science (2007) in understanding obesity, and by the Department for International Development (2014) for analysing the interplay between prevention and cure in health systems.

Related approaches include system dynamics and complexity economics, both of which can provide a quantitative understanding of how systems will behave over time under general conditions, without being limited to the special case of equilibrium. This enables explanation and modelling of how dynamic phenomena, such as exponential growth, asset price bubbles and crashes, patterns in price volatility, network effects, innovation, system lock-in and system change, arise within the economy (Arthur 2014). The Bank of England has used complexity economics to deepen its understanding of the UK housing market and of the likely effects of different forms of government intervention (Baptista et al. 2016). The literature on techno-

economic paradigms and technology transitions includes frameworks for understanding how societies and markets move from one technological revolution and its related 'best practices' (Perez 2003; Geels and Schot 2007) or dominant 'socio-technological regime' (a family of technologies fulfilling a social function) to another.

All the above frameworks can be used to identify, design and assess policy measures that are effective in expanding and shifting innovation and technology frontiers, in support of the implementation of missions – and creating new markets. Both the OECD (2015) and the European Commission (2016) have considered these dynamics-focused analytical frameworks, noted their distinct differences from more traditional allocative efficiency frameworks, and highlighted their applicability to mission-oriented policy making.[11] While there remains a challenge to provide comprehensive guidance on the application of dynamic efficiency frameworks to economic policy decisions, there are some clear differences from the allocative approach that are identified in this literature. These emerge from the core characteristics of complex systems:

- **Heterogeneous agents**. In neoclassical models of the economy, a 'representative agent' or firm is generally assumed with identical preferences to all other agents (or agents who act in such a way that the sum of their choices is mathematically equivalent to the decision of one individual or many identical individuals). Such an approach aids model tractability, but is unrealistic and misleading since economies are inherently heterogeneous, with differences in income, status, wealth, firm size and ownership all influencing 'rational' behaviour. In complex systems, heterogeneity and heterogeneous behaviour is explicitly assumed and modelled.
- **Fundamental uncertainty.** Decisions about the future always involve factors that are to some extent unknowable. Within complex systems, such as areas of the economy that are subject to significant change, these factors are likely to be highly relevant to strategic decisions. This implies that an analytical framework to support mission-oriented policy making should place a *low* priority on the ability to confidently quantify precise future outcomes. Instead, they should have explicit and transparent ways of working with irreducible uncertainty, bringing it to the centre of consideration.
- **Path dependence.** The evolution of complex systems over time is path dependent. Institutions and agents can become 'locked in' to particular behaviours, norms and cultures (Arthur 1989). This implies that our framework should place a *high* priority on the ability to demonstrate that any action (or inaction) is consistent with the desired direction of travel.
- **Disproportionality of cause and effect.** In complex systems, disproportionality, or non-linearity, is the norm. A large effort applied to one part of a system may produce no perceptible effect, while a small effort applied to another part may produce a very large effect. This implies that our framework should place a *high* priority on identifying the points of greatest leverage, to ensure the cost-effectiveness of our interventions.
- **Emergence.** The behaviour of complex systems tends to depend more on the interactions of their components, and on the feedback of those interactions on the emergent structure, than on the properties of those components individually (e.g. the behaviour of weather systems cannot be understood by extrapolating from the properties

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[11] Note that the OECD uses 'system innovation' as an alternative name for the mission-oriented approach; and the European Commission studies the particular case of decarbonisation, which as noted above is an inherently mission-oriented area of economic policy.

of a water molecule). This implies that our frameworks should place a *low* priority on assessing potential actions individually, and a *high* priority on understanding and assessing their collective effect.

- **Absence of optimality.** While an 'optimal' allocation of existing resources can be defined, there is no meaningful definition of an optimal pathway through time. This is because the range of possible future combinations of technologies, business models and market structures is effectively infinite. Dynamic efficiency cannot be perfected, it can only be made better or worse. This implies that our frameworks can only give comparative rather than definitive answers, and that rather than requiring optimality, they should give a *high* priority to pathways being *adaptive*: creating options where there is uncertainty and enabling policy to be revised as uncertainties are resolved.

All of the above will need to be considered in relation to the monitoring and evaluation of mission-oriented policies as they are carried out, as well as in the initial decisions on which policies to implement. Furthermore, evaluation of the performance of public agencies and civil servants needs to reflect these notions of uncertainty as well; risk governance should be seen as an essential feature of mission-oriented policy making.

Table 1 summarises the points made in this section.

Table 1: *Process-based vs mission-oriented approaches to evaluation*

Nature of problem:	Operational/process-based	Strategic/mission-oriented
- Level of uncertainty:	- Low	- High
- Desired change:	- Incremental	- Transformational
- Cause-effect relationships:	- Proportionate	- Disproportionate
Desired efficiency:	**Allocative**	**Dynamic**
Analytical frameworks:	CBA, market failure, welfare economics	Systems thinking, system dynamics, complexity economics, technology transitions
Principles applied to policy evaluation and monitoring:	Value ability to predict quantified future outcomes	Value alignment with desired direction of travel
	Minimise/eliminate uncertainty	Work constructively with irreducible uncertainty
	Focus on equilibrium; avoid distortion	Focus on change; identify points of greatest leverage
	Assess deterministic effect of each action individually (micro level)	Assess emergent effects of all actions collectively (meso level)
	Value evidence of optimality	Value evidence of adaptability and resilience to shocks

3.3 Evaluating mission-oriented policy: milestones, spillovers and project portfolios

Aside from considerations of efficiency, given the importance of dynamics over time for market-shaping policies, it is important to define a concrete target and objectives. In other words, it must be possible to say definitively whether the policy has been achieved or not. Technological

missions such as 'putting a man on the moon' had obvious end points which made evaluation easier. However, modern grand challenges are more long term with less easy to define end points. Under such conditions, the use of intermediate milestones is critical. Intermediate milestones will provide the means to keep track of progress towards the mission objective and allow for informed and flexible adaptive decisions to intervene. Real-time data, publicly available, on progress on the milestones will also keep a sense of urgency, achievement and motivation among involved actors. The use of artificial intelligence and big data for creating dynamic metrics and dashboards could help achieve this.

Intermediate milestones can also be important for flexibility and adaptation so that the mission can be changed over time if the milestones provide new information or show that the mission, for whatever reason, has been framed problematically and needs adjusting. While missions are long term and should have a stable goal, the intermediate signposts should be used to decide whether changes in direction are required and, in some cases, whether the mission itself needs redefining.

In addition to the milestones, broader measures of the cross-sectoral and cross-science impact are needed. So even if a milestone or the overall mission objective is not reached, the mission might still be considered to be successful (at least to an extent) if the process produces positive, economy-wide spillovers. For example, the internet was not discovered because of an *ex-ante* objective, but rather as a solution to a problem that scientists had in the late 1960s around allowing multiple computers to communicate on a single network. The BBC's project to develop a micro-computer was not a commercial success, but procurement for its parts supported the development of Acorn Computers and eventually led to the emergence of ARM holdings, one of the most successful UK technology companies in recent decades (Mazzucato 2018b). Indeed, creating cross-sectoral spillovers can be an objective itself, best achieved when the process of innovation remains open and cross-disciplinary.

Similarly, a mission is not a single project, but a portfolio of actions from diverse policy fields that should encourage multiple solutions. A diverse set of different funding instruments will help achieve this, from grants to prizes, new forms of procurement and financial instruments. This will guarantee that public funding is allocated to a diverse set of activities with a focus on complementarities and avoiding duplication. The process should explicitly be one that admits the tension between the top-down direction setting and the bottom-up explorative approaches. Rather than prescriptive specifications of projects, participants should be given flexibility to propose a variety of solutions for achieving the mission goals and intermediate milestones. This will nurture bottom-up experimentation, but in each case the lessons (and data) from the experiments should be collected, analysed and understood. Appraisal and evaluation tools and metrics should be built with this experimentation in mind; equally importantly, performance management tools should allow for failure of experiments as well.

Rather than managing projects in isolation and according to project-specific objectives, a portfolio of projects would be managed to stimulate interaction, experimentation and cross-learning. Rather than evaluating at the level of the overall programme following the completion of actions, evaluation would be an integral part of the mission and would feed into the ongoing implementation and management of projects and funding. This would also avoid funding projects that simply support existing networks without necessarily adding new value.

In budgetary terms, there should be a possibility to increase the budget for a mission if there are indications that extra investment (within boundaries) could make the difference between reaching a mission objective or not. Similarly, if indicators consistently point towards a situation where a mission objective is out of reach, it should also be possible to terminate the mission. Such decisions should be based on metrics that can orchestrate the difficult balance between the need for some form of *ex-ante* dynamic risk assessment and the danger of writing off potentially viable missions at an early stage because *ex-ante* impact assessments cannot predict the kind of unexpected spillovers the mission approach can cause.

Evaluation of project proposals should thus pay as much attention to the portfolio of projects as to the excellence of individual proposals. If individual projects, after a period of time and based on clear indicators, do not seem to be contributing to the mission objective, it should be possible to redirect funding to other activities. In a similar vein, to ensure the maximum contribution of activities to the mission objective, funding should be distributed on a 'stage-gate' principle, where successive tranches of funding are only allocated based on reaching an intermediate milestone (Mazzucato 2018: 18).

4. Mission-oriented policy and macroeconomic policy

Conventional macroeconomic theory considers public investment as beneficial mainly in the short run as a countercyclical demand-side instrument during recessions or to ameliorate frictions, market rigidities and market failures. Any increase in public expenditure outside these periods will 'crowd out' private investment, by artificially raising the rate of interest which is considered as the main determinant of business investment (Buiter 1978; Taylor 1999).

However, mission-oriented public investment is, by definition, about more than countercyclical impacts. One way of conceptualising the macroeconomic impact of mission-oriented policy is to consider the notion of the Keynesian economic multiplier. This holds that government spending, usually capital investment (e.g. on infrastructure) can have a multiplier effect greater than one because it can stimulate re-spending by firms and households, generating a self-fulfilling increase in demand. With mission-oriented policy, however, the multiplier may be larger than normal, given that the policy intervention is aimed at shifting multiple sectors in a new and more productive direction and crowding in private sector finance. The concept of the 'super-multiplier' accounts for both multiplier and accelerator effects from directed (mission-oriented) public sector innovation spending (Deleidi and Mazzucato 2018).

This perspective can be summarised as follows: (i) private investment, rather than being influenced by interest rates, is determined by demand, expectations of future growth and technical progress; (ii) innovation is endogenous and determined by targeted public policies that positively stimulate private initiative (crowding in rather than crowding out); (iii) expansionary fiscal policies generate positive effects on output, effects which can have long-run impacts, including on the level of investment, when they are driven by persistent and systemic policies geared towards structural transformation.

A recent empirical study examined the economic multiplier impact of different types of government spending in the US to test this hypothesis (Deleidi et al. 2018a; Deleidi et al. 2018b). The study examined several alternative fiscal policies in terms of their impact on GDP growth and private investment. Mission-oriented innovation policies generate the largest (super)multiplier, around 10 times higher than standard government spending on consumption and capital investment. Mission-oriented spending also appeared to generate the highest expectations of growth and therefore the highest private sector R&D multiplier: it would appear to 'crowd in' private investment, rather than crowding it out.

These results are consistent with what we might intuitively expect from complex systems, since the combination of high path dependence and disproportionate cause and effect means that the effects of interventions in complex systems can be widespread and long-lasting – and mission-oriented policies are explicitly designed to have maximum effect.

Mission-oriented policies could have economic benefits anywhere in the economic cycle and not just during recessions as countercyclical measures. They suggest government departments should work closely together to coordinate fiscal policy and industrial policy to maximise the value of government spending.[12] The 'market-failure' framework, with its focus on marginal

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[12] Research suggests public financial institutions, such as state investment banks, can also play a key role in providing the kind of patient, committed and long-term finance needed to support mission-oriented innovation and investment (Mazzucato and Penna 2016; Mazzucato and Macfarlane 2017).

improvements and static before and after cost-benefit analysis, is not set up to capture the potential of mission-oriented policies to crowd in private R&D and generate large and long-lasting multiplier effects.

5. Conclusion

Market-shaping, mission-oriented approaches to policy give us the possibility to reconsider how to justify ambitious policies that aim to transform landscapes rather than fix problems in existing ones. This approach to policy raises challenges in regard to how to nurture organisational structures that can manage such policies, and how to appraise and evaluate the market-shaping effect of the policies. Rather than assessing the impact of policy based on budget-constrained, static, allocative efficiency measures, we have argued it should be focused on dynamic efficiency and the creation of collective public value. This approach would help capture the potential for policy to create spillover effects across many sectors of the economy and alter the level of investment and broader trajectory of economic growth. A summary of the key elements of the market shaping analytical framework, comparing it with market fixing framework, is provided in Table 2.

Table 2: Market-fixing vs Market-shaping analytical frameworks

	Market fixing	**Market shaping**
Justification for the role of government	Market or coordination failures: • Public goods • Negative externalities • Imperfect competition/information	All markets and institutions are co-created by public, private and third sectors. Role of government is to ensure markets support public purpose, also by involving users in co-creation of policy
Business case appraisal	*Ex-ante* CBA – allocative efficiency assuming static general relationships, prices etc.	Focused on systemic change to achieve mission – dynamic efficiency (including innovation, spillover effects and systemic change)
Underlying assumptions	Possible to estimate reliable future value using discounting. System is characterised by equilibrium behaviour	Future is uncertain because of potential for novelty and structural change; system is characterised by complex behaviour
Evaluation	Focus on whether specific policy solves market failure and whether government failure avoided (Pareto-efficient)	Ongoing and reflexive evaluation of whether system is moving in direction of mission via achievement of intermediate milestones and user engagement. Focus on portfolio of policies and interventions, and their interaction
Approach to risk	Highly risk averse; optimism bias assumed	Failure is accepted and encouraged as a learning device

We argue that theoretical and practical approaches to policy evaluation should be considerably enriched and diversified in order to create the capacities needed to deliver challenge-driven policies. Governments should embrace new tools and techniques from service design research that focus on user experience and co-creation practices, and from evolutionary economics and related disciplines that focus on shifting and shaping technology and innovation frontiers, and managing complex systems in contexts of uncertainty. This report suggests that market-shaping, mission-oriented policies should be evaluated on three levels: enhancing user experience and engagement; expanding technology frontiers; and increasing macroeconomic multiplier effects.

Further research, in particular based on practical policy experience, is needed to flesh out mission-oriented policy evaluation frameworks at both the microeconomic- and macroeconomic levels.

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