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MISSIONS: A BEGINNER'S GUIDE

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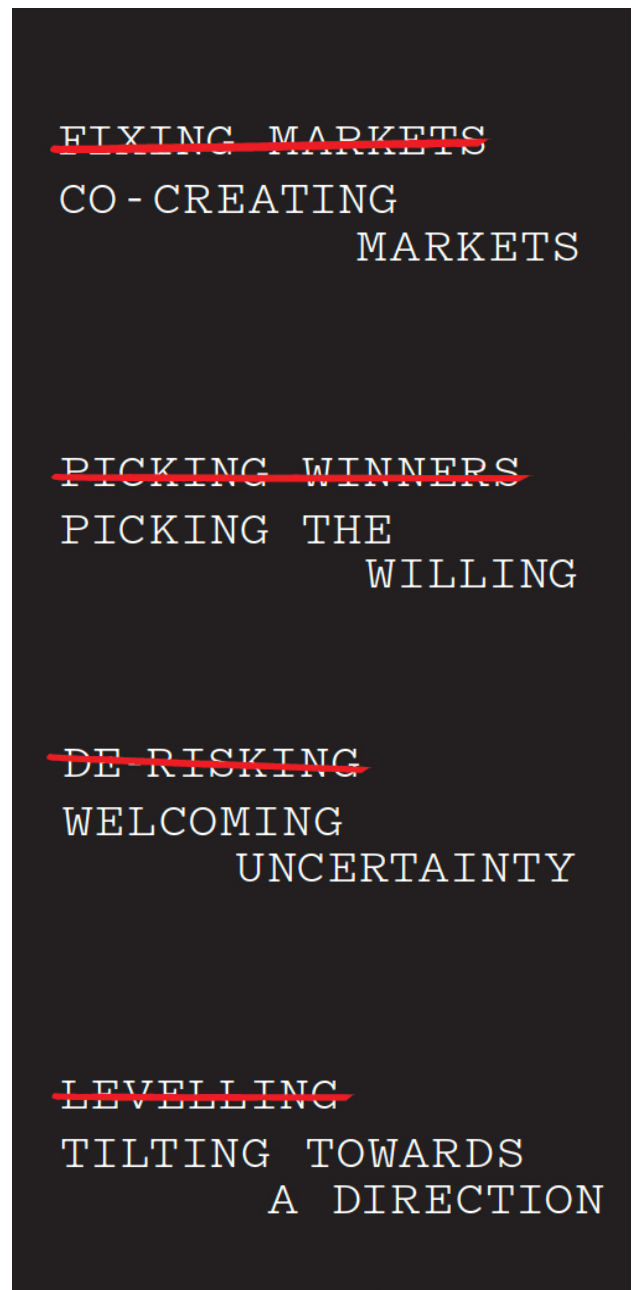
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Introduction

The UCL Institute for Innovation and Public Purpose (IIPP) had led on putting missions at the heart of innovation and growth policy globally. This policy brief sets out why, where, and how missions matter.

The 21st century is becoming increasingly defined by the need to respond to major issues facing society, the environment around us and the possibility of developing a prosperous equal economy. Sometimes referred to as 'grand challenges', these include climate change, ageing societies, preventative healthcare, and generating sustainable growth for the benefit of all.

Innovation has not just a rate but also a direction. How that direction is set — not just by the government but by different actors and socio-political forces — is a key aspect of IIPP's work. But how should we decide which direction? We use the concept of public value as a way to think about which direction innovation and industrial policy takes. Public value is value that is created collectively for a public purpose — this requires citizens to engage in defining purpose, nurturing capabilities and capacities, assess the value created, and ensure that societal value is distributed equitably.



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GLOSSARY

Bottom-up	Progressing upward from the lowest levels of a system
Grand challenge	A difficult but important, systemic and society-wide problem with no “silver bullet” solution
Measurable	Quantifiable with existing metrics, or achievements that are evidently yes or no
Mission	A concrete target, achievable step towards a grand challenge that contextualises projects
Project	A single, isolated, clearly defined innovation activity with risky or uncertain outcomes
Sector	A defined category or subdivision of economic activity
Spill-over	Technological, intangible or other innovation finding a use and value beyond that originally intended
Time-bound	Constrained by a hard deadline
Top-down	Hierarchical system where actions or policies are initiated at the highest level

What are missions?

Grand challenges by their nature are big, bold, difficult and complex. The UN recently launched 17 Sustainable Development Goals which act as global grand challenges, beginning with ending poverty everywhere. To make these challenges achievable, they have to be broken down into pragmatic steps. We term these missions — concrete targets within a challenge that act as frames and stimuli for innovation.

Using missions to drive national industrial strategy or innovation policy means focussing less on sectors — from automotives to telecommunications — and more on problems that matter to all.

Missions are not new — they have been used to inspire and direct action throughout history. A generation of missions in the 1960s were technological — such as NASA’s Apollo mission of putting a man on the Moon by the end of the decade. The moonshot required innovation in many sectors — as diverse as nutrition, textiles and aeronautics — and hundreds of projects, many of which failed — because innovation often does fail to achieve what it set out to do. However much of the technology

in our smartphones and laptops today were outcomes of those projects, both successful and unsuccessful. Mission-oriented strategies translate challenges into concrete problems which require many organisations and sectors to collaborate.

Today’s social challenges are more complex, or “wicked”, than the space race. In *The Moon and the Ghetto*, Richard Nelson asks how we got a man to the moon but have not been able to solve key issues around inequality (Nelson, 1977). Wicked problems require more attention to the ways in which social issues interact with political and technological issues, behavioural changes, smart regulation, and critical feedback processes. The so-called Maastricht Memorandum provides a detailed analysis of the differences between old and new mission-oriented projects (Table 1).

By setting the direction for a solution, missions do not specify how to achieve success. The right answers are not known in advance. Rather, missions stimulate the development of a range of different solutions to meet grand challenges and reward those actors willing to take risks and experiment.

Who sets missions? While technological missions have often been driven top-down by central government, social missions must involve a wide group of stakeholders in both definition and implementation. They should inspire the public and attract cross-sectoral investment, whilst remaining focussed enough to involve industry and achieve quantifiable success. Through well-defined missions that are focussed on solving society's most important challenges, policymakers can determine the direction of growth by making strategic investments across many different sectors. For example, a 'Green New Deal' is more complicated than purely technological feats such as getting to the Moon and back. It requires not only innovation in technical terms but also societal innovation and behavioural change. At the heart of this is the role of citizens. Bringing trade unions and citizens' organisations to the table for open and early, rather than late and defensive, discussions on what 'green' means for their way of life is vital.

Missions and grand challenges

As described above, grand challenges are coming to define policymaking in the 21st century — how do economies deal with problems with no simple solution, that require transformation and innovation to solve, like an ageing society or air pollution? Missions are inspired by challenges but are more granular and specific in that you must be able to answer whether or not they have been achieved. **So how do you go from a challenge to a mission?**

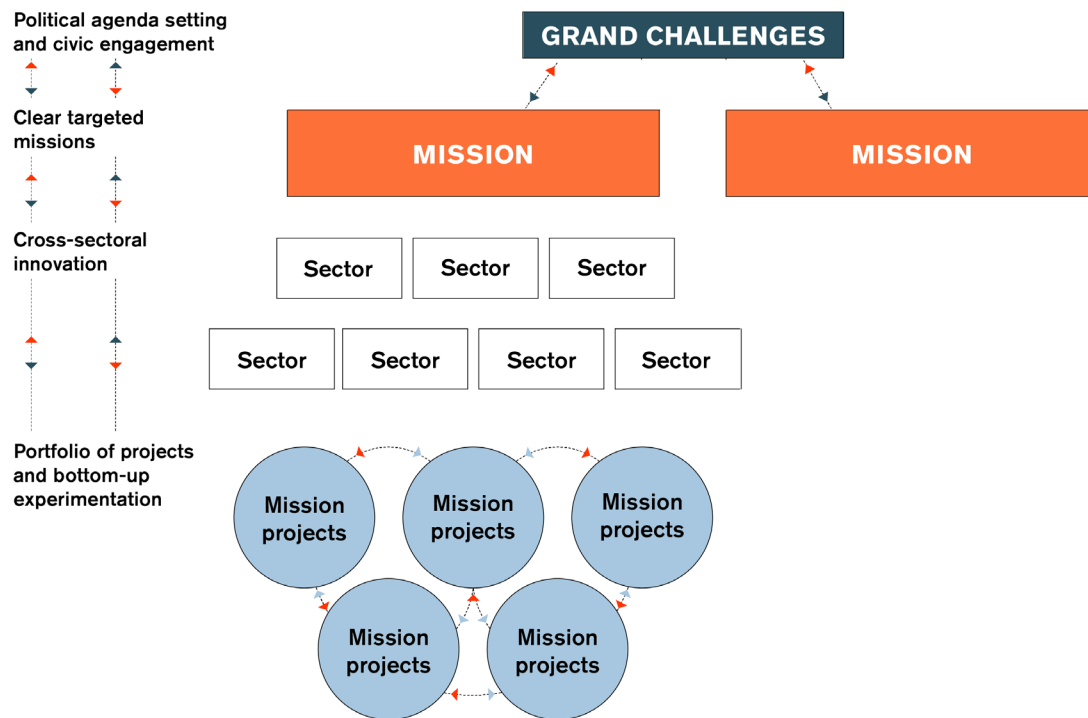
The mission must set clear objectives that can only be achieved by a portfolio of projects and supportive policy interventions, for example removing plastic waste from the oceans may require new design regulations, material standards, and removal technologies that require innovation projects from artificial intelligence and self-guidance to bio-plastic digestion.

Table 1: Characteristics of old and new mission-oriented projects

Old: Defense, nuclear, and aerospace	New: Environmental technologies and societal challenges
Diffusion of the results outside of the core of participants is of minor importance or actively discouraged	Diffusion of the results is a central goal and is actively encouraged
The mission is defined in terms of the number of technical achievements, with little regard to their economic feasibility	The mission is defined in terms of economically feasible technical solutions to particular societal problems
The goals and the direction of technological development are defined in advance by a small group of experts	The direction of technical change is influenced by a wide range of actors, including government, private firms, and consumer groups
Centralised control within a government administration	Decentralised control with a large number of agents involved
Participation is limited to a small group of firms due to the emphasis on a small number of radical technologies	Emphasis on the development of both radical and incremental innovations to permit a large number of firms to participate
Self-contained projects with little need for complementary policies and scant attention paid to coherence	Complementary policies vital for success and close attention paid to coherence with other goals

Source: Modified version of Table 5 in Soete and Arundel (1993: 51).

Figure 1: From challenges, to missions, and projects



We have set out five criteria for the development of missions — they should:

- **Be bold, inspirational with wide societal relevance:** Missions should engage the public. They should make clear that through ambitious, bold action, solutions will be developed that will have an impact on people's daily lives.
- **Set a clear direction — targeted, measurable, and time-bound:** Missions need to be very clearly framed. While enabling long-term investments, they need a specific target that can either be formulated in binary ways (as clearly as whether man has reached the Moon and returned back safely) or quantified (as clearly as whether a certain percentage reduction in carbon emissions against a baseline has been reached across manufacturing).
- **Be ambitious but realistic:** Mission objectives should be set in an ambitious manner (taking risks), centred on research and innovation activities across the entire innovation chain, including the feedback effects between basic and applied research.
- **Encourage cross-disciplinary, cross-sectoral, and cross-actor innovation:** Missions should be framed in such a way as to spark activity across, and among, multiple scientific disciplines

- (including social sciences and humanities), across different industrial sectors (e.g. transport, nutrition, health, services), and different types of actors (public, private, third sector, civil society organisations).
- **Involve multiple, bottom-up solutions:** Missions should not be achievable by a single development path, or by a single technology. They must be open to being addressed by different types of solutions.

Making markets, not fixing markets

Missions are about guiding the direction of innovation and setting a path. This requires understanding markets as outcomes of the interactions between public, private and civil society organisations.

The idea that the State is at best a fixer of markets has its roots in neoclassical economic theory, which asserts that competitive markets will bring about optimal outcomes if left to their own devices. This theory justifies government 'intervention' in the economy only if there are explicit market failures. And yet the recent history of capitalism depicts a different story — one in which different types of public actors have been responsible for actively shaping and creating markets and systems, not just fixing them; and for creating wealth, not just redistributing it.

Public purpose clashes with the currently dominant view of markets as the interactions of private enterprise,

successful exactly because of the absence of public-sector involvement. In fact, the practice of public value does not truly exist in the Economics discipline. Our view brings public value back to the heart of economic practice. Mission-oriented policies are a way to embed public purpose and direction. They are also a means to give confidence back to public servants that their work is of importance to society, and to rethink how government is structured, making bureaucracies creative, and attracting high performers into the civil service — for example, when Nobel-prize-winning physicist Steve Chu was recruited to run Barack Obama’s Department of Energy.

Capturing spill-overs

Systems of innovation are complex and require a network of different institutions across the entire innovation chain, including those that fund basic science, applied science, and the patient long-term strategic finance that allows innovative firms to grow.

Fostering cross-sectoral research towards a specific goal can result in the development of technologies with much wider use — so-called **spill-overs**. For example, military research by the Defense Advanced Research Projects Agency (DARPA) and the US Department of Defense resulted in the development of hard drives, touch screens and the Internet, all of which are now integral to consumer electronics and the online economy. Spill-overs can be tangible or intangible — they can be technologies that are then used throughout the economy (like GPS) or they can be structures, institutions, services or organisations that are used for subsequent development.



“The MISSIONS report provides clear insight in how research and innovation missions can create impact with societal relevance and how to design and implement such missions.”

Carlos Moedas
EC Commissioner for
Research, Science &
Innovation

those with a remit of accelerating the commercialisation of technologies.

Mission-driven innovation needs to be a process of collaborative, open problem-solving between such organisations which engages the private sector, consumers, citizens, universities, social entrepreneurs and public institutions.

The impact of missions on policy

Mission-oriented innovation and market-shaping policies have recently been adopted by policymakers around the world in international bodies like the EU and UN, national governments, and institutions. Here we look at case studies where IIPP has advised on the implementation of missions as a policy tool.

Mission-oriented innovation policy

Innovation is an inherently uncertain process, with long lead-times and involving significant amounts of risk. Governments and the public sector have participated throughout the innovation process in a variety of ways, often in a mission-oriented manner, which has resulted in radical technologies reaching the market. As shown in *The Entrepreneurial State* (Mazzucato, 2013), many modern technologies from the Internet to the smartphone have resulted from public sector investment in innovation needed to solve problems.

IIPP research covers the entire innovation process including innovation funding, the patent process, access to patient capital and public procurement. Reforming these instruments to be more mission-oriented will result in economic and technological spill-overs as well as the development of solutions to challenges.

From 2017-2019, Professor Mariana Mazzucato (Director of IIPP), was the special advisor to Carlos Moedas, the Commissioner for Research, Science, and Innovation in the European Commission (EC). She authored the report *Mission-Oriented Innovation Policy: Challenges and Opportunities* to help **direct the Horizon programme for EU science and R&D funding** in a more mission-oriented way. This report led to an adoption of the missions framework as part of the 2021–2027 round of funding, called Horizon Europe, and an uplift in funding to approximately €100bn over the seven years.

The spill-overs that occur in trying to achieve a mission will very much depend on the institutions that facilitate interaction between basic and applied science, as well as

From the outcome of this EU-wide consultation exercise, the EC have selected five mission areas:

- Adapting to climate change including societal transformation;
- Cancer;
- Healthy oceans, seas, coastal and inland waters;
- Climate-neutral and smart cities; and
- Soil health and food.

Professor Mazzucato and IIPP followed this influential report with a second for the EC titled *Governing Missions in the European Union*, launched in July 2019. This report focussed on the **governance and implementation** challenges of the missions approach in Horizon Europe, confronting the task of delivering missions that are accountable to citizens and successful. The report addresses three main areas:

- How to engage citizens in co-designing and co-implementing missions;
- What are the tools that the public sector needs in order to foster a dynamic innovation eco-system; and
- How can mission-oriented finance and funding leverage other forms of finance.

Mission-oriented industrial strategy



“There is huge potential in a missions - based approach to drive faster solutions - and it is an approach being pioneered here in the UK, by University College London's Commission on Mission-Oriented Industrial Strategy”

Theresa May
UK Prime Minister,
May 2018

Missions are about focussing on problems — not sectors, technologies, or companies. As industrial strategy makes a return to policy around the world, the **missions approach is useful for thinking about how to redirect industrial strategy**, so that it fosters new forms of collaborations across different forms of organisations and a wide variety of sectors.

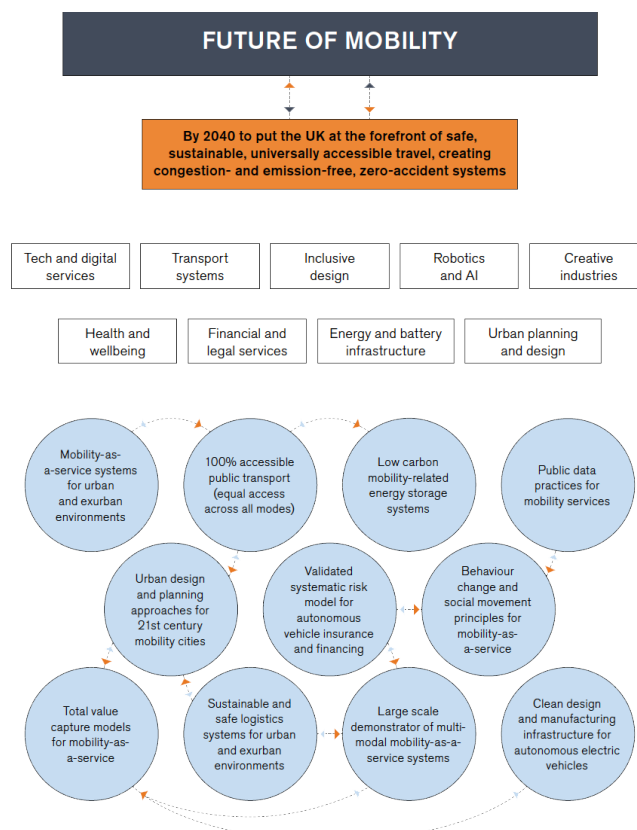
Historically, industrial policy has been addressed

through **horizontal** economic foundations (R&D, tax, education and skills) and vertical elements, which have conventionally tended to be economic sectors such as the automotive and aerospace sectors or the creative industries. Focussing these **vertical** elements on societal challenges can foster cross-sectoral innovation, as well as direct innovation towards solving problems that matter to citizens.

IPP launched the UCL Commission for Mission-Oriented Innovation and Industrial Strategy (MOIIS) in March 2018, chaired by Professor Mazzucato and former minister, Lord David Willetts, to provide thought-leadership on how to deliver a mission-oriented strategy and how to use the full range of policy instruments to support it.

IIPP and the MOIIS Commission were instrumental in the inclusion of grand challenges in the UK Government's 2017 Industrial Strategy White Paper. The MOIIS Commission worked closely with the Department for Business, Energy & Industrial Strategy (BEIS) to transform the Grand Challenges (Clean Growth, Ageing Society, the Future of Mobility and AI & Data Economy) into concrete missions which were announced by the Prime Minister, Theresa May. These vertical policies are aimed, not only at increasing the rate of innovation, but also shifting its direction.

Figure 2: The 'Future of Mobility' grand challenge (MOIIS Commission, 2019)



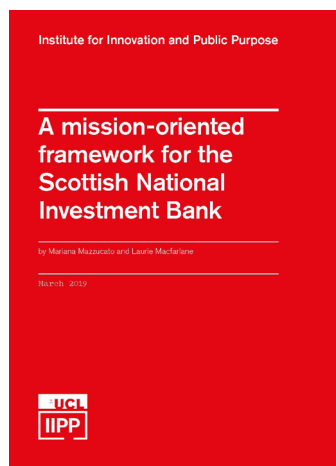
The MOIS Commission report, *A Mission-Oriented UK Industrial Strategy*, published in May 2019 set out in a series of eight recommendations and 25 implementation steps how a mission-oriented industrial strategy can be achieved (UCL Commission for Mission-Oriented Innovation and Industrial Strategy, 2019). The report highlighted a range of government structures, agencies, and instruments that need to be reimaged to deliver this new strategy, from procurement policy to regulations, and from metrics for measuring success to local policy (Figure 2.)

Mission-oriented institutions

Because innovation is highly uncertain, has long lead-times, is collective and cumulative, innovation requires not just any type of finance but patient strategic committed finance. Missions rethink how the instruments and institutes of state can drive and direct innovation — one example of this is state investment banks which provide patient finance. Some state investment banks have recently become key domestic and global actors driving economic growth and innovation, often focussing on tackling modern societal challenges. Access to finance is essential for firms looking to grow and innovate. But finance is not neutral; **the type of finance available can affect both the investments made and the type of activity that occurs.**

Public banks, like industrial strategies, have also often been focussed on sectors. A mission-oriented approach to public banks focusses on the patient long-term finance which different organisations require to tackle missions.

IIPP is working with different financial institutions, including the European Investment Bank and public banks in different countries to consider the role of missions in directing finance.



IIPP report sets out an innovative mission-oriented framework for the Scottish National Investment Bank.

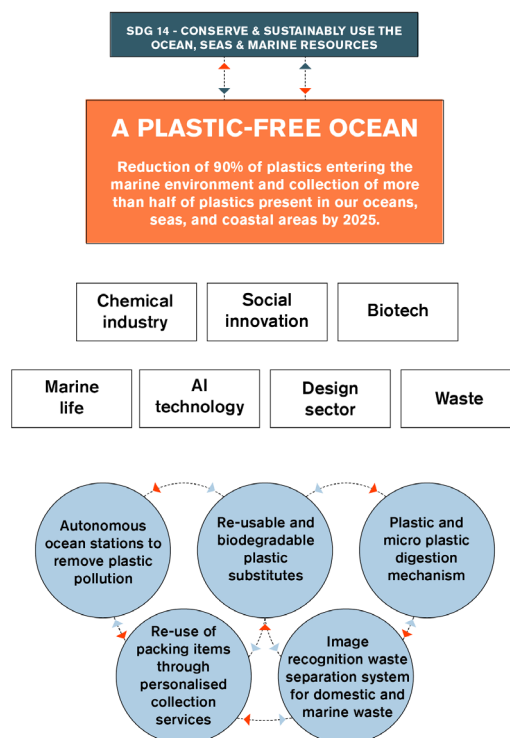
IIPP was central in setting up and helping to implement the new Scottish National Investment Bank to support

the Scottish Government's vision for delivering smart and inclusive growth (Mazzucato and Macfarlane, 2019). The work of IIPP was cited in the bank's implementation plan, published in February 2018, and draws on IIPP's research to outline a framework for creating a new mission-oriented Scottish National Investment Bank.

UN Sustainable Development Goals

The UN Sustainable Development Goals (SDGs) are internationally agreed grand challenges that have already been chosen through broad and comprehensive consultation. They present tremendous opportunities to direct innovation aimed at multiple social and technological challenges, thereby addressing the urgent need to create societies that are more just, inclusive, and sustainable. For example, SDG 14 to conserve and sustainably use the oceans and seas can be transformed into a mission to rid the ocean of plastic (Figure 3).

Figure 3: A mission for plastic-free oceans



This would require innovation in sectors as different as design, new materials, waste management, marine life, and hundreds of bottom-up projects providing different types of solutions. The SDGs — while being framed globally — have direct implications for city planning and the way in which growth is understood at the regional and national level. Finding a way to use the full array of government instruments from procurement to loans and

prizes to stimulate bottom-up experimentation to solve the key goals, will be key to the success of SDGs. IIPP is working on an innovation roadmapping approach for the SDGs with different institutions (Miedzinski et. al, 2019), including the UN Development Program and the UN Sustainable Development Solutions Network (Sachs et. al, 2019).

How to take a mission-oriented approach

Adapting a mission-oriented approach to innovation, industrial strategy or finance, is **not business as usual**. It will require a fundamental reappraisal of the role of the public sector to go beyond the ‘market failure’ framework derived from neoclassical welfare economics to a ‘market co-creating’ and ‘market-shaping’ role. This new role would shift focus from marginal improvements driven by ideas of ‘value for money’, to a notion of public value creation driven by public purpose. The State can grasp its abilities as a market shaper to encourage, enable and provide a sense of direction for these challenges but it also needs to recognise it cannot decide in advance what the best solutions might look like. Here we address some of the most important aspects of policy that must be reformed to adopt a mission-oriented framework.

Policy evaluation

Such a change in policy focus requires a different analytical framework for policy appraisal and evaluation that can capture the dynamic aspects of mission-oriented policies. Such a framework needs to be able to capture spill-over effects and structural changes to the economy that result from policy interventions — this means going beyond conventional cost-benefit analysis (CBA).

Indeed, CBA calculations would stop most missions at inception (Kattel et. al, 2018a).

Market failure framework is rooted in the idea that creating a ‘market price’ for interventions will enable the most accurate decision to maximise welfare and public value. CBA is aimed at preventing costly government failures; by their very nature, they cannot tell us very much at all about proactive market creating and shaping. Governments will have to embrace new tools and techniques from service design that focus on shifting and shaping technology and innovation frontiers and managing complex systems in contexts of uncertainty.

Public sector capabilities

Missions require public actors to think outside of the box, both in helping to frame inspirational missions, as well as to use government levers to crowd-in and galvanise new activity. They require market co-creation, not only market fixing, making space for new forms of evaluation beyond static cost-benefit analysis (Kattel et. al. 2018b). Public sector organisations face several inherent barriers regarding mission-oriented innovation. These can include complex organisational structures which limit the flow of information and reduce openness as well as rigid formal processes that constrain creativity. The key to the success of missions, next to legitimacy and trust in the mission-setting process, are the capabilities within public bodies to devise bold and ambitious governance structures that enable cross-sectoral and cross-institutional coordination.

Organisational flexibility is particularly important for allowing a mission-oriented organisation to respond quickly to different conditions and to the development of novel technologies. We can learn lessons on flexible and adaptive portfolio management from organisations like DARPA in the USA, Yozma in Israel, Sitra in Finland, or Government Digital Service in the UK. While DARPA has focussed on areas of defence, ARPA-E, set up in 2009 to innovate in the energy sector, was developed to learn the lessons from DARPA, and recent work has propelled the possibility of an ARPA in the health sector. These types of organisations are much more accepting of the inherent risk of the innovation process and the cross-sectoral experimentation needed to solve a “wicked” problem.

Instruments

Missions will need new and different forms of finance or instruments of support to enable bottom-up experimentation. Governments must use the whole range of policy levers at their disposal to support achieving missions from challenge prizes, investment banks and leveraging public sector procurement (UCL Commission for Mission-Oriented Innovation and Industrial Strategy, 2019). It is important to have a wide range of funding instruments available to suit different areas of the risk landscape. For example, grants may be more appropriate for visionary, early stage R&D, while equity investments may be suitable for technology-based firms looking to scale up. On the other hand, debt instruments such as long-term loans may be better for lower-risk, incremental activities.

Citizen engagement

Missions present an opportunity to put citizen participation at the heart of innovation policy and

to directly connect R&D spending to issues that matter to people. Missions provide a framework for collaboration. A sense of shared purpose should bring together coalitions and movements to share resources, across the public and private sectors for the sake of a shared endeavour (Leadbeater, 2018). Missions to create new systems depend on coalitions of investors, entrepreneurs, regulators, and consumers who bring about transformation. These “coalitions of transformation” are the agents of mission-driven innovation. Policymakers need to frame missions with the creation of these coalitions in mind.

Organisations

IIPP is dedicated to practice-based theorising. We believe 21st century civil servants need new tools and instruments to guide challenge-oriented policies. To enable this, IIPP also host the **Mission-Oriented Innovation Network (MOIN)**, bringing together leading global policymaking institutions — including state investment banks, innovation agencies, and strategic/sectoral units setting the strategic direction of governments — as well as private organisations interested in public purpose to share the challenges and opportunities they face when trying to create and nurture public value. The network is creating and testing a new policymaking framework that can justify, nurture and evaluate policies which actively shape and create markets, and are driven by public value. MOIN provides an organisational dimension to mission-oriented policies, focussing on how the public sector can create and nurture dynamic capabilities for tackling grand challenges of our time.

Work with IIPP on Missions

We work on mission-oriented policies globally at different levels (city, regional, national and transnational) and on different themes (organisational, policy design, institutional transformation and citizen engagement).

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The UCL Institute for Innovation and Public Purpose (IIPP) is a department within University College London (UCL) – founded in 1826 to solve grand challenges – and part of The Bartlett faculty, known internationally for its radical thinking about space, design and sustainability. We apply our critical thinking to research and thought leadership; teaching and training; influencing public policy; and engaging the broader public.



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