Democratising Innovation

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This paper reflects the view of the author, and does not necessarily reflect the position of SPRU. Any errors or omissions are those of the author.

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The Breadth and Diversity of Innovation

Innovation is not just about technological inventions. It encompasses all the many ways of furthering human wellbeing. This includes improved production and use of goods or services in firms and other organisations [1]. But it also includes new practices and relations in communities, households and the workplace [2]. Advanced science and technological research can help drive and enable innovation [3]. Yet many other new forms of knowledge and action are also important [4]. Innovation can be created and guided by social mobilisation [5] as much as commercial entrepreneurialism [6]. So grassroots movements [7], civil society [8], creative arts [9], and wider culture [10] feature alongside small business, service industries [11] and the public sector [12] in being as important for innovation as universities, research labs and high-tech companies.

Of course, there are no guarantees that any particular innovation in any of these areas will necessarily be positive. Torture [13], financial fraud [14] and weapons of mass destruction [15] are all active areas for innovation that might be judged to be generally negative. For other kinds of innovation, the picture is varyingly ambiguous. But it is rare that any given innovation is entirely, unconditionally and self-evidently positive [16]. And judgements are always relative. This means that even quite detailed aspects of innovation policy are legitimate matters for democracy [17–22].

In these widest of senses, however, well-conceived innovations can undoubtedly offer important aids not only to economic productivity [23], but also to enhancing many kinds of human flourishing or the public good [24]. Some innovation opportunities can be effectively addressed by well-governed fair and efficient markets [25]. So, one important role for innovation policy lies in helping to foster commercial innovation in the public interest [26]. But not all benefits, risks or impacts are restricted to those private actors typically most directly involved in steering business innovation [27]. Established understandings, motivations and incentives driving the most powerful market actors, often fail fully to prioritise wider relevant social values and interests [28]. In areas like health, agriculture, energy, environment, water, mobility, security, waste and housing, many of the least privileged (most vulnerable) people around the world are disproportionately excluded from conventional global patterns of innovation [29].

Market processes alone do not necessarily drive the best orientations for the kinds of innovation that are most needed from broader social viewpoints. This is true both across different domains of policy as well as within any given sector. For instance, the single largest area for public expenditure on research and innovation – in the UK [30] as worldwide [31] – is military. Innovation towards less violent means for conflict resolution are relatively neglected [32 33 34]. Likewise, the most strongly-pursued energy options are those that offer greatest returns on established infrastructures and supply chains, rather than new distributed forms of renewable power and energy service [35 36]. For it's part, biomedical research tends to focus more on health disorders of the rich than the poor, and on therapeutics rather than prevention [37]. Consequently, there are important roles for public policy in helping to prioritise across sectors, as well as encourage and

support appropriate scales and directions for innovation within particular areas. Public policy is also crucial in helping to address the many uncertainties and ambiguities – by promoting greater analysis, deliberation and political accountability [38].

In nurturing these qualities, public policy can also fulfil other significant roles. Alongside higher education, business and civil society, government policy can do much to promote the knowledges, capabilities and environments that best facilitate socially effective innovation [39]. So, the more demanding the challenges for innovation (like poverty, ill health or environmental damage), the greater becomes the importance of effective policy [40 41]. These challenges of innovation policy go well beyond simplistic notions of governments trying to "pick winners" [42 43] – essentially the same uncertainties and intractabilities are equally experienced by government, business and civil society [44]. The central challenge in innovation policy is about helping to culture the most fruitful conditions across society as a whole, for seeding and selecting across many alternative possibilities and together nurturing the most potentially fruitful [45].

Policy and the Politics of Choice

Innovation is not a one-track race to the future [46]. Instead, it is about social choices across a variety of continually branching alternative pathways for change [47]. It's more like an evolutionary process than a race [48 49] and is as much about exploring a space of different possibilities, as optimising any one [50–52] . Whether in the pursuit of sustainable agriculture, zero carbon energy services or clinical and preventive responses to improving public health, there are many radically contrasting alternative pathways for innovation. Two of the most pervasively important qualities in choosing which pathways to prioritise, are therefore: *(i)* attending fairly to a ***diversity*** of possible directions and strategies [53]; and *(ii)* including a ***plurality*** of perspectives in appraising any one [54].

Consequently, it is not only important that innovation be efficient and competitive in any particular direction. It is also crucial equally for economic and wider social wellbeing, that the directions that are prioritised for innovation, are as robustly deliberated, accountable and legitimate as possible [55]. An economy that fails to do this, exposes itself to the risk that it will become committed to inferior innovation pathways, that other more responsively steered economies may avoid. In other words, innovation may "go forward" quickly, but in the wrong directions.

History presents plenty of examples of innovation trajectories that later proved to be problematic – for instance involving asbestos, benzene, thalidomide, dioxins, lead in petrol, tobacco, many pesticides, mercury, chlorine and endocrine-disrupting compounds, as well as CFCs, high sulphur fuels and fossil fuels in general [56,57]. In all these and many other cases, delayed recognition of adverse effects incurred not only serious environmental or health impacts, but massive expense and reductions in competitiveness for economies persisting in the wrong path.

The key conundrum here, is that each alternative innovation pathway in any given area (like food, energy, health or military), will typically display contrasting pros and cons under contending perspectives. Animated differences emerge, for instance, around infrastructures for urban automobiles or cycling [58], nuclear power or renewable energy [59] and violent or peaceful approaches to national security [34 33]. Each involves different innovation trajectories. Competing

pathways will also routinely differ in their social distributions of benefits and harms, winners and losers. And – in any view – the whole picture is further obscured by many deep unknowns. Crucially, a decision *not* to innovate will also present its own mix of pros, cons and uncertainties. Innovating in any particular direction will – for instance, through foregone resources and opportunity costs – typically diminish innovation in others. Whether deliberate or inadvertent, each direction for innovation is a social choice – involving issues of uncertainty, legitimacy and accountability as well as competitiveness.

It is important to acknowledge these complexities of choice, because innovation debates in particular areas often become quite simplistic and polarised. For instance, innovation in fields like food, health, energy or warfare is frequently discussed as if it were a one-track race [46], rather than an exploratory process – simply about whether to '*go forward*' or not. But the crucial questions in such areas are typically not just about '*yes or no?*', '*how fast?*' or '*who's ahead?*'. What often matters more instead, are queries over '*which way?*', '*what alternatives?*', '*who says?*' and '*why?*' [60]. And the scope for uncertainties under these wider questions, compound the scope for controversy. So, conflicts can become especially intensive and disabling (and potentially economically disastrous), if these broader questions are ignored.

Across all fields, the key challenge is that there exists no single definitive 'sound scientific' or 'evidence based' way to calculate the most rational balance of resources to expend on alternative innovation pathways within or across different domains [61]. A robust knowledge base and rigorous analysis are both necessary. But these are typically insufficient. The merit rankings constructed for different innovation choices by expert analysis invariably overlap – and may often be inverted – under contrasting equally reasonable assumptions and value judgements [62] [63] [64] [65] [66]. Decisions concerning which kinds (or areas or aims) of innovation to prioritise are therefore inherently partly subjective, rather than purely technical or economic. This is why research and innovation remain intrinsically political matters, irrespective of whether or not they are acknowledged to be so. And it makes it all the more important that high quality information concerning public policy in and around innovation, is available for wider scrutiny and debate.

Steering Innovation Pathways

One reason why it is important to address the politics of choice in innovation, is that chosen pathways can quickly become effectively irreversible. 'Sunk investments' in a particular innovation can help reinforce commitments to the associated pathway. This can occur, even if the innovation in question is widely seen to be unsatisfactory [67]. And these dynamics are often strongly reinforced by powerful efforts to standardise infrastructures [68], establish organisational momentum [69], appropriate intellectual property [70] [71], build monopolies [72], realise rent on value chains [73], condition user preferences through marketing [74], 'capture' regulators [75] and 'entrap' competing political interests [76]. The resulting path dependencies make it especially important to do whatever is achievable at the earliest stages of innovation, to give confidence that unfolding directions are as appropriate as possible [77]. The dilemma is, of course, that this is precisely the time when the positive and negative implications are most uncertain [78,79]. So, there can be enormous pressures on all sides, to exaggerate the confidence with which evidence can be interpreted and to understate the scope for competing interpretations [80]. One reasonable response to this, is to be much more open and questioning about uncertainties [61]. But another

rational measure, is to extend scrutiny beyond anticipated consequences and also look at the driving purposes of innovation [81].

This kind of careful broad-based societal consideration is, however, rarely evident in mainstream innovation. More often, it is a narrower range of expectations about the future that most strongly drive directions for change. The values upheld by particular communities of researchers themselves may be influential, as well the interests of leading firms, powerful financiers or particular users [82]. If a specific pathway is strongly held to be more likely than others by these kinds of influential actors, then this can become self-fulfilling [83]. Examples include competing media formats or software operating systems, where early market penetration can be driven more strongly by expectations about future adoption, than by assessments of performance [49]. Some degree of performance shortfall is often the price for collective compatibility [84]. Consequently, expectations can add to path dependencies, compounding the 'locking in' of a particular innovation, and the 'crowding out' of alternatives [85].

It is crucial not to misunderstand the implications of 'lock in'. In order to be successfully achieved, even the most positive innovation pathway will require some closing down in associated standards, regulations and practices [86]. So 'lock in' is not in itself necessarily a bad thing. But it remains a significant policy dilemma, since it means that not all potentially good innovations that are technically practicable, economically feasible or socially viable will actually prove to be historically realisable. The most important point then, is that these issues need to be discussed and addressed openly – and democratically – rather than brushed under the carpet or drowned in simplistic and polarising 'pro' claims (or 'anti' accusations) over innovation in general.

Opening Up Innovation

There are many ways to develop more reasonable debates about innovation. Some are about the style of discourse – developing a greater tolerance on all sides, for embracing adverse public reactions to particular innovations. Just as scepticism is one of the crucial constituting qualities in science itself [87 88], so space for public scepticism and healthy critical debate can help improve the quality of innovation more generally [89 90]. An adequate response to the challenges discussed here requires being clear about the resulting practical implications for policy. These can be readily summarised in terms of three overarching principles: ***participation***, ***responsibility*** and ***precaution*** [91].

Policy making should more explicitly and transparently acknowledge the inherently partly political (rather than purely scientific) nature of the interests and motivations driving contending pathways for innovation. This requires institutions and practices for facilitating greater ***public participation*** in the governance of innovation systems – and in innovation itself [92 93]. This includes key roles for the creative arts, humanities and civil society [8 9 10]. There is also a pressing need for all actors in research and innovation processes – especially the most powerful – to take more direct and explicit ***responsibility*** for the consequences and uncertainties of their activities [40]. This involves serious efforts to be reflective in anticipating, describing and analysing the impacts that might arise, as well as the attendant ambiguities and unknowns [94].

And finally, a greater emphasis on ***precaution*** is needed to moderate the powerful forces of closure and lock-in in science and technology [95 56,57]. Rather than treating existing patterns of

research and innovation as value-free, the precautionary principle strikes a stronger balance in favour of human health, environmental integrity and social well-being in the steering of priority directions [96]. Thus guided by precaution, participation and responsibility can elucidate more clearly what might be meant by these values in any given context. So together, these complementary imperatives help provide a counterweight to otherwise dominant incumbent interests. When innovation is recognised as a branching rather than single-track process, it becomes clear that precaution is also not about impeding innovation, but steering it in ways that better favour human health and the environment. In essence, precaution expresses the fundamental principle that – in innovation just as in science itself – reasoned scepticism fosters greater quality.

Innovation is not so much about a race to optimise a single pathway, as a collaborative process for exploring diverse alternatives. Current noisy anxieties over single-track 'zero sum' competitive innovation races, tend to be driven by expedient pressures from incumbent interests. These can conceal or deny underlying motives, uncertainties and alternatives. Instead, the three principles of ***participation***, ***responsibility*** and ***precaution*** can help innovation policy escape from currently narrow (often fear-driven) supposed technical inevitabilities. They illuminate how innovation is fundamentally about the politics of contending hopes [45]. Most importantly of all, it is perhaps only in these ways, that we can move away from narrow technocratic ideas of a knowledge economy y[97], to nurture a more realistic, rational and vibrant ***innovation democracy***.

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