



RSA

Action and Research Centre

From Design Thinking to Systems Change

How to invest in
innovation for social
impact

*by Rowan Conway,
Jeff Masters and Jake
Thorold*

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About the authors

Rowan Conway is the Director of Innovation and Development at the RSA. She ensures that the RSA is undertaking rigorous, profile raising and influential research and innovation projects. She has previously worked as a business journalist and editor and in community involvement and participation for London 2012.

Jeff Masters is an associate at the RSA. He was previously a Treasury official, a policy advisor to Chuka Umunna MP and secretary to the cross-party Commission on 2020 Public Services based at the RSA. He holds a Master of Public Policy degree from the Kennedy School of Government, Harvard University.

Jake Thorold is a research assistant at the RSA focusing on a range of topics from Universal Basic Income to government innovation. He worked previously for Clinton Global Initiative in New York.

About the RSA

The RSA (Royal Society for the encouragement of Arts, Manufactures and Commerce) believes that everyone should have the freedom and power to turn their ideas into reality – we call this the Power to Create. Through our ideas, research and 27,000-strong Fellowship, we seek to realise a society where creative power is distributed, where concentrations of power are confronted, and where creative values are nurtured. The RSA Action and Research Centre combines practical experimentation with rigorous research to achieve these goals.

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Executive summary

Achieving change in a world ever more defined by complexity is difficult. We face an array of complex ‘wicked’ problems, from an ageing population to climate change to intergenerational cycles of poverty. It can often seem that these challenges are insurmountable and that we lack the ability to make meaningful change.

To find opportunity in challenge will require reimagining the ways that we currently think about innovation and design. The narrative around a ‘fourth industrial revolution’ risks narrowing the focus of innovation to technology which would locate innovation-led growth solely in the outputs of universities and research institutes, or technology clusters like Cambridge’s Silicon Fen. While these are a vital piece of the UK’s innovation jigsaw, they are not the whole picture. Enterprises large and small across sectors and regions need to also be part of the innovation mix.

The UK has long been at the forefront of design, a rich heritage that permeates a diverse range of sectors. Design thinking methodologies are deployed in service, policy and governance design across sectors, not merely product design. Harnessing the power of this creative capacity will be crucial to generating the innovative solutions required to tackle pressing social challenges.

But design thinking alone will not be enough. The core insight of this paper is that solving our most complex problems will require augmenting design thinking with a systems thinking approach as the basis for action. While design thinking has proved itself to be successful in the realm of creating new products and services, the challenge is how to support innovations to enter and actively shape the complex systems that surround wicked social challenges.

Great design doesn’t always generate impact. As we show in this report, innovations attempting to scale and create systemic change often hit barriers to change, sending them catapulting back to square one. We call this the ‘system immune response’. The particular barriers will differ dependent on context, but might be cultural, regulatory, personality-driven or otherwise. This report argues that innovations for the public good are susceptible to the system immune response because there is a deficit of systems thinking in design methodologies.

This report introduces a new RSA model of ‘think like a system, act like an entrepreneur’ as a way of marrying design and systems thinking. At its most simple, this is a method of developing a deep understanding of the system being targeted for impact and then identifying the most promising opportunities to change based on that analysis – the entrepreneurial part. By appreciating factors like power dynamics, competing incentives and cultural norms, innovators can prepare themselves for barriers to change, and find the entrepreneurial routes around them to successfully affect system change.

This report takes the Small Business Research Initiative (SBRI), a two-phase pre-procurement innovation programme that aims to match social challenges with new ideas, as its primary case study. It suggests augmenting the excellent design thinking deployed through SBRI with a think like a system, act like an entrepreneur lens in order to drive better social outcomes from SBRI-originating innovations. Programmes like SBRI have great potential to drive change and address pressing challenges, but must be guided by a more developed understanding of how change happens.

The stakes are too high to not raise our game when it comes to social innovation. Wicked problems can be overcome but will require sophisticated theories of change able to account for the complexity and unpredictability of modern life. We offer think like a system, act like an entrepreneur as a contribution to this effort.

This report is based on the following research:

- Desk based review of relevant literature;
- A series of structured interviews with participants in SBRI competitions; and
- An expert round table that brought together policymakers, commissioners, procurement experts and entrepreneurs to consider and develop initial findings.

Marrying design and systems thinking

We sit on the cusp of a fourth industrial revolution, with automation, robotics, machine learning and biotechnology promising to transform transport, medicine, social care, communication and more, and extend human capabilities in remarkable ways. But these new industrial advances also threaten to disrupt the labour market and create profound instability and public anxiety. For this industrial revolution to be “empowering and human-centred, rather than divisive and dehumanizing”¹ as Founder of the World Economic Forum Professor Klaus Schwab hopes, we must think deeply about the social challenges we face, while innovating in new ways to meet the human needs of the future.

This might suggest a need for a human-centred industrial strategy, one that takes tackling the real problems faced by ordinary people as a core metric of success rather than solely economic growth. This strategy should be enabled by a combination of design methodologies and systems thinking, working together to unleash the empowering potential of innovation. At the RSA we argue for the need to adopt a process of ‘thinking like a system and acting like an entrepreneur’ if the country is to meet this imperative.

The design economy

In recent years there has been a surge in the use of design methods to stimulate innovation. Public and private agencies have opened up challenge prizes and competitions that have stimulated markets, and the UK Government has promoted a range of design-led innovation processes. Innovate UK is ambitious about the potential of design to stimulate innovation and accelerate economic growth through “the wider take-up of impactful design across industry sectors and challenge areas.” Its 2015 Design in Innovation strategy² states: “Our aim is for UK businesses to innovate better, grow faster and achieve greater commercial success through the effective use of excellent early-stage design.”

The UK is a world leader in design. According to the Design Council’s Design Economy report³, design activity generated £71.7bn in gross value add (GVA) in 2013. There is now an opportunity for UK plc to use

1. Schwab, K. (2006) *The Fourth Industrial Revolution*. Portfolio Penguin: London.
2. Innovate UK (2015) *Design in innovation: Strategy 2015 – 2019*. Available at: https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/474557/Design_in_Innovation_Strategy_2015-2019_WEB.pdf.
3. Design Council (2015) *The Design Economy: The value of design to the UK*. Available at: <http://www.designcouncil.org.uk/sites/default/files/asset/document/Design%20Economy%20report%20web%20Final%20-%20140217%20Yea%201.pdf>.

design methodologies in early stage innovation to deliver improved social, economic and environmental impacts. Designers can reframe social and environmental issues like healthcare or climate change as creative opportunities. As Innovate UK says: “Identifying and tackling the ‘right’ problems: working with designers to utilise their problem solving skills on broader challenges can help businesses and organisations identify genuine economic, social and environmental viable opportunities, rather than concentrate on ‘solutions looking for a problem’”.⁴

Designers are increasingly alert to the innovation potential of social challenges. In a 2017 RSA lecture⁵, Jeremy Myerson, founder of the Helen Hamlyn Centre at the Royal College of Art, urged designers and entrepreneurs to respond to the challenge of an ageing population. As well as providing for a social good, Myerson identified the potential dividend that an ageing population provides for designers, with new retail markets emerging for products like the ‘grankini’ – an all-in-one high tech undergarment that supports mobility for the elderly.

But where a clear commercial market doesn’t exist, government agencies and charitable organisations can also create demand, by procuring innovations directly to support social change or improvements in public services. An example of this is the Small Business Research Initiative, a vehicle through which government agencies can run competitions predicated on particular problems that need solving.

Deploying design thinking

In *Democratising Innovation*⁶, Eric von Hippel argues that we have moved into a ‘user-centred’ as opposed to ‘manufacturer-centric’ era of innovation. As Jeanne Liedtka said in the 2015 Batten Briefing on Innovation and Growth⁷: “The most secure source of new ideas that have true competitive advantage, and hence, higher margins, is customers’ unarticulated needs.” Businesses are now routinely generating innovation using human centred methods. These processes employ user research, experimentation, prototyping, and iteration and foster innovations that meet a particular human need rather than being purely product-driven. These methods have been used to inform design innovations in everything from airline flatbeds at British Airways⁸ to breathable sportswear at Nike⁹.

Design-led innovation has demonstrated a clear dividend in consumer-facing industries, and design thinking is no longer the preserve of product developers. The process also generates service solutions, new concepts and governance models, and it is being used to envisage new business strategies and services across sectors, including the public sector. An

4. Innovate UK (2016) *Design in Innovation: Early Stage Interventions*. Available at: https://admin.ktn-uk.co.uk/app/uploads/2017/01/DesignBook_FINAL_web-version.pdf.

5. Myerson, J. (2017) *Social Challenge – Design Dividend*. RSA Event. Available at: <https://www.thersa.org/events/2017/03/social-challenge---design-dividend>.

6. Von Hippel, E. (2005) *Democratizing Innovation*. The MIT Press: Boston, USA. Available at: <http://web.mit.edu/evhippel/www/books/DI/DemocInn.pdf>.

7. Glinska, M (2014) *Innovation and Growth: Understanding the Power of Design Thinking*. Batten Institute. Available at: <https://issuu.com/batteninstitute/docs/designthinking-121814-issuu>.

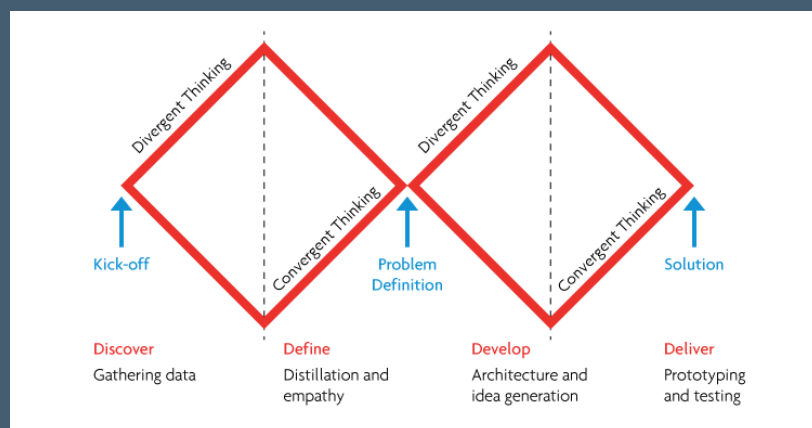
8. Tangerine. *Club World: British Airways*. Webpage. Available at: <http://tangerine.net/our-work/aircraft-interior-design-british-airways-club-world/>.

9. Brownlee, J. (2013) *Nike’s 5 Lessons on Innovation by Design*. Co-design (webpage). Available at: <https://www.fastcodesign.com/3019090/nikes-5-lessons-on-innovation-by-design>

insurgency of open innovation labs and innovation districts in cities have emerged, such as Sitra in Finland, MindLab in Denmark, 18F in the US, and Policy Lab in the UK to test the methods on public policy. Challenge prizes and grant funds have been earmarked to stimulate design thinking and Innovate UK is currently investing up to £2m in early-stage, human centred design projects with its Design Foundations Fund. Social impact investment funds are also seeking to drive innovation for public good further, prominent recent examples being Big Society Capital Fund and the Cabinet Office’s Funds for Social Impact Bonds.

Design thinking is by definition exploratory: solutions are developed, prototyped and tested using iterative, ‘safe-fail’ experiments to gain rapid feedback. The double diamond method developed by the Design Council is a widely recognised way to deploy design thinking. As Figure 1 illustrates, it is a method that helps to uncover a problem by using a collaborative and iterative approach, and then reengaging in divergent and iterative thinking to arrive at a solution. The process does not commit at the outset to the form of an end solution but rather generates ideas that could ultimately become physical or digital products, services or processes.

Figure 1: The Design Council Double Diamond



The potential for design thinking in public sector innovation is substantial and varied. In their review of studies on innovation in the public sector, De Vries et al¹⁰ show the range of innovation types that can be stimulated:

- Process innovations, including the creation of new organisational forms and working methods; or the creation or use of new technologies to improve services;
- Product or service innovations, the creation of new public services or products;

10. De Vries, HA., Bekkers, VJJM., and Tummers, LG.. (2014) Innovation in the Public Sector: A Systematic Review and Future Research Agenda. *Public Administration*. Vol. 94, No. 1. 146-166.

- Governance innovations, the development of new governance forms and processes to address specific social problems; and
- Conceptual innovations, such as new concepts, frames of reference or paradigms to change the understanding of problems and/or their solutions.

From design thinking to systems thinking

Excellent design has proved to be a catalyst for business innovation and growth¹¹ and it is important that the UK builds on its leading design capabilities to drive innovation further. However, the nature of that innovation is also important. According to Clayton Christensen there is a rising focus on ‘efficiency innovations’¹² – where innovation leads to process improvements that save costs – and there is insufficient investment in the ‘empowering’ market-creating innovations that lead to new technology or service breakthroughs that progress society.¹³

Catalysing empowering innovation for social and environmental benefit requires a systemic view. To ensure the UK industrial strategy transforms performance, we need more fully to understand the systemic barriers to scaling empowering innovation and then act more creatively and adaptively when we spot opportunities to circumvent these barriers or take a different path. To transform markets and orientate investment toward empowering innovation, innovators will need to build on human centred design methods and augment them with systems thinking.

The think like a system, act like an entrepreneur approach follows a design thinking logic akin to the double diamond. The first diamond is about discovery of the problem and understanding systemic conditions: the value chain, the institutional or societal context in which it sits, and the power dynamics at play – using different frames of analysis including cultural theory and complexity analysis. The second diamond is about understanding how to act opportunistically like an entrepreneur to achieve change.

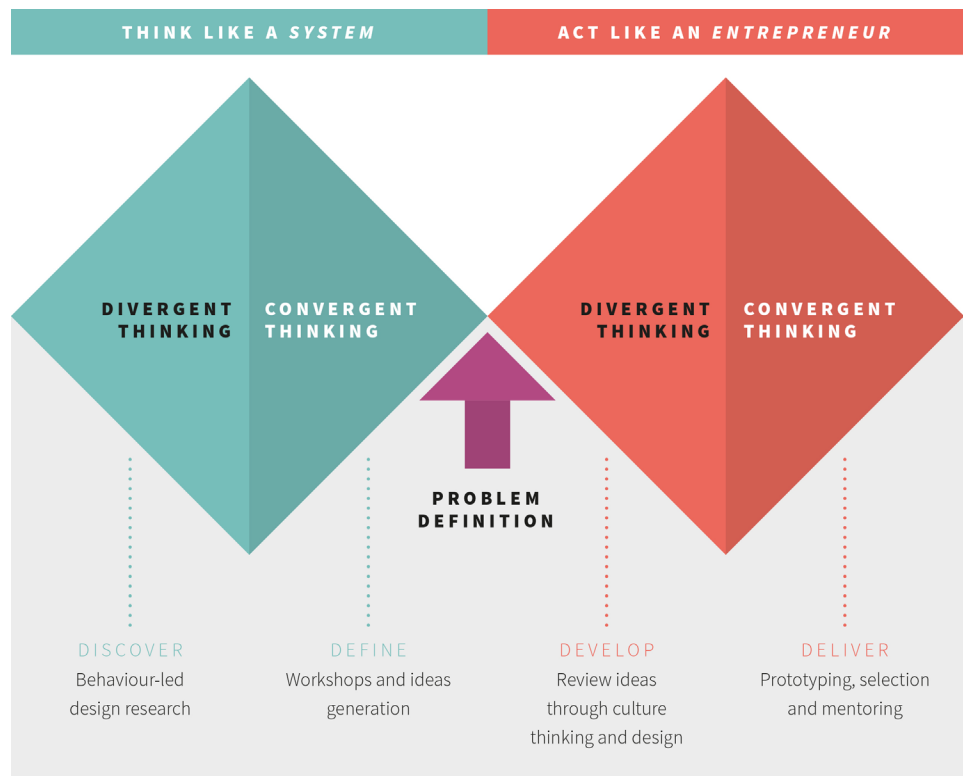
While design thinking alone provides a compelling process for idea development, it fails to recognise that without due consideration of systemic complexity and power dynamics, even the best ideas can lie on the shelf unused, and thus without impact. The design-led approach provides strong insights on users but remains two-dimensional; think like a system, act like an entrepreneur provides a third dimension: systemic understanding and impact.

11. Design Council (2015) *The Design Economy*. Available at: <http://www.designcouncil.org.uk/sites/default/files/asset/document/Design%20Economy%20report%20web%20Final%20-%20140217%20Yea%201.pdf>.

12. Christensen, CM., Bartman, T., and van Bever, D. (2016) *The Hard Truth About Business Model Innovation*. MIT Sloan

13. Christensen, CM., and van Bever, D. (2014) ‘The Capitalist’s Dilemma’. *Harvard Business Review*. June 2014.

Figure 2: Think like a system, act like an entrepreneur



Problems of design-led innovation diffusion

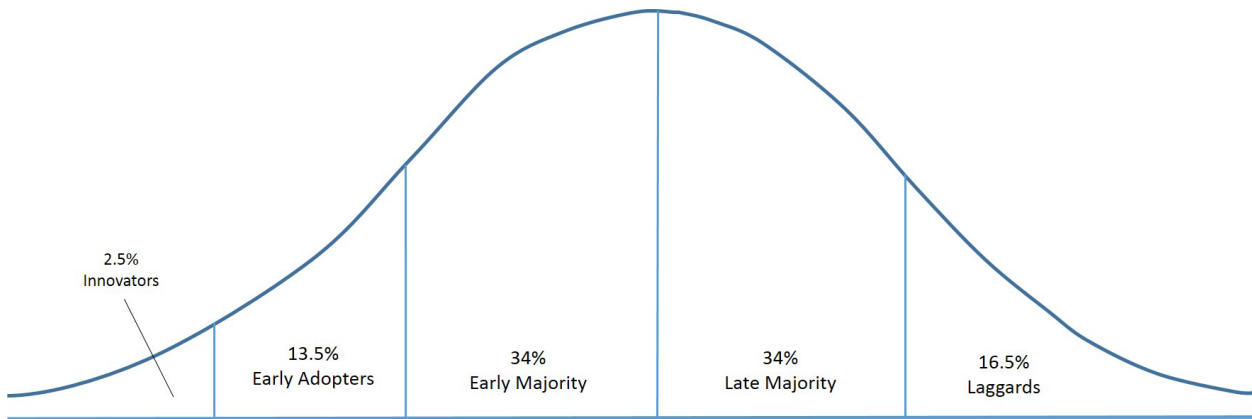
The spread of human centred design thinking is proving effective at developing new ideas¹⁴, the policy challenge is now to shepherd these ideas towards a market – whether consumer, government or otherwise – helping them scale and make a wider social and economic impact. Innovation is about impact, whether shown through market success or, in the case of many social innovations, by the change that results. Social innovators should be constantly looking to supplement market making activities – of which SBRI is a prime example – with other interventions aimed at preparing the system to support the innovation. For example, in order for a service innovation to flourish, you may need to push for a complementary governance innovation, such as altering procurement frameworks or regulatory rules. The problem with many models of innovation is that they are premised upon linear assumptions of scaling.

Everett Rogers’ seminal 1962 model on the diffusion of innovations provides the axiomatic example of the limited thinking embraced by too many in the design and innovation sphere.¹⁵ Roger’s adoption curve follows a linear pathway from slow diffusion, through rapid growth, to saturation, then slowdown. Implicit faith in Roger’s curve can still be readily identified in the “engineering mindset” that sees the innovation chain as a linear path that begins with university research and development, followed by venture capital funding of startups, leading to wider commercialisation and dissemination.

14. Innovate UK (2015) *Design in innovation strategy 2015 – 2019*. Available at: <https://www.gov.uk/government/publications/design-in-innovation-strategy-2015-to-2020>.

15. Rogers, E.M. (1962). *Diffusion of innovations* (1st ed.). New York: Free Press of Glencoe.

Figure 3: Everett Rogers' adoption curve



Where this model of innovation diffusion sees growth as planned and relatively predictable, the reality is that the diffusion of innovations addressing complex social challenges is far from predictable. Probability analysis and prediction becomes ever more difficult for systems mired in complexity such as healthcare and education.

Since Christopher Freeman's 1987 study of innovation in Japan¹⁶, the academic understanding of thinking systemically has been well established. The work of Mowery and Rosenberg¹⁷ had already established that neither technology 'push' nor the 'pull' of demand were sufficient: both together were crucial. But even more important were the linkages between supply and demand, which increased the circulation of information within the system. Freeman developed this thinking with the concept of a 'national system of innovation' - a set of complementary institutions which increase both the rate at which new knowledge is generated and with which it is diffused. This, in turn, has been extended to include other systems - sectoral, technological, as well as socio-technological. And just as markets can fail, systems can be subject to the same tendencies.

The challenge has remained in shifting these insights into the design and practice of policy. But this rich academic seam is precisely attuned to the messy realities of the innovation challenges of today. Warren Weaver's analysis¹⁸ contests that social problems are "disorganized complexity", that means the number of variables and interrelationships in a system can rarely be captured in probability statistics. With the rise of the social web, big data, globalisation, societal fragmentation, rapid urbanisation and movement, and values shifts, complexity has become the norm. As the Gartner hype cycle¹⁹ shows, the pattern of diffusion is today harder to predict and innovations can take decades to scale. We must develop a new account of diffusion and scale that accounts for impact both at a social and economic level. This requires the ability to "think like a system".

16. Freeman, C. (1987) *Technology Policy and Economic Performance: Lessons from Japan*. Pinter Publishers, London.

17. Mowery, DC. and Rosenberg, N. (1979) The influence of market demand upon innovation: a critical review of some recent empirical studies. *Research Policy* 8, pp102-153

18. Weaver, W. (1948) *Science and Complexity*. *American Scientist* (36:536). Available at: <http://people.physics.anu.edu.au/~tas110/Teaching/Lectures/L1/aterial/WEAVER1947.pdf>.

19. Gartner. (2016) 'Gartner's 2016 Hype Cycle for Emerging Technologies Identifies Three Key Trends That Organizations Must Track to Gain Competitive Advantage'. Available at: <http://www.gartner.com/newsroom/id/3412017>

Thinking like a system

“Systems thinking is a context for seeing wholes. It is a framework for seeing interrelationships rather than things, for seeing patterns of change rather than static snapshots.”

Peter Senge²⁰

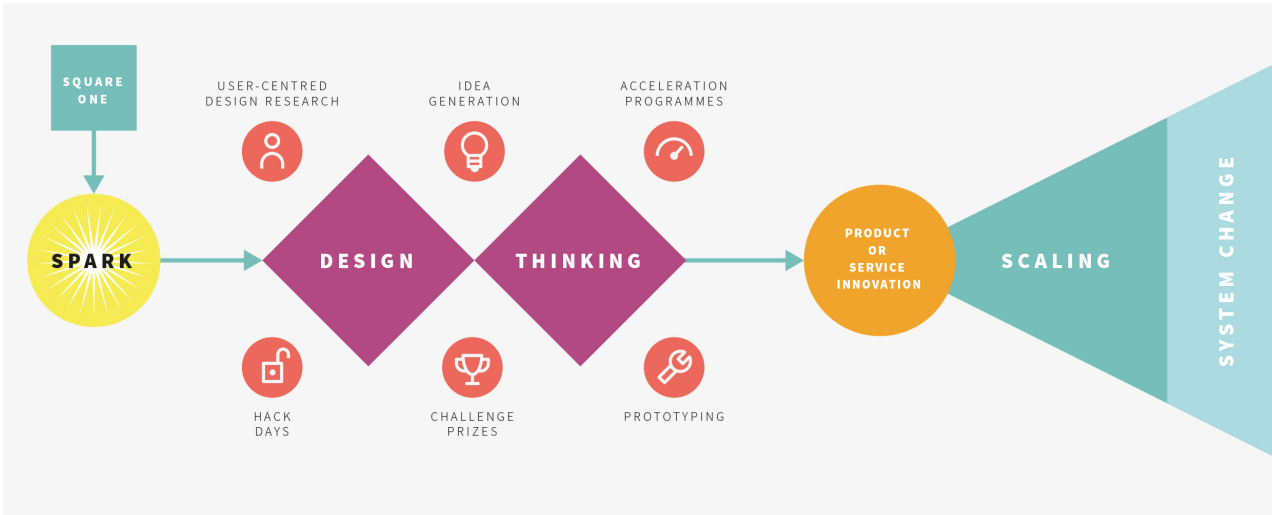
Looking through a systems lens can be overwhelming. It can feel that complex systems are intractable and doomed to stasis. But as systems theorist Donella Meadows²¹ said, systems thinking requires seeing all situations as dynamic, with latent momentum that can create change. As she observes: “Dynamic systems studies usually are not designed to predict what will happen. Rather, they’re designed to explore what would happen, if a number of driving factors unfold in a range of different ways”.

Systems encompass many actors, competing incentives and hidden nuances. It is a mistake to assume that just because human centred design processes create innovations that meet human needs, that their diffusion into a system will follow a linear route that mirrors that of consumer markets. This is particularly the case with major and complex public sector markets, such as the NHS. Figure 4 illustrates this a ‘linear fallacy’ – one that oversimplifies the journey from design of an innovation to scaling and diffusion.

20. Senge, PM. (1990) *The Fifth Discipline: The Art & Practice of a Learning Organisation*. London: Random House.

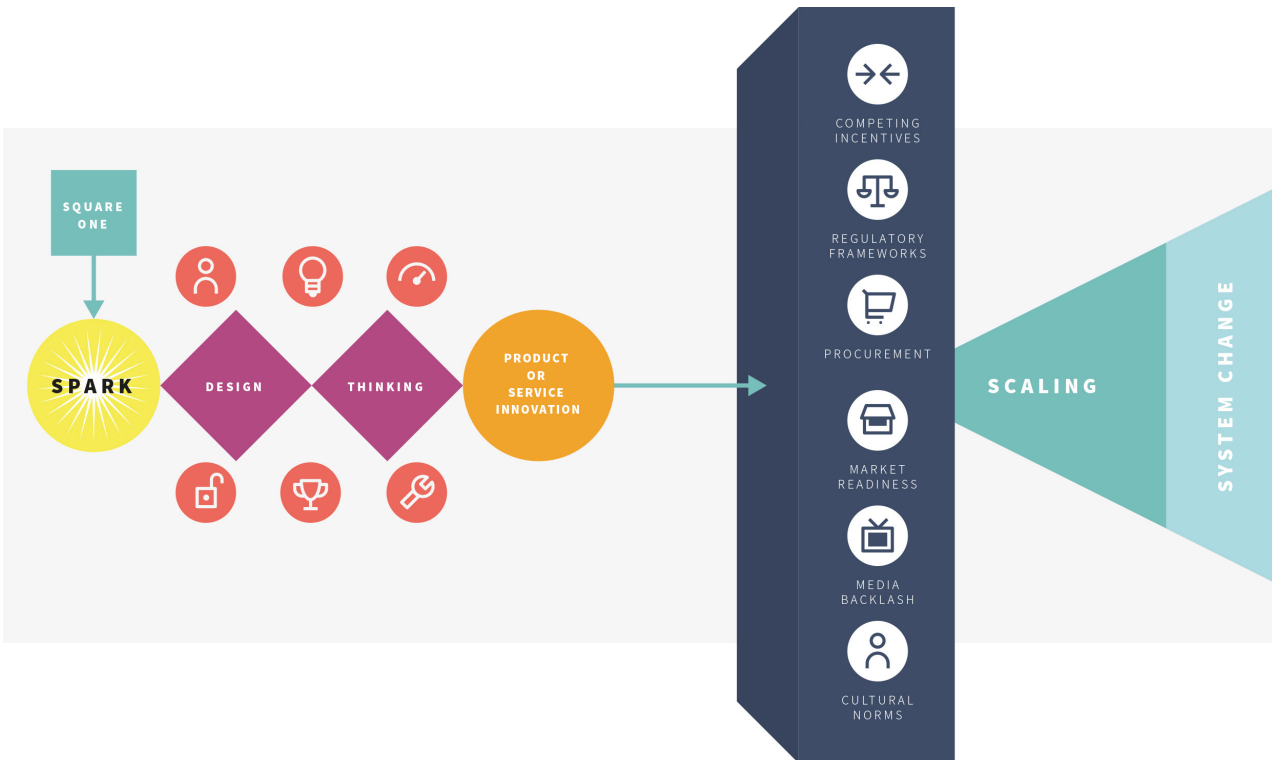
21. Meadows, DH. (2010) *Thinking in systems: a primer*. Earthscan.

Figure 4: The linear fallacy



As the next illustration (Figure 5) shows, in reality what happens all too often is that the route from innovation to scaling, and thereby systems change, is fraught with obstacles. This list is not exhaustive and not all obstacles will be present in every case. The point is that scaling is usually far from a linear inevitability and the development of a product or service innovation may be just the beginning of a process of generating impact.

Figure 5: Innovation hits barrier to change

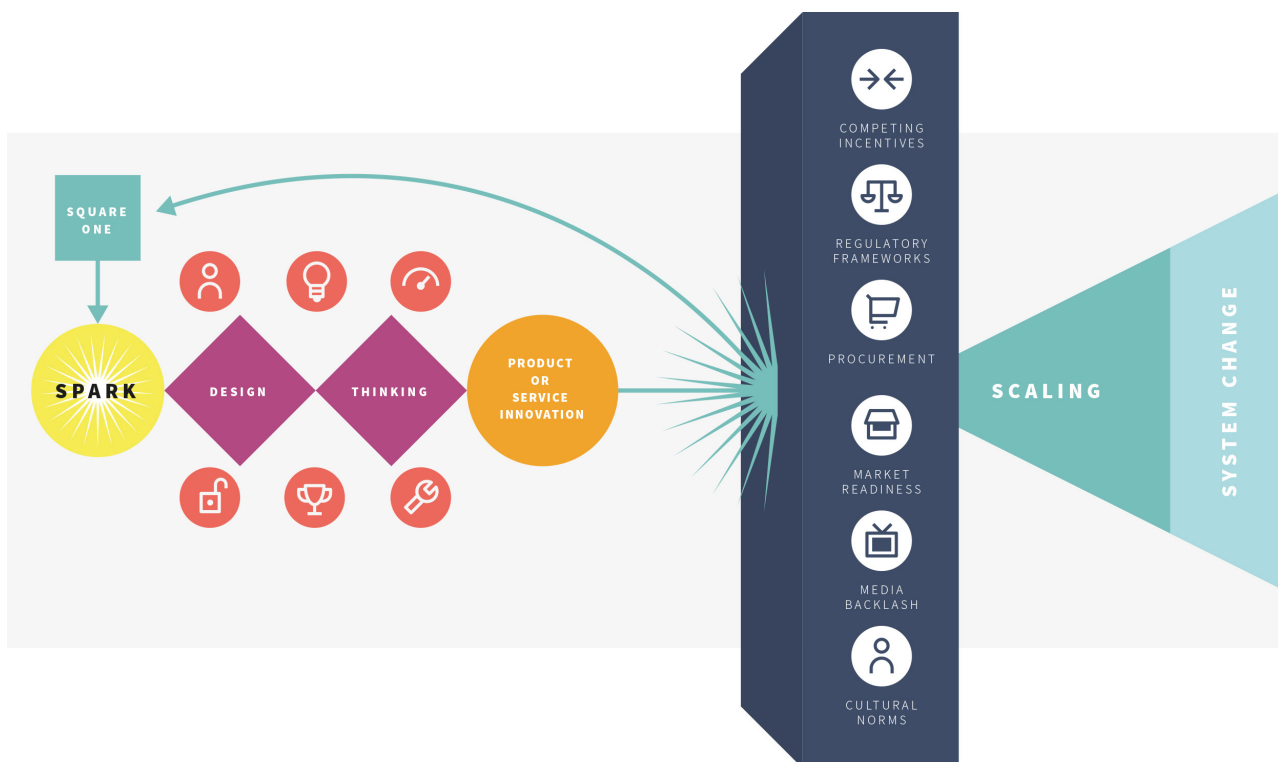


Rather than achieving impact an innovation gets mired in “reasons why not”. Perhaps competing incentives leave an innovation unrealised, or strict regulatory frameworks, fear or cultural opposition create barriers or headwinds. Perhaps the wider context isn’t ready for the innovation because it requires complementary changes in other areas or, as is often the case in government, there are strict procurement strategies in place that prevent new products or ideas from accessing a market. The complexity of institutions may prevent the replication of innovations at scale in public service environments (for example, a human centred process innovation that has delivered exceptional impact in reducing aggression in patients within one hospital environment, may fail to scale to other hospitals because of competing rules and incentives). Donella Meadows describes this response as “systemic policy resistance”:

“Policy resistance comes from the bounded rationalities of the actors in a system, each with his or her (or “its” in the case of an institution) own goals. Each actor monitors the state of the system with regard to some important variable - income or prices or housing or drugs or investment - and compares that state with his, her, or its goal. If there is a discrepancy, each actor does something to correct the situation. Usually the greater the discrepancy between the goal and the actual situation, the more emphatic the action will be...Such resistance to change arises when goals of subsystems are different from and inconsistent with each other.”²²

As Figure 6 shows, when innovations designed to address social challenges hit barriers to change, they can ‘bounce’ off the system sending the innovation back to square one. We call this the system immune response.

Figure 6: The system immune response



22. Ibid.

This immune response sees the promising innovation rejected in the same way that the body would resist a pathogen. The current system releases antibodies (barriers to change) to neutralise the pathogen (the innovation). To proactively counter this immune response, innovators should not just focus on user needs (although this is key to developing effective solutions), they must also comprehensively map the system which they hope to change, employing a range of techniques to appreciate the complex dynamics at play. This is what is referred to by ‘systems-centred design’²³: design that actively considers the particular dynamics of existing systems and looks to innovate in ways that are relevant to them or, more ambitiously, actively influences them.

Different kinds of problems require different methods of systems analysis. Horst Rittel coined the phrase “tame and wicked problems”.²⁴ In this framing, tame problems are those that have a rational and linear pathway to a solution, the problem is relatively easy to define explicitly and can be understood by a variety of people. In contrast, wicked problems are hard to define and whose nature remain ambiguous and elusive. As John Kao states²⁵: “Such wicked problems often involve a large number of diverse stakeholders who do not see the problem or indeed much of anything else in the same way. They might be separated by disciplinary boundaries, by values, or by their role within a system, ie government versus private sector. Another characteristic of wicked problems is that one does not necessarily know they have been solved, except in hindsight.”

Thinking like a system means taking a holistic view: viewing the problem as made up of a set of interacting components that continuously produce feedback. It also means accepting this situation as dynamic, with the relationships between elements in the system as important in understanding how the system will behave as the component parts. The starting point to understanding these dynamics is to identify the dimensions of the problem.

There are lots of ways to organise problems and there are many tools that can be used to understand particularly important systems dynamics. In the think like a system, act like an entrepreneur model of change the wider systems view must understand the following:

- The type of problem;
- The problem situation; and
- The power dynamics in play.

23. Ritter, FE. et al (2014) *Foundations for Designing User-Centered Systems: What System Designers Need to Know about People*. Springer: London.

24. Rittel, HWJ. & Webber, MM. (1973) Dilemmas in a General Theory of Planning. *Policy Sciences* (4). pp. 155-169. Available at: <http://www.ask-force.org/web/Discourse/Rittel-Dilemmas-General-Theory-Planning-1973.pdf>.

25. Kao, J. (2009) *What is Large Scale Innovation?* Available at: <http://www.jamming.com/Large%20Scale%20Innovation.pdf>

Understanding problems

Warren Weaver²⁶ mused in 1948 that: “science has, to date, succeeded in solving a bewildering number of relatively easy problems, whereas the hard problems, and the ones which perhaps promise most for man’s future, lie ahead”. Social challenges often present hard problems – complex and systemic. Knowledge Management theorist Dave Snowden²⁷ uses a sense-making framework he calls Cynefin to make distinctions between problems that sit in ordered systems and unstructured systems. In this framework a default state of ‘disorder’ is the starting point for those trying to make sense of a system. Problems sit in one of four domains – two ordered and two not:

Table 1: Cynefin Sense-Making Framework

Ordered systems	Unordered systems
<p>Simple problems</p> <p>In this problem situation there are fairly straightforward relationships between cause and effect, and there is a right answer if it can be found. The approach to take is the tried and tested – follow best practice.</p>	<p>Complex problems</p> <p>Where the relationships between cause and effect are not obvious. To make progress in solving or managing the problem expertise will help, combined with experimentation. Snowden calls for ‘safe fail’ experiments, generating rapid feedback to enable adjustment. Experiments that succeed should be amplified; experiments that fail should be dampened.</p>
<p>Complicated problems</p> <p>Here there are still relationships between cause and effect, but they are much harder to understand. There are solutions to the problem, but there might be more than one. Technical expertise is required, following good practice.</p>	<p>Chaotic problems</p> <p>Here there is an absence of cause and effect. Immediate action might be needed to stabilise the situation. If immediate action is not needed to stabilise the situation, this domain may be ripe for successful experimentation and innovation.</p>

Careful deliberation is required to ensure a full understanding of the domain in which a given problem lies. By identifying the type of system and problem that they are dealing with, innovators can better understand the correct kinds of responses to arrive at a solution. While we suggest a less drastic split, there is much wisdom in Einstein’s assertion that ‘if I had an hour to solve a problem I’d spend 55 minutes thinking about the problem and five minutes thinking about solutions.’

26. Weaver, W. (1948) Op Cit.

27. Snowden, DJ. and Boone, ME. (2007) ‘A Leader’s Framework for Decision Making’. *Harvard Business Review*. November 2007.

Understanding problem situations

The situation in which the problem is located is a further analysis that thinking systemically will require. Leadership theorist Ronald Heifetz²⁸ distinguishes between technical problems – where the solution is bounded and finite, and just needs to be correctly applied to the problem – and adaptive problems – where learning is required and the solution must be co-created by service and service-user. In understanding how to apply this distinction Heifetz describes three problem situations:

- In Type I situations the problem is clearly defined, the solution to that problem is known, and the challenge lies in matching and applying the solution to the problem.
- In Type II situations, the problem is clear, but the solution is unclear. To solve the problem, some kind of learning is required. This may be the development of a new technical ‘fix’ to solve the problem, or it may require adaptive work, involving all parties to the problem in a shared journey towards the solution. No party can ‘solve’ the problem alone.
- In Type III situations, both the problem and the solution are unclear and require learning to understand and resolve. Technical fixes are not available. Adaptive work is required.

Heifetz goes beyond other thinkers (see, for example, Mackenzie et al²⁹) in focusing not just on the problem situation, but on the extent to which learning is required and the how far the solution needs to be co-created by all actors involved.

Thinking systemically about problems requires that at a certain point the boundaries of a problem are set. Without boundaries, a systems mindset is at risk of analysis paralysis – where systems maps create overly complicated analyses of problems, which produce so much data it is impossible to act. Here, Donella Meadows calls for flexibility, she says: “The right boundary for thinking about a problem rarely coincides with the boundary of an academic discipline, or with a political boundary... Ideally, we would have the mental flexibility to find the appropriate boundary for thinking about each new problem.”³⁰

Understanding power dynamics

Flexibility is also important in understanding the power dynamics at play within a system. Cultural theory is a useful systematic methodology for understanding power dynamics and motivations within social systems.³¹ By using it to understand the politics and culture around a problem, it can help to identify blockages and enablers of change. When applied to a problem, cultural theory can help in understanding how far a proposed solution will resonate with the dynamics of an existing system – and

28. Heifetz, RA. (1994) *Leadership Without Easy Answers*. Cambridge, Massachusetts: The Belknap Press of Harvard University Press.

29. Mackenzie, A., Pidd, M., Rooksby, J., Sommerville, I., Warren, I., and Westcombe, M. (2006) Wisdom, decision support and paradigms of decision making. *European Journal of Operational Research* 170. 156-171.

30. Meadows, DH. (2010) Op Cit.

31. Hood, C. (1998). *The Art of the State: Culture, Rhetoric and Public Management*. Oxford University Press, Oxford.

therefore be effective – or run counter to them, and risk rejection by the system. Cultural theory divides a social system into four domains: hierarchical, solidaristic, individualistic and fatalistic:

Table 2: Cultural Theory Domains

Domain	Explanation
Hierarchical	Refers to hierarchical forces such as authority, strategy and regulation; the top-down laws, institutions and levers that government and institutions have at their disposal to compel people to act in certain ways.
Solidaristic	Emphasises belonging, values and the ideas of justice and fairness as important motivations for citizens.
Individualist	Speaks to the power of self-interest (enlightened or otherwise) to drive change and innovation.
Fatalistic	Sees social problems as intractable and efforts at change unlikely to deliver intended outcomes, or irrelevant. Can exist in any of the above systems.

Power dynamics revealed by a cultural theory analysis can help to suggest the types of intervention that will have the highest chances of success in any given system. For example in a highly hierarchical setting, such as a factory with entrenched chains of command, it is likely that interventions that seek to drive change by drawing upon solidaristic motivations will fail due to the regimented nature of the system. Taking a wider system view that understands cultural norms and patterns of behaviour as well as the interplay between actors in a system sheds new light on ways to address complex challenges. Using cultural theory can help to match the correct type of intervention to the problem based upon the dynamics of the system.

By going beyond user research and undertaking the thinking like a system part of the process, innovators develop a depth of understanding of the broader ecosystem they are looking to enter. Systems thinking unveils the frictions that inhibit change, the veto points and countervailing forces that combine to create this system immune response. A product of this kind of this process may be that certain interventions are jettisoned because the possibilities for change are revealed to be highly limited. In their place may be new ideas and problems previously unconsidered, yet seemingly with a feasible route to achieving impact. The next phase of the process is to act entrepreneurially.

Acting like an entrepreneur

A common critique of systems thinking is that in its quest to understand complexity it gets stuck in analysis. To progress to practical action, innovators must use systems analysis as a platform for action as opposed to paralysis. Here they must mimic the habits of entrepreneurs, looking to spot hungry markets, understand available funding and the “social moments”³² that will lead to their innovation gaining the greatest traction. Opportunism is key.

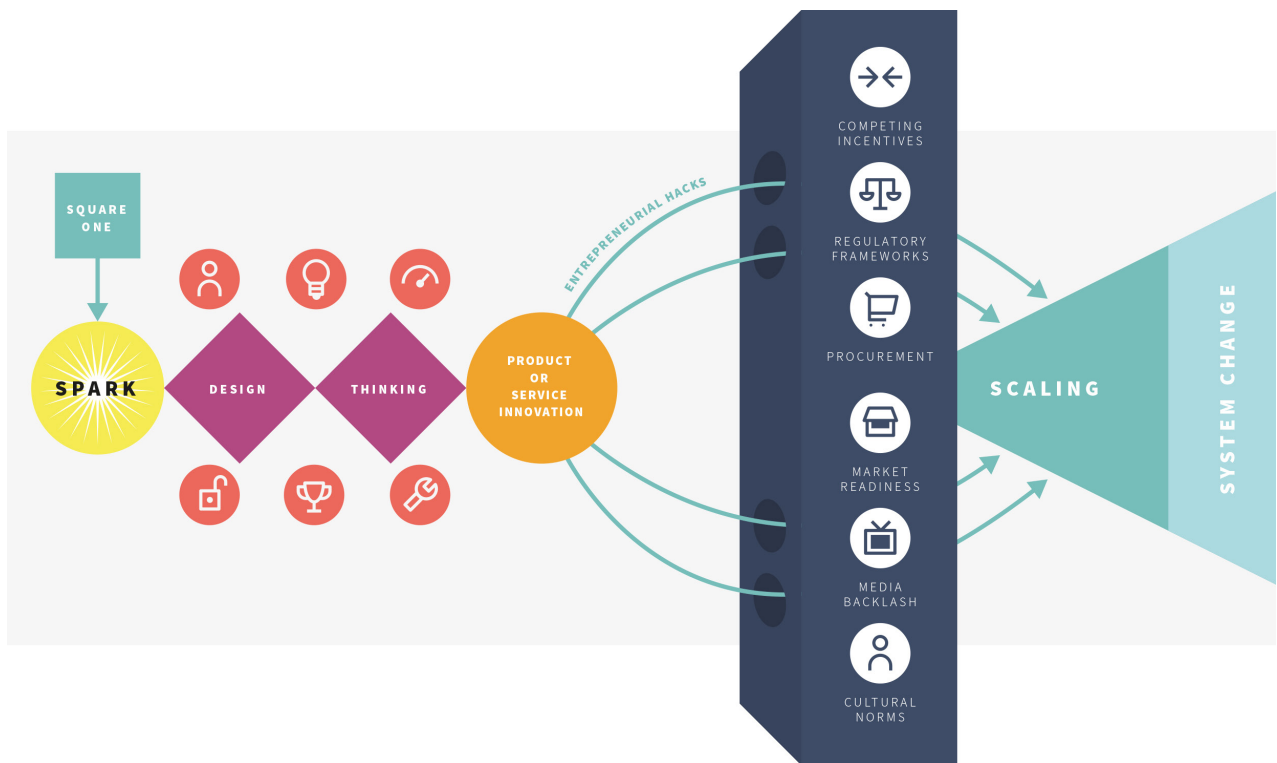
Having clearly defined the problem through a systems mapping process, innovators can identify routes to change, testing innovations in live small-scale environments or through scenario modelling in real time. In these experiments actors continuously seek feedback and iterate their prototypes to assess if they are helping or hindering change.

Acting entrepreneurially isn’t just about spotting the best opportunities for change. It is also about maximising the possibility for an innovation to navigate through barriers to change and make an impact at scale. This requires a hacker mentality. Hacking the system means finding the counterpoints to the barriers to change and creating ways to circumvent them.

This might mean engaging with key stakeholders with powers of veto to convince them of the shared benefits of allowing a new product or service to pass through. Or being willing to iterate to make an innovation fit strict policy parameters. Alternatively savvy innovators may need to involve certain actors in the process, or generate social movements or media campaigns to elevate the legitimacy of the need for the innovation and therefore influence changes in policy. The particular actions will depend on context, but the entrepreneurial actor is defined more than anything by an attitude that constantly asks ‘what can I do now to create a better possibility of success further down the line?’ In a fashion similar to the approach taken by market innovators to create demand, socially-oriented innovators should plough every furrow to generate adoption and social impact.

32. Burbidge, I. (2017) *Altered States*. RSA Journal (1).

Figure 7: Finding ways around the system



The system immune response diagram above illustrates how acting entrepreneurially can cut through barriers to change, by seeking out circumventing hacks. This is about being agile and responsive both when challenges present themselves and opportunities open up. It means being able and willing to iterate both product and strategy in response to circumstance. While the appropriate actions will be context-dependent, the central point is that linear, non-adaptive thinking won't do. If a proposed change sparks a media backlash, hiding your head in the sand won't suffice. Rather, innovators should use the tools at their disposal to navigate the situation. Innovators are rarely powerless against barriers, but will likely have to outthink them.

When entrepreneurs take risks, they recognise the possibility of failure. But these downside risks are balanced against the large upside possibilities of success. It may be harder to lose it all within the public sector, but there is also little financial incentive to take the kinds of risks that innovation sometimes requires. Those within the public sector who take risks are the change makers – the 'intrapreneurial' talent that government want to attract. New guidance for effective behaviour for senior leaders includes "seek[ing] out opportunities for innovation and hav[ing] the courage to take risks and make step changes in how things are done."³³ It is also in line with the openness to experimentation embraced with the Government's 2017 Transformation Strategy.³⁴

33. Civil Service Human Resources (2015) *Civil Service Competency Framework*, 2012-2017, 2015 Update. Available at: https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/436073/cscf_fulla4potrait_2013-2017_v2d.pdf.

34. Cabinet Office and Government Digital Service (2017) *Government Transformation Strategy: government beyond 2020*. Available at: <https://www.gov.uk/government/publications/government-transformation-strategy-2017-to-2020/government-transformation-strategy-government-beyond-2020>.

SBRI as a catalyst for human centred innovation

So, where are the hackers who will experiment with the think like a system, act like an entrepreneur methodology? As a market-creating method, the Small Business Research Initiative, a pre-commercial procurement programme, could be a key tool in testing the model toward stimulating a human centred industrial strategy. As a demand-led policy, SBRI aims to address one of the main challenges for early stage technologies – finding that crucial first customer. But, the challenge for SBRI is not just to generate solutions to public problems; it is to generate solutions that have impact at a sufficient scale.

For public agencies, there can be two distinct reasons for running an SBRI competition: First, to secure a process improvement – improving the internal performance of a government department or public service they have responsibility for; or second, to meet a broader policy objective – like reducing carbon consumption, for example, by changing market offerings or the behaviours of consumers. SBRI is a programme that does well at producing new innovative technologies, yet these new products sometimes struggle to affect the intended market and achieve the desired impact. This makes it an ideal case study for considering how a different approach could be more successful. The SBRI process is illustrated in Figure 8.

In its current guise the programme has been running since 2009, following a major overhaul of the previous iteration begun in 2001. More than 70 public agencies have used it, and currently about £75m a year is spent through the SBRI. There have been notable success stories, perhaps the most celebrated being PolyPhotonix development of a non-invasive treatment for degenerative sight-threatening conditions caused by age and diabetes – with a device that looks like a sleep mask. It is estimated this will save the NHS around £1bn a year for treatment of diabetic retinopathy and other eye conditions.³⁵

Within this research project we engaged with a number of SBRI commissioners and competition participants. We encountered examples of ideas that produced results in one context, but which did not find a wider market. In one case a process solution made a 26 percent saving of nurse time on a paediatric ward, but could not achieve wider success because it could not find a way around regulatory obstacles. This is an example of where a user-centred design leads to an appropriate solution in one context, but too much complexity prevents it from diffusing to a wider market.

35. Innovate UK, (2015) Op Cit.

Our research here is not systematic so should be considered as observational rather than definitive. We sought to question how to optimise the SBRI model, enabling innovators to think systemically and understand ‘barriers to change’.

Figure 8: SBRI competition process

1	Government department or other public body identifies specific challenge
2	This is turned into an open competition for new technologies and ideas
3	Interested companies submit an application
4	All submitted ideas are assessed for impact on the challenge and technical and commercial feasibility
5	Development contracts (typically £50K - £100K) to assess the feasibility of the idea are awarded to the most promising proposals
6	First feasibility phase (generally 2 - 6 months)
7	Second assessment stage – not all projects will progress to phase two
8	Second phase contract awarded – usually to develop prototype or demonstrator – for up to two years (typically up to £1M); this is the principal period for research and development aimed at producing a well-defined prototype
9	Successful company free to further develop and exploit their product or service, offer to other customers and take to market including competitive procurement

Problems aren't the same as markets

Through stakeholder interviews and a roundtable with SBRI commissioners and entrepreneurs, we found a range of issues arising from SBRI, but a core finding was that despite the fact that it can produce high calibre, design-led innovations, some solutions had problems getting to a wider market or having an impact beyond their SBRI commission. A conclusion we draw from this is that problems are not the same as markets. Competition commissioners are often not the same as the end buyers of the solution and the social challenges or the public service problems that stimulated the brief in the first place do not necessarily equate to clear market opportunities. As one commissioner stated: “The problem is at the back end – how do we get the ideas into the market-place?”

SBRI competitions create ‘competition demand’ for solutions to public problems. But providing the elusive first customer does not provide a guarantee that there will be a second or third customer. Competition demand is not the same as market demand. In one case studied, the (public sector) market demand was extremely low and largely met through the competition, even though the public value of the innovation was very significant. In other cases, where the competition is to address a policy problem, challenges might remain in translating a real social or environmental problem into actual market demand.

“We’ve just received an order for a batch of 100...That will flood the UK market”.

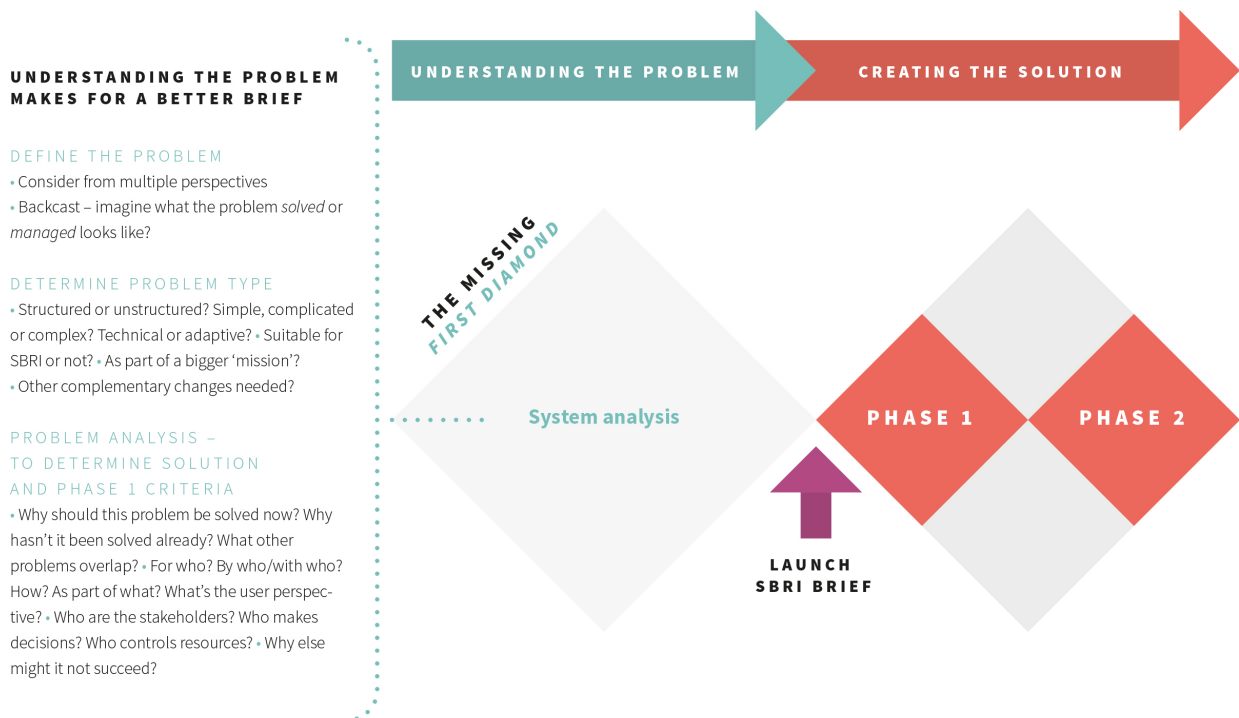
SBRI competition winner

Think like a system for SBRI

There is an opportunity to deploy systems thinking to optimise the SBRI process. Firstly, at the front end there is the need to define a map of the long term market and/or estimate the societal impact. Adding this to the SBRI commissioning process would expose the technological, institutional or other complementarities that might be required to make it successful, the veto points or players who could block it, or other obstacles along the route.

By observing SBRI through a systemic lens, we see the potential of system thinking to the selection of challenges. Much of the unfulfilled potential that our research identified stems from the fact that competition commissioners do not routinely undertake a rigorous systems analysis before they decide on the problem to convert into an SBRI challenge. To counteract this we advocate for the creation of a ‘missing first diamond’ – a think like a system phase for competition commissioners.

Figure 9: The missing first diamond



This is important for three reasons: First, how a problem is defined affects the range of possible solutions that might be considered. The framing of the competition might imply the direction of the solution, perhaps excluding better alternatives. When a problem is considered using a range of methodologies and from multiple perspectives – including user perspectives – this can open up new ways of understanding the problem and new approaches to solutions.

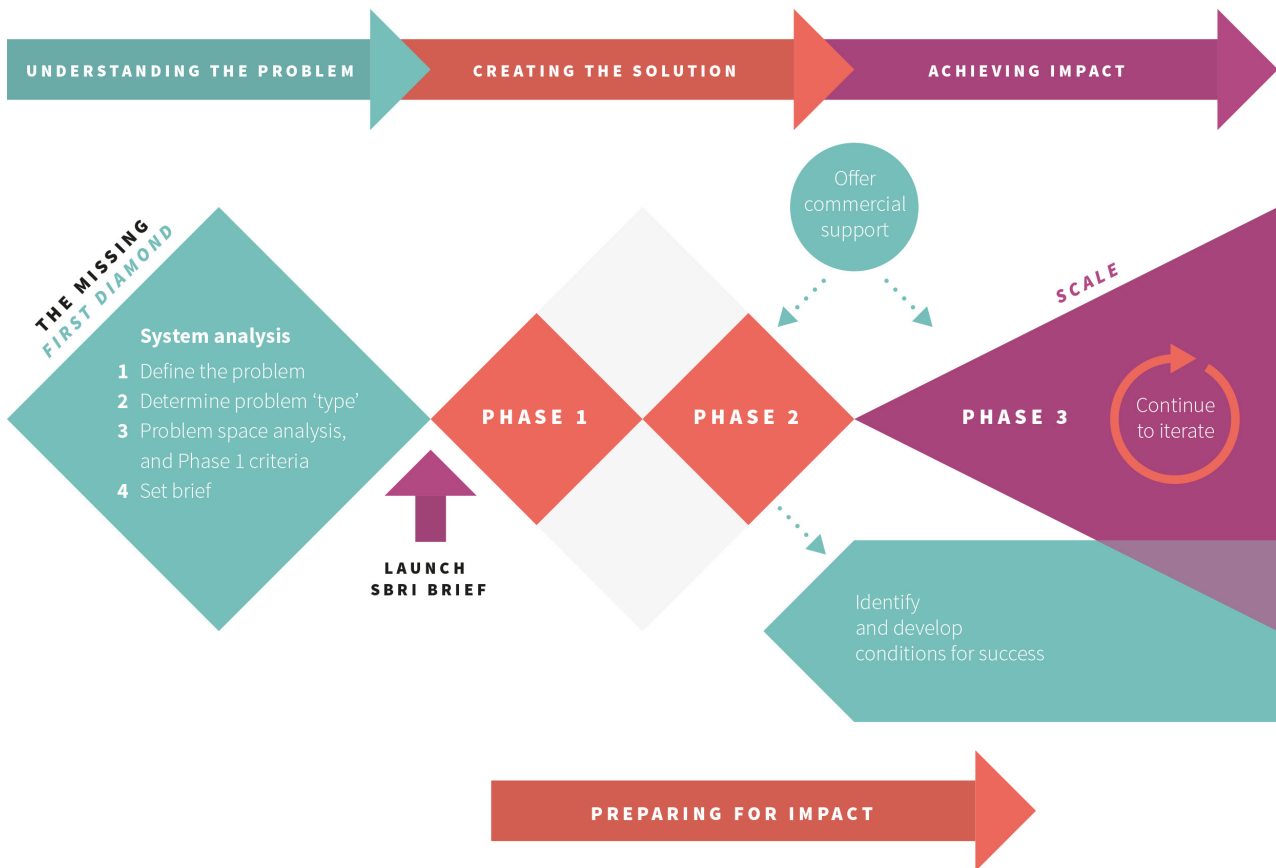
Second, understanding the type of problem (for example, technical or adaptive; simple, complicated or complex) may help to determine whether it is the kind of problem that is suited to the kinds of solutions SBRI competitions are good at developing. And, if it is, is a combination of solutions needed, requiring more than one competition? Alternatively, is the problem of the type that a bigger ‘mission’ is needed to address it, involving multiple SBRI competitions in combination with other problem solving innovation processes too? Would institutional, regulatory or other changes also be needed to address this type of problem, or other problems needed to be solved simultaneously?

Thinking like a system here will include problem analysis (for who? By who/with how? How? As part of what?); understanding stakeholders and power (including who makes decisions, controls resources – including those that can be leveraged, holds blocking cards or might not want the competition to succeed?); considering problems that overlap; and, crucially, thinking hard about why this problem has not been solved already.

Planning for impact

While the entrepreneurial hacks will emerge through the process, the SBRI commissioner could also set the vision for the long term impact of the commission, thus setting direction for the acting like an entrepreneur part of the process. Early scans for market opportunities that are ripe for exploitation, as well as the hacks of the system that will be needed to allow for wider adoption of the innovation, will give a sense of the commercial support and market making that the commissioner may need to undertake to go beyond competition demand to wider market uptake and impact, as illustrated in Figure 10.

Figure 10: A reimagined SBRI



Through our interviews with commissioners it was revealed that the those providing solutions to SBRI challenges often have little commercial experience or had not expended enough or even any thought on how to progress their innovation to be market ready. Innovate UK and commissioners should therefore provide commercial support to competition participants in the phase 2 period and beyond. Given that the impact of an SBRI innovation is often entirely dependent on market success this support shouldn't be considered as an added extra; it should be a core aspect of the SBRI programme.

One feature of this support should be to help SBRI competition winners to continue reiterating their product as they look to scale. It may be the case that barriers to scaling can be worked through by making adjustments – perhaps only minor – to the innovation. Entrepreneurs recognise that creating the successful product or service will require trying, failing, making changes and then trying again, often multiple times. The necessity of this process provides the reason to introduce a phase three to the SBRI process – as has already been trialled in SBRI Healthcare competitions – across the full suite of SBRI competitions.

Conclusions

Applying a systems lens to the question of how procurement programmes like SBRI might be optimised for innovation, we can glimpse the greater impacts that could be achieved. For innovations to scale in complex environments, we need to have different expectations of the patterns of diffusion they will follow. A linear model predicated upon assumptions of an ‘adoption curve’ remains prevalent but lacks an account of the barriers to change that can render even the best innovations unused. A model that acknowledges this system immune response exists is more likely to encourage the types of actions and behaviours that can assist navigation toward effective action.

Undertaking a thorough systems analysis can reveal the likely barriers to change to a given innovation, providing the innovator with time and opportunity to prepare accordingly. A key component of this is expending effort to properly define the problem to be solved. This requires appreciating the type of problem, the problem situation and power dynamics at play. Thinking systemically about how problems are defined is an advance on traditional design thinking and will test the capacities of designers and innovators, but inspiring empowering innovation will take more than just the creative process. Thinking like a system will lead to designing for impact.

Procurement processes guided by systems thinking recognise that the development of complementarities – from other products, to training needs, to new guidelines, even to new regulations – may be needed to shape the most fertile environment for a good idea to have real impact.

Thinking systemically can assist in matching the correct kind of response to the problem. However there will always be challenges for innovations negotiating obstacles of different missions, power dynamics, cultures, rules, budgets and boundaries. The answer is not to wish these obstacles away. It is to find a way through. This requires patience, fortitude, courage and a proactive eye for opportunities. It makes an entrepreneurial mindset crucial: always focusing on what can be done now and on identifying the points of leverage that can be manipulated to create disproportionate change within a system.

Innovators must see shaping this wider environment as part of their responsibility. This could be particularly crucial for programmes like SBRI. Aside from designing to the specification of the first customer, this wider ability to reshape the environment into which an idea will emerge is a true advantage that a public innovation programme has over ideas developed solely in the private sector. Understanding this market making power – and thinking strategically about how to use it – lies at the heart of how to optimise procurement tools like SBRI for innovation.

Making change happen in a complex world

Operationalising a systems thinking driven approach to procurement will pose many challenges that need to be tackled: new approaches to support business and entrepreneurship in design; new ways to unlock the potential of procurement; the need to understand how to play to regional strengths and create new place-based institutions that can direct innovation toward societal needs.

Above all, however, is a need to look beyond the stimulation of creative ideas to the deeper changes that are needed in institutions, policies and regulatory frameworks in order to support innovations achieve maximum social and economic impact. As this report has endeavoured to show, the broader environment into which an innovation is born matters as much as the idea itself in determining whether sustainable innovation is achieved.

When thinking about the pursuit of impact, we should care as much about how we achieve it as about the goals we pursue. Making change in systems as complex as public health or education may seem insurmountable. By applying the think like a system, act like an entrepreneur mindset, we do not attempt to take on grand societal challenges in their entirety, instead we look to identify nimble opportunities for change within the system, seed innovations, test prototypes and support successful efforts to grow and influence other parts of the wider system. This is where, at its best, SBRI has the potential to serve the dual goal of both making commercial markets for innovations and delivering social impact at scale.

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8 John Adam Street
London WC2N 6EZ
+44 (0)20 7930 5115

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