



INNOGEN INSTITUTE

RESEARCH ON INNOVATION IN THE BIO-ECONOMY – SCIENCE INTO IMPACT

The Innogen Institute (Institute for Innovation Generation) is the successor to the ESRC Innogen Centre that, from 2002-14, published over 1000 articles (over 500 in peer reviewed academic journals), trained 40 successful PhD students, and gained funding of £12M for over 100 projects in addition to the £7.7M from the ESRC (www.innogen.ac.uk). Our research programme focuses on science and innovation communities, policy makers and regulators, and citizens and stakeholder groups, conducting in-depth research within each of these constituencies and integrative analyses of their interactions. This enables us:

- (i) to understand how these interactions determine which products, processes and services are able to reach a market place, over what timescale, in which industry sectors, regions or countries, and
- (ii) to identify where change at particular pressure points in the overall innovation ecosystem could work most effectively to enable innovation to take place safely, more rapidly and more efficiently.

Our unique combination of cross-disciplinary and cross-sectoral insights and expertise enables us to support company and policy decision making in translating research findings to advanced innovative technologies¹ across a diverse array of sectors.

The Innogen Institute is unique in having the analytical insights, based on the following framework of methods and guidelines, to improve the capacity of innovators to develop business models and value chains¹ to move from basic science to market application. There are major differences across sectors in the relative importance of different external influences on these value chains (see Figure 1). Among the most important are:

- scientific and technological uncertainty (what will work);
- regulatory impacts on translational processes;
- the benefits and challenges of open source approaches to innovation relative to investors' needs for intellectual property protection;
- the need for novel funding approaches for advanced, speculative innovations;
- the complexity and uncertainty of future pathways to market in the face of global competition; and
- the eventual citizen acceptance of an innovative technology.

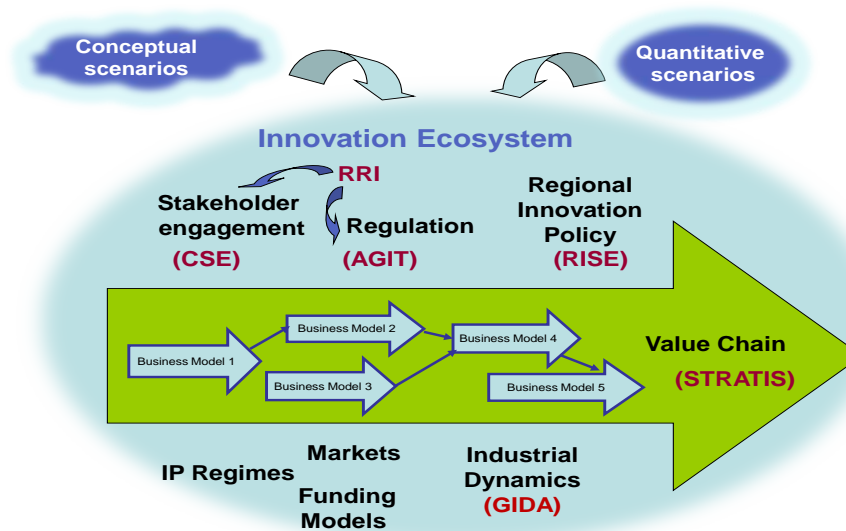
Our analyses can shift perspective from that of the innovator to that of the policy maker or regulator, and/or to those of citizens and stakeholders, and to integrate insights across these perspectives, enabling us to locate the pressure points within a complex innovation ecosystem where efforts to improve innovation processes can most effectively be focused. Figure 1 illustrates the overall approach, encompassing the following methods and guidelines that we have developed

¹The value chain describes the range of activities required to bring a product or process from conception to end use, including design, production, marketing, distribution and business support. Depending on the nature of the opportunity and the complexity of the route to exploiting it, the value chain may be restricted to a single, probably large, firm, or may encompass a number of firms with different business models operating in sequence or in parallel, nationally, internationally or globally.

to contribute to conceptual and quantitative scenarios to aid decision making by innovators, policy makers, regulators, and third sector actors.

- *Strategic Planning for Advanced Technology Innovation Systems (STRATIS)*ⁱⁱ – supports analysis of current and future business models and value chains for advanced innovative technologies by: enabling better decisions on technology development; being adaptive to emerging technology changes; understanding better where convergent innovations can generate or close off business opportunities; planning how to integrate business models along a value chain; and taking account of factors external to the value chain that can act as enablers or constraints on innovation.

Figure 1. Innogen framework of methods and approaches.



- *Adaptive Governance of Innovative Technologies (AGIT)*ⁱⁱⁱ – guidelines for decision making on regulation and governance that distinguish between the different requirements of basic research and more downstream developments and consider how smarter policies and regulations could facilitate safe and societally useful innovation.
- *Responsible Research and Innovation (RRI)*^{iv} – building on the AGIT approach, improves on current EU and UK initiatives in RRI, gives greater consideration to innovation issues than is currently the case, and extends beyond ethics and stakeholder engagement to develop a broad practice oriented approach to the concept of responsibility.
- *Regional Innovation System Evolution (RISE)*^v – supports regional innovation policy decision making, building on EU Smart Specialisation initiatives and integrating them with more detailed consideration of the regionally located innovative capacities and likely future value chains in specific innovative sectors.
- *Constructive Stakeholder Engagement (CSE)*^{vi} – takes account of a broad range of public views and stakeholder perspectives, and includes criteria for the quality of evidence to be considered in a dialogue, along with approaches to decision making in the absence of a consensus of views among stakeholders.
- *Global Industrial Dynamics Analysis (GIDA)*^{vii} – supports decision making related to the changing global structure and balance of health, agricultural and environment related industries.
- Other issues including: open source and intellectual property (IP) considerations; development of standards; the need for more innovative funding models; and market related factors.

This integrated suite of approaches and guidelines has been applied in a range of contexts, including: pharmaceuticals; stratified medicine; stem cell therapies and regenerative medicine; genetic databases; industrial biotechnology; synthetic biology; food production; GM crops; and biofuels. It is also the basis of Innogen's current contributions to policy discussions and decision making on: industry innovation practices; responsible research and innovation (RRI); smarter approaches to regulation; open source initiatives for research and innovation; the development of standards for synthetic biology; EU and UK regional innovation policies; and new more constructive approaches to stakeholder engagement and dialogue.

ⁱ David Willetts (2013) *Eight Great Technologies*, London: Policy Exchange

ⁱⁱ Mastroeni, M., Mitra, J. and Tait, J. (2012) Methodology for the Analysis of Life Science Innovation Systems and its Application to Three Case Studies. REALISE Project. Innogen Centre Report to Technology Strategy Board. <http://www.innogen.ac.uk/reports/490>;

Mitra, J. and Tait, J. (2012) Analysing Stratified Medicine Business Models and Value Systems: Innovation-Regulation Interactions. *New Biotechnology*, 29(6), 709-719.

ⁱⁱⁱ Lowrie, H and Tait, J. (2011) *Guidelines for Appropriate Risk Governance of Synthetic Biology*. International Risk Governance Council Policy Brief

<http://www.genomicsnetwork.ac.uk/innogen/publications/innogenpolicybriefs/title,25986,en.html>

^{iv} Tait, J. (2015) *The Role of the Social Sciences in Innovation and Risk Regulation* Innogen Institute Working Paper, <http://www.innogen.ac.uk/downloads/Tait-Role-of-Social-Sciences.pdf>. (Published as Tait, J., (2014)

Bringing it all Together. *In Annual Report of the Government Chief Scientific Adviser, 2014*. Innovation: Managing Risk not Avoiding It. Evidence and Case Studies, pp 129-136

<https://www.gov.uk/government/publications/innovation-managing-risk-notavoiding-it>)

^v Mastroeni, M., Tait, J. and Rosiello, A. (2013) Regional Innovation Policies in a Globally Connected Environment. *Science and Public Policy* (2013) pp. 1–9

^{vi} Tait, J. (2009) Upstream Engagement and the Governance of Science: the shadow of the GM crops experience in Europe. *EMBO Reports*. Vol 10, Special Issue, pp 18-22.

<http://www.nature.com/embor/journal/v10/n1s/pdf/embor2009138.pdf>)

^{vii} Wiold, D (2013) Bioeconomy and the global economy: industrial policies and bio-innovation *Technology Analysis and Strategic Management*, 25(10), 1209-1221