ACPA7005 Introduction to Innovation Management

Assignment B

The setting up of a

'Service Innovation'

Graphene Engineering Innovation Centre (GEIC)

Owned by

The University of Manchester (UoM)

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Monday, 27 February 2023

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Introduction

The UoM, a public research University (UoM n. d. a) where two of it's researchers discovered a new material 'Graphene' (UoM, 2010.b) in 2004 led to a Nobel prize in 2010 (The Nobel Foundation, n. b.).

The GEIC was set up by the UoM as the second Graphene service facility in 2018, with the aim of a specific industrial outcome, the commercialisation of Graphene and 2D material. This service innovation was set up to complement the existing services offered by the 'National Graphene Institute' (NGI) created by the UoM in 2015. (UoM 2018. c). Both facilities together are labelled 'Graphene@Manchester'. (Baker J & Tallentire, 2022 P71/72). The NGI, offers early stage from 'discovery' to 'lab' services up to TRL 3, the GEIC then translates that science into products offering 'Industry led' services to TRL4 - 6/7. Partners take the project up to, potentially TRL 9. Fig 1 graph below (Baker J & Tallentire, 2022 P52/53)

The graph below highlights where the GEIC service offering sits within the UoM bigger picture in relation 'The Manchester model of innovation' (Gowland and Baker, 2022)
Readiness Level TRL v System Readiness levels SRL From James Baker 2020 (explained under 'processes heading')

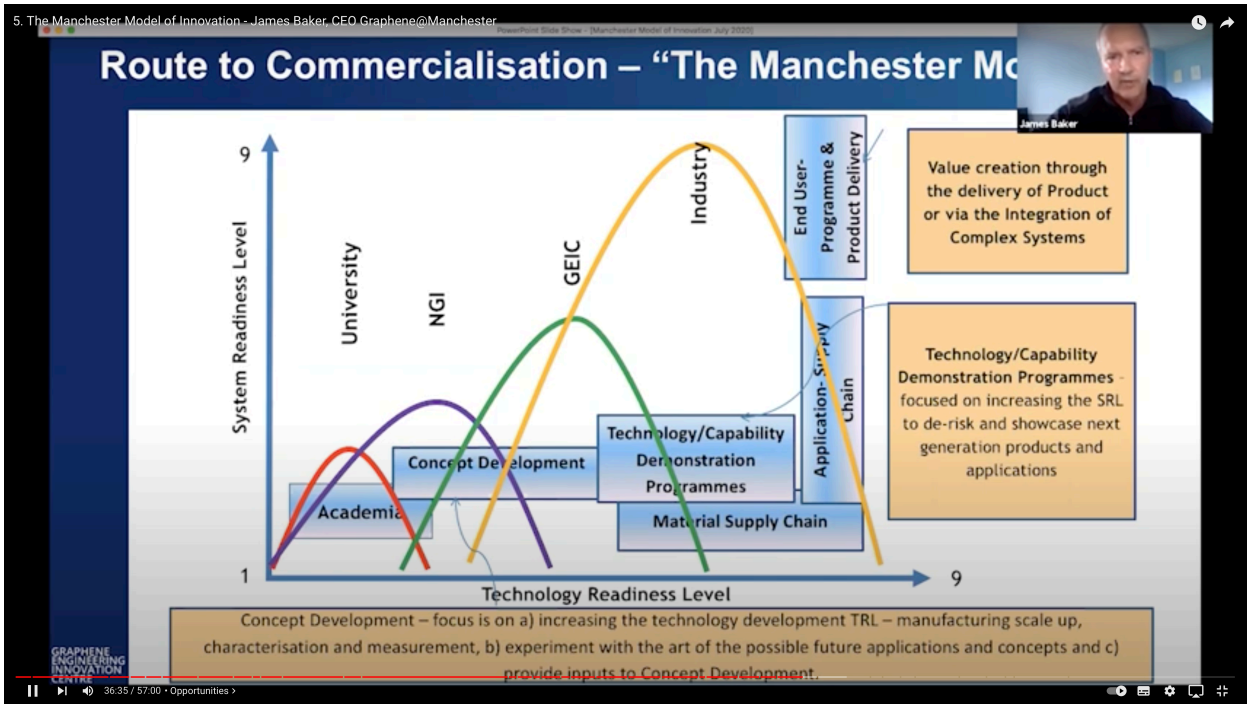


Fig 1

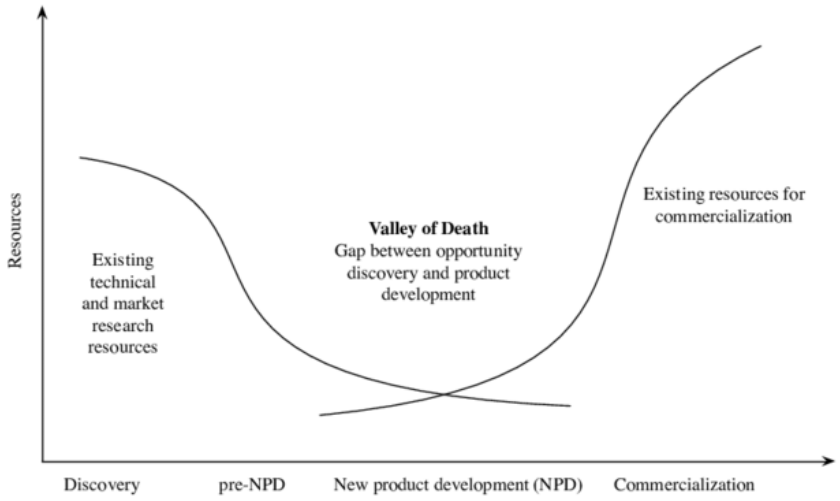
The GEIC, an innovation accelerator, creates value by helping companies/partners venture across the potentially perilous so called 'Valley of death,', which falls approximately within the mid point of the TRL process where their can be financial gaps, infrastructural gaps, lack of technical machinery, relevant personal, professional know how and competences.
(Gowland and Baker, 2022)

The 'Valley of Death' is a metaphor to describe a gap between the development of new scientific knowledge and commercialisation of new products (Biemans and Huizingh 2020; Markham 2002). It also describes a situation where commercialisation projects fail to achieve their goals. "the transition between invention and innovation" (Auerswald and Branscomb, 2003, 229)

The MASDAR buildings houses the GEIC's pilot production process machinery, needed for partners to quickly design, scale up, 'de-risk', and rapidly produce pilot prototypes to see if an idea works with development in composites, energy, solution formulations and coatings, electronics, membranes, Inks and graphene production.

The GEIC does not produce Graphene/2D material to supply to market, only to its partners/customers for trials/testing. The service offers its partner package options for a monthly fee. (UoM gain royalty fee against all ongoing partner product sales).

gain ample resources will be available to take the idea to market.



Cite

Fig 2

The

Principal drivers

We're excellent at discoveries/invention, however, less so when we attempt to commercialise those ideas, This allows competitors to take advantage of our UK discoveries. (Baker J Tallentire J, 2021 P49/50)

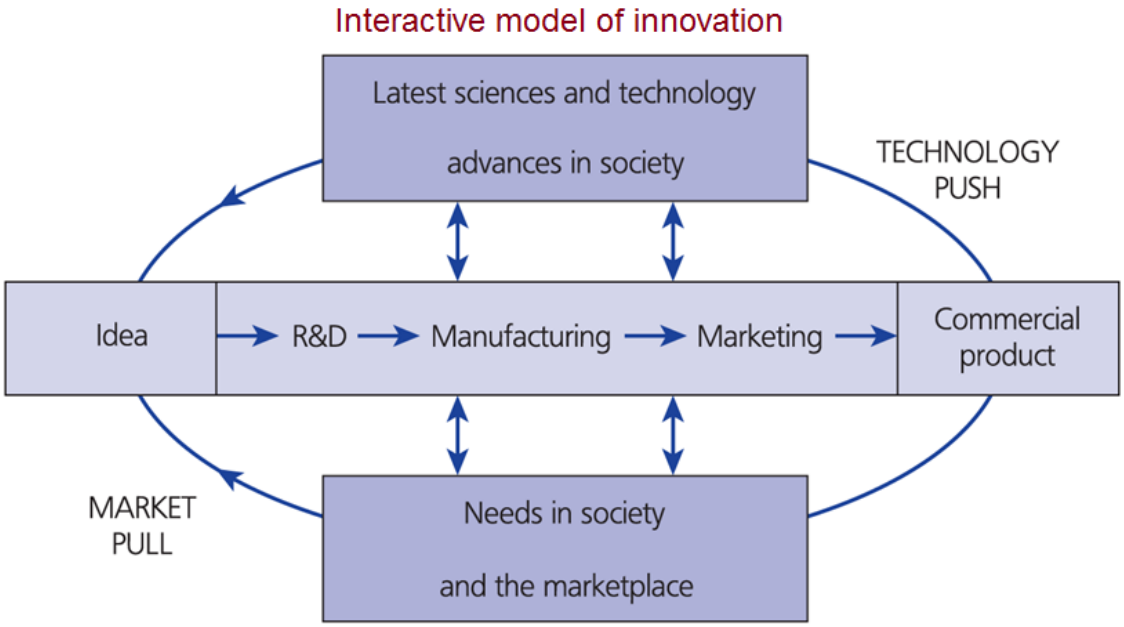
Despite Graphene being looked upon as a potential disruptive technology, one potentially leading to new markets which created heightened partner interest, industry's enthusiasm wained as the project risk was perceived as being too high to pursue beyond the NGI's service offering. The roadmap from 'lab to market' wasn't fully in place (Baker J & Tallentire 2021, 52) (Baker J & Tallentire 2021, 68). Industry wanted a solution to de-risk their Graphene/2D related projects. (Baker J & Tallentire 2021, J P50/51/67)

In 2012-13 The government report, on the 'Vally of death', aimed to gain a better understanding to support the UK's innovation strategy. House of Commons (2012-13). The UoM and the government wanted to strengthen a stronger economy in Britain, (Baker J & Tallentire 2021, P49)

Funding for the GEIC was granted from the following sources which was a key driver for the innovation to proceed. (The University of Manchester, n.d. e).(Baker, J. & Tallentire, J, P68)

- £15m– Research England. (Research England, 2023)
- £30m – Masdar, the Abu Dhabi-based renewable energy company owned by Mubadala. (Masdar, 2023)
- £5m – Innovate UK. (Innovate UK, 2023)
- £5m – European Regional Development Fund (ERDF, 2023).
- £5m – Greater Manchester Combined Authority (GMCA)

Trott (Trott, 2017) discusses the dominant forces within the several models of innovation as drivers of innovation falling into the categories of 'technology push' and 'market pull' where as Tidd and Bessant (Tidd & Bessant, 2009) discuss the major drivers of innovation falling into the categories of either a 'knowledge push' or a 'needs pull'. It could be argued that the new discovery services offered by the NGI represent the 'technology push' (TRL3) where as the GEIC services represent the 'Market pull' (TRL6). Ass a part of the eco-system Rottweil and Zegelt (Rothwell and Zegelt, 1985) discuss the interactive model of innovation links together the technology-push and market - pull models. Cyclic / Coupling coupling of innovation.



Source: Adapted from R. Rothwell and W. Zegveld (1985) *Reindustrialisation and Technology*, Longman, London

Barriers & Risks

The GEIC innovation was at risk of plummeting into their own 'Valley of Death'.

	Minor	Moderate	Major	Critical
76%-100%	Low	Medium	High	High
51-75%	Low	Medium	Medium	High
26-50%	Low	Medium	Medium	Medium
0-25%	Low	Low	Low	Low

Probability

Impact

Simple Probability Impact Matrix - Example 1

‘The Hype’

The Gartner Hype Cycle

In 2004 Industry became excited by the Marketing story of the “Wonder material’ this triggered’ interest on the The Gartner Hype Cycle graph ref Figure 3. In 2010 interest ‘peaked’ when the Nobel prize was awarded for the discovery of Graphene. This interest resulted in great disappointment as It was soon found that graphene was not so easy to adopt into products and applications, at which point interest fell into the ‘trough of disillusionment’ as demonstrated in Fig 3. The graph provides a graphical representation of the maturity and adoption of technologies and how they are potentially relevant to solving real business problems and exploiting new technologies. Investors can sometimes use this research insight to decide when to invest in a technology if at all. They want to discern ‘the hype’ from what is commercially viable. (Gartner, 2023)

(Baker and Tallentire, 2022 P51) On the Impact v Probability Matrix classed as Major.

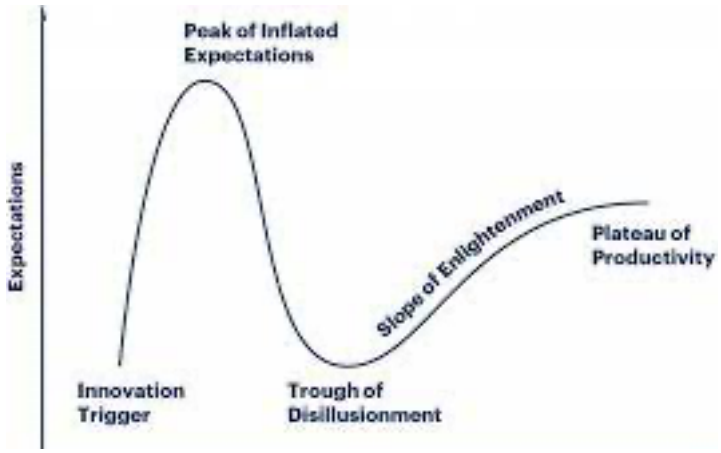


Figure 3

Lack of funds

According to Budi and Aldianto (2020), funding limitation and the lack of funds served as the key cause of VoD. Belz et al (2019) explained that the difficulty of accessing financial resources led to a weak transition of new technologies from the laboratory to industrial applications.

This was a potential barrier in setting up the GEIC service innovation as the UoM had already been given 60M worth of funding for the NGI, applying for further funding for the GEIC from the same sources would prove to be difficult. (Baker, J. & Tallentire, J, Page 51, 112) The Hype Cycle (Gartner, n.d.)

Money was needed for:-

- Expensive equipment (x many applications)
- A specialist building to house the machinery, run operations and deliver the service.
- Specialist training
- Appoint a 'Product Champion' and an effective 'Cross functional' team who are knowledgable and experienced.
- Running costs

Product Champion Technical people find value in discovery and pushing the frontiers of knowledge, while commercialisation people need a product to sell and often consider the value of discovery as theoretical and useless. This can stifle progress and in some cases becomes a barrier... (Markham et al,, 2000)

With the right mindset, the 'The Champion' facilitates the process by bringing both sides together to meet objectives.

Key Determinants in the process of committing to develop the innovation.

1. Funding - covered the cost of the new facility, including specialist machines, workforce and setting up the infrastructure needed for the commercialisation of graphene to succeed.

2. James Baker Product Champion

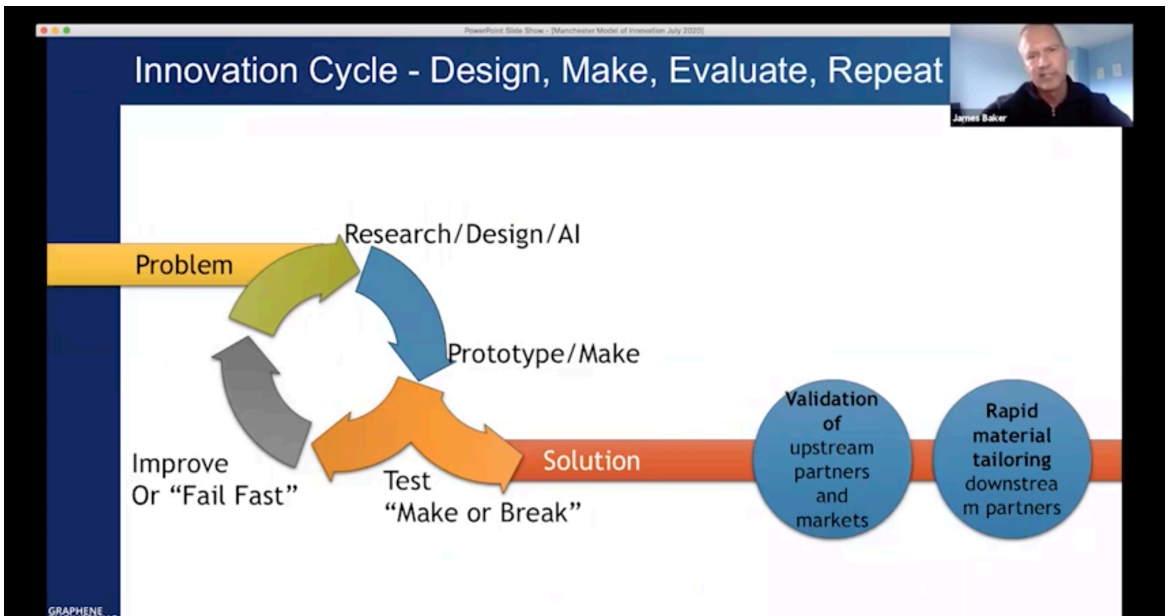
Prior to joining UoM he was involved in the commercialisation and the pulling through of new technology for BAE systems. He undertook the 'futures' activity, where he witnessed great technology and ideas overcome the many barriers during the innovation process. (Baker.....)

James Tallentire - UoM Marketing Manager - Story Teller
Brought the graphene narrative to life through his skills and background in communication and marketing which proved to be instrumental in delivering the right message to the right people at the right time which helped secure the funding. Equaly, over hyping the marketing message can stifle innovation due to over exaggeration which can deter investors.

Kostyra Novoselov researcher (who discovered Graphene) - possessed specialist knowledge and experience in manufacturing Graphene and the setting up of the NGI, that was needed to specify the specialist machinery, help design the GEIC building and facilities.

The Processes & Technologies which the company used to carry the development forward. The GEIC utilises data, AI e.g Labortech Mechanical Tester, which has a 5kN load cell used for testing polymers. Scanning Electron, FTIR, Raman, Scanning Electron microscopy, Spectroscopy equipment to probe the chemical nature of the structures produced: Physical Electrical properties.

The Innovation Cycle Process - Design, Make, Evaluate, Repeat above responds to a problem research and drawing on digital tools like AI and big data, to help design a solution. A prototype can then be developed and tested to see if it breaks. If the design does fail then learn quickly from the experience and refine the design (fail fast) and repeat this cycle until you achieve a reliable solution. We should not fear failure but we should really push the boundaries of what we might traditionally look to do but do so not over a long and prolonged timescale. By exploiting modern technology and working across the supply chain using rapid manufacturing and prototype techniques you will be able to demonstrate concepts with rapid prototypes (James Baker, Liam Britnell, Craig Dawson.P) Utilise up to date technology such as AI, Digital Twin technology (Stock, 2014). (Bhat , M., James, E., Ledwith, A., & Nicholas, J. n.d.)



, 2002)

The GEIC has adopted Open innovation to develop this innovation service, who follow Dr Henry Chestbrough (2003) of which is regarded as an information–creation process that arises out of social
interaction sharing information both inside and outside the organisation.

Technology Readiness Level (TRL) scale (Nasa, n.d.) was originally developed for NASA as a metric to measure the maturity and usability of an evolving technology (Olechowski et al., 2015).

System Readiness Level (SRL) as a second axis to capture the progress of various manufacturing commercial and other consideration, such as regulatory compliance that can provide barriers to accessing a market.(Nasa, nd)

Extent of external resources and how they were managed
Overall, managing the innovation process via a subcontractor requires careful planning, clear communication, and close monitoring. Security considerations should also apply such as NDA agreements.
The chosen, 'Approved suppliers' as listed below offered benefits such as increased flexibility, reduced costs, and access to specialised expertise.

CRM - A new CRM solution was adopted to ('SaaS, Software as a Service') streamline communications for customer onboarding and case management. Prince 2, with stage-gate embedded was used by the PM for implementing the solution. The software is set up to link electronically via (API) to their PPMS core asset system, and track the TRL and SRL for each of the customer projects. Having a Stage-gate process imbedded within the CRM case management system, and pulling in data from other systems allows executive managers, gatekeepers, project leaders a better insight into projects within their portfolios at any given time.

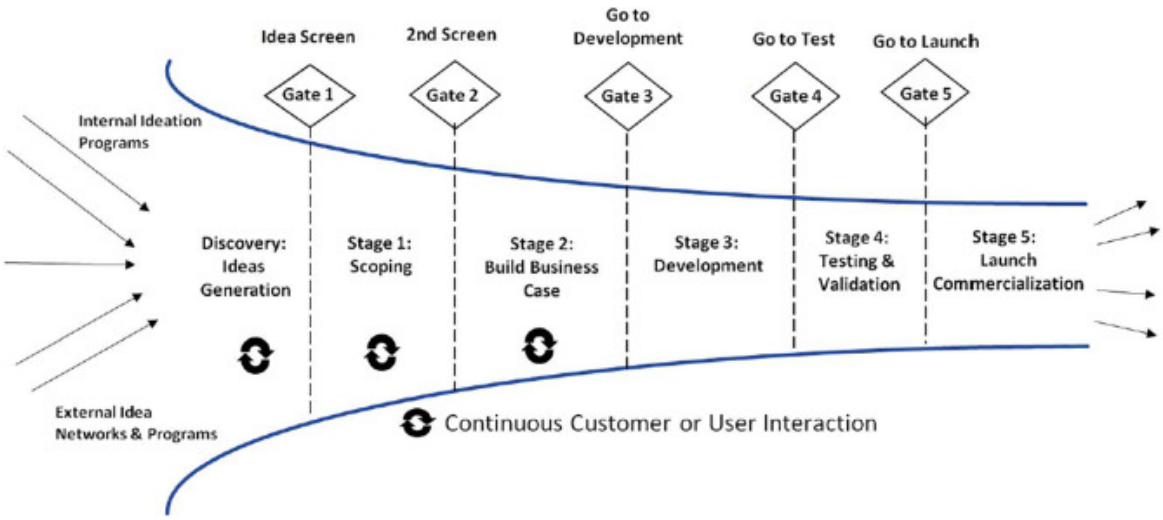
Marketing research - Subcontracted to Consultant

Industrial companies were identified as key potential users of the GEIC, from large to small SME and interviewed,.https://innovation-success.com/case_study/the-graphene-centre-a-strategic-review/

Stratocore (formally called PPMS) Core Facility scheduling & scientific project management software. increases administration efficiency. The hosted solution can be accessed by customers and staff. It allows reservation i.e. instruments, remote training, financial accounts of core charges etc Facility usage tracking, (Stratocore, n. d)

How management overview of the development was maintained.

The stage-gate process is an innovation management process as shown in Fig 9. (Robert



Cooper). Management overview is regularly maintained. Gates are in place for review through out the process to transform an organisation's best new ideas into winning new products'.

As an example, the 'process innovation' within this project, adopted software, to not only streamline operations, but to also monitor the progress of each customer's innovation project e.g KPI's, TRL & SRL scale or Agile Innovation cycle' prototyping. details under title 'Extent of external resources and how they were managed.

The Extent to which you feel this innovation process represents best practice

There is no unified out look of what constitutes best practice. James Baker states, 'there were great examples in the UK to draw inspiration from such as the HVM catapults that had been created to translate some of the great activity from universities into industrial manufacturing capability' (Baker J, 2021 P56

Through the creation of partnerships, collaboration and open innovation the GEIC service value offering is modelled greatly on the idea from DARPA prototyping approach in the USA, considered to be a powerful research and development agency that looks to bring often radical ideas rapidly into application.

CRITIQUE

There are clear indicators of success and positive outcomes on the innovation journey e.g the quality design of the Masdar building won two accolades in social impact awards organised by the RICS. In 2019 the GEIC won the "design through innovation" award before going on to win the overall "Project of the year" North West, which recognised the scheme that demonstrated outstanding best practice and exemplary commitment to adding value to its local area" building. Best practice in terms of Subcontracting innovation Pros and cons

An important measure of whether a product innovation represents best practice within its specific context will always be its ultimate success within the marketplace.

Being part of the Graphene Engineering Innovation Centre (GEIC) community at The University of Manchester is incredibly important to Versarien. It gives the company an additional strength:

graphene was first isolated in Manchester in 2004, it's the home of graphene, and often that's a great starting point for customer conversations'.Over the last three-and-a-half years, we have been able to use these facilities to test new ideas and products and scale up products to take to market'. (Barkan, 2022)
Steve Hodge, the Award winning CTO of Versarien plc and Graphene Industry Champion.

This innovation ran very high risk at the expense of the public purse, with a focus on Graphene material only.

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Product Champions Crossing the Valley of Death," in The PDMA ToolBook for New Product Development. Eds. Paul Bellevue, Abbie Griffin and Stephen Somer Meyer. John Wiley & Sons, Stephen_Markham@ncsu.edu

Dyer, Gregerson, and Christensen (2011) found five skills that push new ways of thinking, spur and support innovation, and represent distinguishing features of organisations known for innovation:
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