

Engineering Serendipitous Innovation through Knowledge Brokering

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Abstract

British SMEs and much larger organizations are running a huge innovation deficit that has yet to be calculated. The cost of not applying what is known and relevant to delivering new value is probably incalculable and the problem is the permeability of new ideas within existing organizations restricted by the power of legacy operations, cultural inflexibility and lack of peripheral vision.

This working paper provides examples of serendipitous innovation through discovery, proposing social innovation approaches based on connecting innovative SMEs' knowledge and capability through a systemic approach to knowledge brokering through utilising current functions within the University of Greenwich in a novel partnership to connect innovators and transform profitability. A simple Knowledge Application Culture model is introduced.

1. Innovation Deficit Context

Back in 2010, Henry Chesbrough pointed out that the few ideas adopted at Palo Alto Research Center that made it to market were all innovations that fitted Xerox's existing business models [1]. Those ideas that escaped and changed the world of personal computing all required new customised business models. It is only possible to guess at the impact that legacy innovation models is having on innovation-attrition, but if we include the impact of legacy new product development models where risk is calculated on the novelty of innovation, it becomes obvious that having innovative ideas is not the problem, but building satisfactory eco-systems that turn them into new value is becoming increasingly difficult as minor differentiation and extensions around current products, services and business models becomes the norm. It could be argued that the proliferation of publications and masterclasses on managing stage-gate decision meetings is the product of the difficulties of justifying minor innovation as well as the difficulty of evaluating truly novel ideas that may require shifting from the current customer context.

The innovation deficit as a concept grows when approaches to strategic innovation are focused on "market-taking" rather than "market-making"; in other words: some major players calculate the size of the potential market and drive innovation investment in capturing estimated market-share (which is seen as largely static) rather than including deliberate innovation investment to change the shape of the market itself.

The second problem, of cultural inflexibility is a phenomenon that reflects the fact that innovation is both a social and political act. Social in that innovation changes relationships between workers and customer behaviours, and political in that when innovation becomes a stable technology, a new power-structure built around stabilising that technology also emerges. But our problem of cultural inflexibility toward innovation is a product of failing to understand and apply some simple lessons that could enable wider success in dealing with the social and political problem of innovation in organizations.

The third problem of peripheral vision involves the old issues of curiosity, energy levels and the ability to put the core business into a wider context, moving thinking from being just about the business to thinking about the business as just one business among many different types of business who all have to pay attention to similar issues.

In 2007, an exploratory exercise was conducted within innovation workshops for the NHS Institute for Innovation & Improvement identifying 3 antidotes to overcoming to the NHS's cultural resistance to implementing innovations from outside [2]. These solutions were largely social and included active consideration of the following:

- a. User Perspective: the person selling the innovation needs to look and talk like the person or group they are selling to. This means they need to dress and speak in a way that demonstrates that they come from the same, shared context as the potential user of the new idea and understand their world.
- b. WII4E (What's in it for everyone?): the benefits of the innovation need to include the user as well as the patient. This means that the innovation needs to be designed with the user's working environment and daily work-cycle as well as with the patient in mind. The innovation needs to be designed to fit both the user and the customer.
- c. Stay Hungry: recruitment preference needs to include identifying recruits in the future who want to innovate in their work-practices and participate in constructing consistent performance in serving the patient's needs and delivering outstanding outcomes.

Assuming these antidotes to innovation resistance apply generally, there is probably some advantage in applying them within the SME sector to facilitate innovation replication and take-up to enable faster absorption of innovation into organizations' working and living contexts.

The problem is about building a new type of innovation leadership, one that is agile and aware of useful elements of legacy approaches to innovation, and capable of constructing and adapting innovation eco-systems that are fit for purpose, that fit the innovation rather than excluding innovations that don't fit, and able to identify and apply serendipitous discovery (instead of ignoring it).

2. Exploring Unknown Unknowns to Innovate Serendipitously

Part of building peripheral vision or an Agile Innovation Leadership approach is to encourage a willingness to consider or maintain interest in unknown-unknowns, as Donald Rumsfeld [3] expressed it: “There are known knowns; these are things we know we know. We also know there are known unknowns; that is to say we know there are some things we do not know. But there are also unknown unknowns – the ones we don’t know [that] we don’t know”. This famous Donald Rumsfeld suggested that energy and intellect was required to deliberately attempt to populate a 2 x 2 dichotomous matrix, where the most dangerous potential space was that of the unknown, unknowns: where we “don’t know what we don’t know” similar to what Taleb [4] refers to as “black swans” or outlier conditions and events, and are therefore vulnerable and currently “blind” to emergent threats or opportunities.

Leaders with an curiosity for exploring unknown-unknowns tend to be like Clive Woodward whose first love of football (and Chelsea in particular) meant that he was an effective innovator by being able to borrow from other sports (like NFL, athletics, baseball), to see rugby merely as a sport among other sports [5]. This perspective meant he could see more widely and deeper than the competition, which gave him freedom to innovate due to being able to see potentially-useful information outside his current context that was applicable his business, which gave him more choices.

The issue of unknown unknowns could be approached head-on or indirectly through a programme of Breakout Benchmarking [6] to begin the process of asking better questions, in other words constructing a comparative matrix comparing strategic core processes with a competitor (direct contextual comparison, Land Rover Freelander 2 and Toyota Landcruiser) and with an out-of-sector/ context organization that does something similar (Great Ormond Street post-operative neonatal hear surgery stabilisation prior to movement to intensive care unit and Ferrari Formula 1 pit-stop disciplines). A Breakout Benchmarking matrix could also compare tactical capabilities or processes that apply across all businesses, like risk management, pricing and selling strategies with the potential for differentiating the product, service or business model (both in and out of sector or industrial context). Another approach would be to form a collaborative alliance of businesses with novel capabilities with the potential to add value or build new value in current and alternative contexts. This will be explored later in this paper.

There are many examples of how an idea in one context, has new emergent properties and value when it is translated into a new context. Examples include how

- Viagra (sildenafil citrate) designed to help patients with low blood-pressure, was inadvertently discovered as a means of treating erectile dysfunction;

- Ray Kroc's discovering a customer buying unusual volumes of his milkshake mixing machines with a simple business model led to the development of the McDonalds' global franchise;
- A Russian physicist's paper on the properties of differently-shaped objects when reflecting radar waves led to the first stealth-fighter;
- Clive Woodward as England Rugby coach consciously chose to explore "Critical Non-Essentials" (CNEs) or those items which if developed using existing solutions outside traditional rugby and methodically integrated, could differentiate performance and which led to victory in the 2003 Rugby World Cup.
- Eiji Toyoda led the transfer of methods for reducing waste within Japanese cotton loom manufacturing systems to the automotive sector, to derive a new ideology in the form of the Toyota Production System for identifying and removing new forms of waste, that changed manufacturing forever; and finally
- Where an MP3 player device and bootleg downloading over the internet, led to a new business model in the form of iTunes, which with data analytics will ultimately transform higher education and publishing and bring them into the media industry.

These few examples suggest that ideas and techniques from one context have emergent properties when they are translated into new contexts and combined with current capabilities that deliver new market value that may not have been previously suspected or were hidden. The practical experience of successfully operationalising the serendipitous discovery of Viagra by means of constructing a searchable database [7] as a means for discovering alternative uses of existing drugs in 2003, underlines the potential for consciously engineering serendipitous innovation in the pursuit of new value.

Similarly, constructing Collaborative Value Architectures [8] whereby technologies are combined with new value propositions to change the behaviour of patients and customers (and even young drivers) are gaining acceptance as industry slowly begins to understand the potential of using sensor-based devices over the internet. These are currently largely driven by telehealth and Nike/ Garmin performance-tracking wrist devices to track and manage transactions and behaviours that enable athletes and coaches to manage performance more efficiently. A great example is the latest version of the Prozone system in Rugby whereby each player wears a real-time GPS device that whilst measuring movement, force of impact in contact and heart-rate can signal when a player has entered their personal "red zone" (of operating above the 85% maximum heart-rate and has become vulnerable to injury). Formula 1 employs similar GPS monitors to measure the impact of G-forces on drivers [9].

Putting it all together, the new innovation economy based upon the internet and its ability to change customer expectations involves 3 key elements: translation, combination and collaboration.

3. Recent Experiences with Innovative SMEs

Part of a recent exercise in building SME relationships between GRE, the Business School and C4i3 (the Centre for Innovation, Imagination & Inspiration) at the University of Greenwich involved a series of visits to potential SME partners introducing our SME approach to developing capability based on the Flash Innovation programme workshops and also to offer SME partners an opportunity to collaborate with the MBA programme in supplying industrial consulting projects for the postgraduates to practise and develop their skills. This open approach to engaging with SMEs in the South-East led to some surprising, serendipitous discoveries: that there are great SMEs who are good at what they do who whilst not obsessively applying lean thinking across their entire enterprise, have identified and solved problems by developing techniques that integrate different forms of knowledge with immense potential within a wider or alternative context. It became quite clear after a small number of joint visits, that several SMEs had developed knowledge and capabilities which whilst supporting the core business, were in some ways so advanced as practices that these SMEs had the potential to act as demonstrator sites for businesses in other industrial sectors who in turn, could then access knowledge and capability with the potential to transform their own operations if such knowledge & capability were translated into a practice, and combined with current business models or strategies, through a non-competitive collaborative knowledge network.

Here are six recent examples of organizations with Knowledge Products or knowledge “nuggets” with wider potential through translation into new contexts or through new partnerships.

- Company A, is a plastic extrusion business in a largely low-margin, highly competitive industry which became involved in pressure-valve design, manufacture and export and realised that assembling these devices involved complex and rapid movement with the potential for developing repetitive stress injuries among the workforce with the potential for incurring levels of worker compensation which could rapidly destroy the financial health of the business.

To overcome this problem they developed a working partnership with an industrial robot manufacturer to construct robotic assembly cells, thus removing RSI risk from the manufacturing environment. They now have the capability to rapidly design, test and implement robotic solutions for assembling complex, intricate and delicate products in other fields like medical devices or aerospace, and thus move up the value-curve (in terms of volume and value from differentiated to niche products). Their potential knowledge leadership lies in their ability to manage a customisation process in similar and diverse contexts.

- Company B, is a traditional marketing publication business which in the process of moving from just-in-case publication to just-in-time, developed advanced analytic capability similar to Amazon's in being able engineer predictability into what customers were likely to want in advance (once they fitted a dynamic customer profile) and identify additional complementary options that were likely to be triggered by their position in their dynamic customer profile.
This has reduced holding reserve volumes of stock in a warehouse and changed the way they interact with their customers through their ability to anticipate demand and introduce a more profitable business model.
- Company C's innovation team in a large multi-national consumer electronics company approached GRE to discover the relevant expertise within the University. GRE went beyond merely outlining the areas in which the University could provide innovation support to Company C but outlined the capabilities in its wider network of innovative SMEs and start-ups that could help the Company produce innovative products. In effect GRE acts as part of Company C's open innovation outreach, or as an innovation scout. The benefits to Company C are the University's impartiality in not trying to sell a particular technology or platform, and ability to provide qualified open innovation opportunities.
- Company D has patented technology for on-line gaming scratch-cards and wanted to diversify the technology into sales promotion. GRE introduced company D to an on-line fashion promotion start-up. Company D is now developing their on-line promotion scratch-card technology with the promotion company as their first customer.
- Company E is an Electrical and Mechanical Engineering contractor working with infrastructure providers to upgrade or build new transport terminals. They act on behalf of their clients to de-risk the introduction of new technology by ensuring compliance with the client's regulatory environment. The role of GRE has been to understand their value proposition and then introduce them to new start-ups and SMEs who have complementary technologies and capability that can help them meet client needs.
- Company F is developing an innovative crowd management and pedestrian dynamics software product, based on crowd analytics. They have recently completed a project with metropolitan airport involving the use of the current CCTV camera system to manage pedestrian flow, passenger-time to gates and waiting times.

In these cases, few of the companies are aware of how unusual their identification of these problems has been within their industry (their competitors largely ignore these issues) and currently treat their tacit capability as an everyday activity without wider potential. Whilst A & B, are currently not aware of the generalizable

potential of their tacit capability, C & D have become aware of the potential to move their core capability into new customer contexts, and E & F have only become aware of their complementary capabilities to introduce new value into the management of travel networks through the mediation of GRE as a knowledge broker.

This is not to suggest that say they should all productise their capability, give up the core business and become consultants in generally applying this knowledge, but there is clearly a wider, national opportunity to identify and locate, translate, harvest and release serendipitous potential in the form of emergent value from identifying similar innovative capabilities or knowledge nuggets, and make them visible in a way that doesn't trigger traditional not-invented-here behaviours from potential users.

4. Introducing the Innovation Knowledge Broker Role to Construct an Active Social Innovation-Network.

There is a clear strategic role for an Innovation Knowledge Broker who understands the emergent value of engineering serendipitous discovery relationships within the South-East (and perhaps even at a national level by partnering with the Technology Strategy Board). This Knowledge Broker role is one that a University like Greenwich, with its ability to build relationship with SMEs, its GRE infrastructure and Business School's C4I3, is uniquely positioned to exploit the potential for what Kealey [10] calls "social innovation" by changing users' interaction with existing innovations by constructing an active social network populated with knowledge nuggets being actively applied by successful users, with the potential to be applied in different contexts to deliver serendipitous value.

Such a Knowledge Broker would need to be able to populate a Knowledge Application Culture Matrix [11] as in figure 1, which identifies an innovation knowledge broker's key activities within a social innovation network constructed to support serendipitous innovation. Within figure 1, the 2 key partners are (1) the local Practitioner-Handyman and (2) the Knowledge-Broker. Their interactions are key to establishing the network in the early days of the social innovation network lifecycle with useful, differentiated knowledge nugget demonstrator sites.

<i>External Knowledge</i>	(3) HUNTER-GATHERER: Innovation-spotting & scouting; Identifying potential & unusual practices.	(2) KNOWLEDGE-BROKER: Big picture context, building user social network of demonstrator sites.
Internal Knowledge	(1) PRACTITIONER-HANDYMAN: Local problem-solving & solution-building by members.	(4) TRANSPORTER-REPLICATOR: practice identification & knowledge productisation.
	Internal Market Application	External Market Application

Figure 1: Knowledge Application Matrix for Serendipitous Innovation

The Knowledge-Broker needs to rapidly develop their own (3) Hunter-Gatherer capability to analyse further Practitioner-Handyman organizations (probably using Breakout Benchmarking as a membership profile audit from which to build new connections) to introduce into the network; and potentially develop a (4) Transporter-Replicator function capable of taking tacit/ emergent practice behind a knowledge nugget and turn it into a knowledge product capable of wider dissemination. By applying the lessons from the 2007 NHS Institute for Innovation (user perspective, wii4e, and stay hungry) within a social innovation-network constructed to enable the 4 types of activity identified within the Knowledge Application Matrix, and using Breakout Benchmarking and related serendipitous techniques it will be possible to manage the social and political aspects of enabling the identification and adoption of innovative techniques as a social rather than as a purely mechanical process.

5. Conclusions

The UK, especially London and the Southeast of England have a large and diverse SME and start-up base. The start-up community is much less driven by the competitive instinct to maximise the success of their business at the expense of competitors at this stage in their lifecycle, whilst stable SMEs are often willing to cooperate in sharing non-core capabilities with the potential to solve complex problems of interested organisations. It has been the authors' experience that stable SMEs are willing to act as demonstration sites for practical solutions within a virtual learning enterprise to share practices and technologies that differentiate their performance in bringing products to market.

However, SMEs and start-ups do not have the time or resources to understand how their intellectual capital can be best exploited in this way, to translate, combine and collaborate. Consequently there is role for Universities, such as the University of Greenwich and GRE, to act as the locator and integrator of potentially-valuable offerings in the form of differentiated knowledge products or nuggets through developing a strategic Knowledge Broker role to begin to realize the potential opportunity for value creation within the current innovation-deficit environment to move the national performance dial a notch further forward. Further, it is also the case that large organizations, ranging from traditional manufacturing concerns (such as BAE and Unilever) to retailers (such as Tesco) are becoming active in the open innovation arena. However, they do face significant business culture obstacles in engaging with SMEs, start-ups and the lone inventor that a University may be positioned to overcome.

There is an important role for Universities, and the Knowledge Transfer offices, to act as an agency or broker connecting SMEs to larger concerns, filtering and drawing to their attention the range of potentially-innovative solutions they seek that already exist.

6. References

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