Innovation Management, Innovation Ecosystems and Humanitarian Innovation

Literature Review for the Humanitarian Innovation Ecosystem Research Project

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Executive Summary

Innovation matters. In the business world this is a clear imperative – if we don't change what we offer the world (products, services) *and* the ways we create and deliver them (process innovation) then we may not be in business for long. Innovation is often presented as a survival issue and this provides a powerful metaphor to focus attention on the need to manage innovation and to update our capabilities to do so on a continuing basis.

But of course there are situations – at the heart of the humanitarian sector's concerns – where we really are talking about life and death and where change relay is a survival imperative. That makes consideration of innovation in this sector an urgent challenge – and one which drives concern to learn from experience about how to repeat the innovation trick. How can we best organize to enable innovation to happen and what are the roles for key actors – donors, agencies, and most importantly 'users' – in this emerging innovation ecosystem?

There is a very extensive literature on innovation management with the earliest papers dating back to around 1910. Given our focus on *ecosystem* approaches to innovation, the strategy we have taken in this literature review is to move from some basic concepts on innovation management to an understanding of current best practice and then on to new approaches that are emerging in the context of a changing technological and market landscape.

In the historical overview, presented in section 1, we explore how the process can be organised and managed in a conscious fashion and how individuals and organisations can learn and develop such capability. Although the literature under review is extensive, it can also be characterised by an evolving understanding and sophistication in the conceptual and practical models describing how innovation takes place. The review charts the progress from simple linear models based upon knowledge push or needs pull, through to more complex conceptualisations of the process which have been built upon numerous empirical studies of those factors which have been identified as affecting success and failure. The newer models emphasise the linkages occurring between the organisation and geographically dispersed external actors, with whom interactions often take place within networked environments typically labelled as innovation systems or ecosystems.

Section 2 sets out core concepts in innovation management in more detail. As a result of having an extensive body of both theoretical and empirical research at our disposal, innovation management has become a subject that can be taught. In this section we focus on the stable body of knowledge on which innovation management courses and textbooks are based. Included are descriptions and explanations of how the process of innovation takes place, the role of creativity within a spectrum of novelty, the role of entrepreneurship and multiple actor interactions, as well as the importance of those factors influencing the diffusion of innovation.

Having looked at the core themes in innovation management, which have emerged as a stable knowledge base on which to organise and manage, section 3 presents the current frontier in the literature and practice. The field is one where the routines, or the patterns of behaviour, accepted as *best practice* are constantly being adapted and redefined in the face of a changing technological and social environment. In this section we explore a number of the key cutting-edge issues in innovation management that are especially relevant to humanitarian aid: open innovation, user-linked innovation, innovation systems and ecosystems, and public sector/social innovation. We also cover more briefly a number of other complementary approaches. As the sheer volume of this literature presents any review such as this one with what some might call a *wood for the trees* problem, at the end of section 3 we present a *contingency model* to help readers more readily navigate the diverse and extensive literature.

In section 4 we explore the emergence of thinking and practices in humanitarian innovation, where the literature begins almost a century later than innovation management. We look in particular at how different innovation processes have been documented and what this says about the nature of the innovation ecosystem in the sector. We note that there has been a steady evolution of innovation practices within the sector and that technology is now viewed as having a central role to play in humanitarian aid preparedness and relief. The review also flags some of the tensions being expressed in the literature between, for example, top-down and emergent innovation, as well as between open and closed approaches, and the role of the private sector.

We conclude by drawing out potential lessons and challenges for the Humanitarian Aid sector drawn from the mainstream literature around innovation management, and particularly the potential for novel approaches that focus on *systemic* concepts. The challenges identified include the development of a core capacity, the need for ambidexterity, the role of entrepreneurs, the potential for user-led and open innovation, as well as the need to balance risk, reward and reliability within the incentives systems and structures embedded in the sector.

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1. Innovation management: a historical overview

The focus of this literature review[1] is not on innovations themselves but rather on the ways in which the process of creating value (commercial and/or social) from ideas and knowledge takes place. In particular, we are interested in how the process can be organised and managed in a conscious fashion and how individuals and organisations can learn and develop such capability. The field is now quite mature, some of the earliest articles dealing with the subject having appeared around the turn of the 20th century.

The innovation management literature can be characterised not only in terms of its huge volume but also by an evolving understanding and sophistication in the conceptual and practical models describing how innovation takes place. Early models were driven by a concern to spend R&D investments better or to avoid costly market failures and these studies tended to use simple linear models of the process (e.g., (Sherwin and Isenson 1967; Isenson 1968). Typically these could be seen as versions of *knowledge push* or *need pull* and they prompted extensive debate around the relative importance of these sources and the implications of this for managing the process. In the 1970s a number of influential studies began to explore other influential factors affecting success and failure, using different methodologies but pointing to the same underlying messages (Langrish, Gibbons et al. 1972; Robertson 1974; Rothwell 1977; Freeman and Soete 1997).

The field also began to open up in terms of specialised interest areas such as the challenges facing small and medium-sized enterprises or the role of innovation policy as a framework for supporting the process by external actors in government and elsewhere (Rothwell and Zegveld 1981). A key field of study is understanding how innovations diffuse across populations began to emerge as an area of relevance (Rogers and Shoemaker 1971). At the same time the parallel field of *entrepreneurship* began to emerge, focusing on the challenge of small-business start-ups and new venture creation, and drawing on seminal ideas from Schumpeter (2006).

Contributions came from many disciplines, including sociology, psychology, organisation theory, engineering and economics. At the same time a number of practitioner-based approaches and the emergence of a *toolkit* of approaches can be seen – for example, around creativity techniques (Rickards 1988), forecasting (Whiston 1979), project planning

[1] The approach we took to generating this literature review consisted of an extensive search across published books and academic articles dealing with the core themes of innovation with special reference to the humanitarian system. *Grey* literature in the form of working papers and unpublished reports from researchers in the field have also been included. However, whilst we recognise that there is an extensive range of material also available on the Web and in various blogs we chose not to include this primarily because of the difficulty of separating anecdote and opinion from more solid evidence-based reporting. That said we were helped considerably by examining these blogs for signposts to relevant published literature and for assistance in identifying key themes which are being explored further via interviews and case studies as part of our wider activities in the mapping the Humanitarian Innovation System project.

and appraisal (Dinsmore 1993), inter-group communication (Lawrence and Lorsch 1967), and R&D strategy (Adler 1989).

The 1980s saw a convergence around innovation studies with considerable expansion in the number of specialised courses dealing with the subject (Bell, Bessant et al. 1992). Textbooks and resources from around this time stress an increasing number of actors working within the innovation space and interacting to create value. Important themes began to emerge from this richer understanding; for example, the role of users in the innovation process (Von Hippel 1988), the relevance of demanding customers helping to shape and pull innovations through (Rothwell and Gardiner 1983), the key influences of different sector patterns (Pavitt 1984), and diffusion as an interactive shaping process (Rosenberg 1982).

The emphasis was increasingly on the importance of innovation strategies, and learning to build innovation capability within and across organisations. In particular, the idea of routines became prominent: these were seen as patterns of behaviour that are learned and become embedded as structures, procedures and mechanisms to enable innovation to take place (Nelson and Winter 1982).

The discussion of innovation also focused around the impact of major new technologies, particularly in the information and communications field (Miles, Rush et al. 1988). Some writers argued that these represented major shifts in the *techno-economic paradigm* and would lead to significant changes in economic and social spheres (Freeman and Perez 1989). Associated with this was an important strand of thinking about *technological trajectories* and the bandwagon effect where new fields acquired a dominant logic which shaped innovation search behaviour (Dosi 1982).

The 1990s saw growing interest in differences between firms in terms of their approaches and the idea that external context (e.g., sector or geographical location) and internal management played complementary roles in shaping innovation strategies and management (Pavitt 1990; Nelson 1991). Interactivity, from the picking up signals about potential innovation threats and opportunities, through implementation and into wider scale adoption and diffusion, began to be seen as interactive processes with multiple actors involved. Rothwell offers an extensive review of this early phase in thinking about innovation, identifying five generations of mental models, from simple linear views to increasing complex, systemic and geographically dispersed ones (Rothwell 1992).

Section 2 sets out core concepts in innovation management in more detail, while section 3 presents the new frontiers in the literature and practice. The sheer volume of this literature presents any review such as this one with what some might call a *wood for the trees* problem. As the end of section 3 we will present an approach to help readers more readily navigate the diverse and extensive literature (see 3.7).

2. Core concepts in innovation management

Building on this body of extensive research, innovation management is now a subject which can be taught and there is a stable body of knowledge around such courses and textbooks (Goffin and Pfeiffer 2001; Schilling 2005; Goffin and Mitchell 2010; Trott 2011; Tidd and Bessant 2013). Relevant core concepts include the following:

2.1: Innovation is a process not an event.

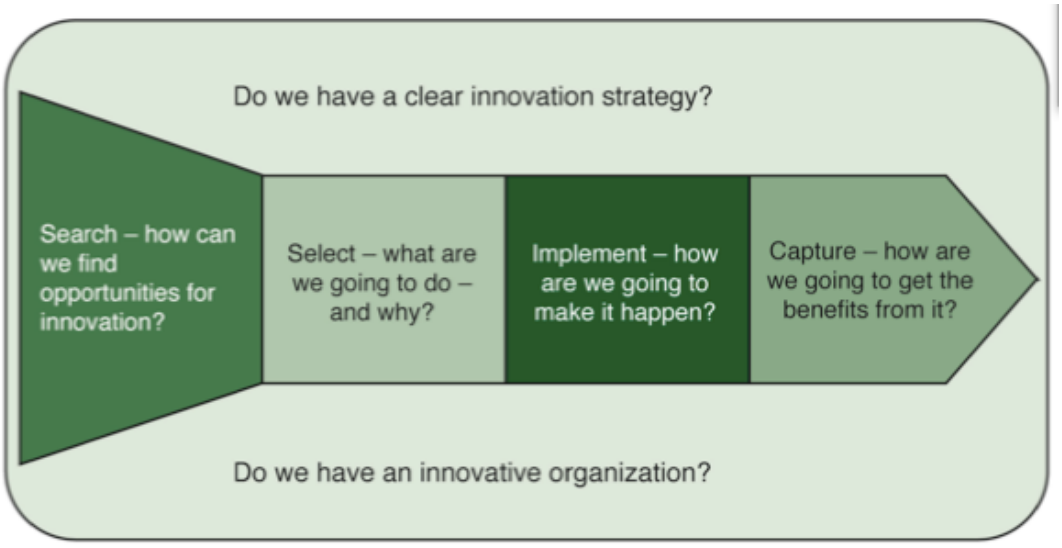
There are many similar models of the innovation journey, and representations of the key stages and different management challenges associated with them (Van de Ven 1999). As shown in Figure 1, typical stages in this process/journey are:

- Search
- Select
- Implement
- Capture value

This process is shaped and influenced by key contextual factors such as:

- Strategic direction and targeting
- Enabling and supportive organisations

Figure 1: The Innovation Process



Source: Tidd and Bessant (2013)

2.2: Innovation management as a learning process.

Learning to innovate is achieved by building behavioural routines, and then embedding them in structures, procedures, policies. These are viewed as ways of carrying out the innovation process and repeating it (Nelson and Winter 1982; Pentland and Rueter 1994; Bessant 2002; Pavitt 2002; Zollo and Winter 2002). The

processes through which organisations learn are varied; they include learning by doing, learning by collaborating, learning from interaction with users, learning through failure, learning through using (the learning curve effect), learning by exporting, etc.,(Arrow 1962; Bell and Scott-Kemmis 1990; Levin 1993; Fleck 1994; Kim 1997; Figuereido 2001). All offer opportunities for capturing and embedding behavioural patterns – routines – which enable innovation to be organised, managed and repeated.

From this discussion emerged the concept of innovation as *dynamic capability*: mobilising resources and processes in support of innovation but also having the ability to reconfigure them in a changing environment (Teece and Pisano 1994; Zollo and Winter 2002; Teece 2009).

Closely linked to this was the notion of *absorptive capacity*: the ability of an organisation to find and make use of new external knowledge to create innovations (Cohen and Levinthal 1990; Zahra and George 2002.; Todorova and Durisin 2007). Absorptive capability is something which is learned and built up over time, essentially acquiring and embedding the routines which constitute an innovation management capability (Pavitt 1990; Bell and Pavitt 1993; Phelps, Adams et al. 2007; Rush, Bessant et al. 2007).

2.3: Innovation as a spectrum of novelty.

The spectrum of innovations typically runs from incremental to radical. Most innovation is viewed as incremental in nature and has its impact through accumulation (Enos 1962; Hollander 1965; Figuereido 2001). Radical innovation is higher risk and requires different approaches to search and selection (Leifer, McDermott et al. 2000). A major challenge is striking a balance between *exploit* and *explore*: these terms illustrate the differences in search behaviour, selection approaches and organising for implementation around *do better* (incremental) and *do different* (radical) (Burns and Stalker 1961; March 1991; Leifer, McDermott et al. 2000; Benner and Tushman 2003; Gassman, Widenmayer et al. 2012; Nicholas, Ledwith et al. 2013).

2.4: Multiple pathways through the innovation space.

Following Schumpeter's original discussion there are many ways in which value can be created through innovation, ranging from new offerings, processes, supply chain reconfiguration, etc. (Tuff 2011). We can think of an innovation space (Francis and Bessant 2006) with core dimensions around what we offer the world (*product innovation*), how we create and deliver that offering (*process innovation*), where we target and deliver that innovation (*position innovation*) and the underlying mental models that govern our approach (*paradigm innovation*).

These multiple pathways are important because they move attention from products (what an organisation offers the world) and processes (how it creates and delivers those offerings) to other ways in which innovation can create value and other groups for whom this can take place. Innovation strategy becomes a search through the innovation space (Kim and Mauborgne 2005), with a range of possible directions in which to explore.

2.5: Creativity and problem solving as a core discipline.

Creativity and problem solving need to be applied in a systematic fashion rather than the light bulb/ genius model that typifies many innovation anecdotes. Innovation needs to be seen as an organised process, applying focused creativity (Kelley, Littman et al. 2001). Many representations see this process as a mixture of divergent, explorative cycles interspersed with convergent integrative ones (Kelley 2005). Different stages in the process require different approaches; see, for example, the concept of the *innovation value chain* (Birkinshaw and Hansen 2007).

2.6: Innovation as entrepreneurship.

Innovative behaviour is often associated with entrepreneurship (Drucker 1985). Although there is an extensive literature on this subject, until recently much of this focused on start-ups and small business (Burns 2011) and not on innovation per se.

Understanding entrepreneurs and how they enact the innovation process has been an important stream in the literature and moves us away from the lone instinctive inventor and towards a learned set of skills and process (Drucker 1985; Shane 2003; Bessant and Tidd 2011). Models of the entrepreneurial process are essentially similar to the generic innovation journey set out in 3.1, with key stages typically being:

- Opportunity recognition (either via discovery or creation)
- Assembling resources
- Developing the venture
- Capturing value

The emphasis is placed upon learning and feedback: a process of discovery, probe and learn rather than grand strategy (Sarasvathy 2008). Entrepreneurs learn to operate in uncertain environments by flexibility, tolerance of ambiguity, adaptability and equifinality (multiple pathways to the same goal). Prototyping and learning via interaction around experiments is a core feature of innovation entrepreneurship, and multiple fast failures are characteristic of the behaviour that generate viable solutions (Ries 2011; Blank 2013).

Recently there has also been considerable focus on *intrapreneurs* – the internal entrepreneurs within organisations who help to renew organisations (Buckland, Hatcher et al. 2003; Shane 2003; Schumpeter 2006; Burns 2008; Sarasvathy 2008). Corporate entrepreneurship of this kind is becoming a central means by which established or mature organisations create new directions and enable radical innovation (Kanter 1997; Pinchot 1999; O'Connor, Leifer et al. 2008). A number of notable examples are widely used as examples such as 3M, Corning and more recently Google (Gundling 2000; Graham and Shuldiner 2001; Iyer and Davenport 2008).

Another growing field of relevance is *social entrepreneurship* where the emphasis is on creating social value rather than, or as well as, commercial value (Ellis 2010; Murray, Caulier-Grice et al. 2010; Gruber and Fauchart 2011).

2.7: Innovations are path dependent.

The trajectories of innovation in any given sector tend to be profoundly shaped by the pathways laid down by early pioneers who, knowingly or unwittingly, created a *dominant design* in the innovation space (Abernathy and Utterback 1975; Dosi 1982; Utterback 1994). Abernathy and Utterback's influential model of the innovation life cycle suggests there are different phases of innovation, each of which is associated with different types of activity.

In the early stages of a particular innovation space, in the *fluid* phase, there is considerable experimentation around different possible innovation configurations. Much of this activity leads to failure but eventually there is convergence around a *dominant design* which becomes the standard that others work with and the variant which achieves widespread adoption.

In the *transitional* phase emphasis shifts towards process innovation, trying to stabilise around the dominant design and developing processes which can produce it reliably and to cost targets. Finally there is a phase associated with maturity in which emphasis is on incremental improvement innovation around that dominant design, establishing a trajectory which may persist for extended periods before some new trigger (e.g., new technology, new market configuration, etc.) ushers in a new fluid phase. This sets up the conditions under which entrepreneurs working at the edge can disrupt industries and challenge existing incumbents (Christensen 1997; Augsdorfer, Bessant et al. 2013).

The challenge of path dependent technological trajectories is that while they both provide a guide and focus for innovation strategies, the dominant designs that result can also act as a constraint on exploration for radical alternatives. Established organisations are well-suited to incremental improvements and some limited exploration in this space but there are powerful internal resistances which can inhibit the search for radical innovation (Bessant, Von Stamm et al. 2011).

As an illustration, Henry Ford, was a comparative latecomer to the emerging automobile industry but whose Model T and accompanying manufacturing process became the dominant design in America and Europe, and persisted through until the 1980s when Japanese *lean manufacturing* techniques offered radical new options and brought about a new wave of experimentation and change.

2.8: Innovation as a multi-actor process.

While individual entrepreneurs, inventors, scientists, engineers, or designers certainly have an important part to play, the study of innovation has progressively recognised the numerous people and organisations typically involved in the process. Innovation is necessarily a multi-party activity. Even the lone entrepreneur seeking to get a new idea to market is unlikely to be able to do this entirely on their own. They will usually rely on others for financial backing, specialist knowledge of technologies, equipment, distribution and marketing, legal advice. Ultimately, they will depend on their prospective users and customers to complete the innovation

process by actually using the product, service, or process that has been developed. Innovation, therefore, necessarily depends on a complex network of actors and activities.

There have been growing attempts to understand different aspects of these networks as a central determining factor of successful innovation processes (Lundvall 1990; Nelson 1993). Early discussion of national innovation systems looked at key relationships such as those between firms and government, finance and education (Freeman 1991; Lopez-Martinez and Piccaluga 2000). Also of interest were emergent models of local and regional innovation systems and their connection to economic geography via clusters and collective efficiency (Cooke 2001; Howells and Bessant 2012). The concept of focal or keystone firms and managed networks have become important in our understanding of innovation systems, as are notions of platforms and ecosystems (Miller, Hobday et al. 1995; Gawer and Cusumano 2002; Davies and Hobday 2005; Durst and Poutanen 2013). This aspect is covered in more detail in section 3 on new frontiers in innovation management.

2.9: Diffusion of innovation.

Innovation only has real impact when it can be scaled across a population of users. Understanding of adoption and diffusion has been a focus of study for a long time but is now an increasingly important part of the picture. Diffusion studies cover different types of innovation. These include *product innovation* where marketing studies have revealed a lot about buyer behaviour and influences on the process (Kotler 2003), and *process innovation* where adoption of new farming methods as an example shows the influences such as social flows of knowledge (Griliches 1957). Everett Rogers carried out pioneering work in mapping this field and identified a widely used framework for analysis and action. Unbeknownst to many in the aid world, his original work was funded by USAID, and examined adoption of agricultural innovations in developing countries. His core model framed diffusion as being based on a process of communication and influence, in which a mix of factors influencing the adoption decision of different actors. These factors form a checklist with which to think about and configure innovations for effective diffusion. Key elements are:

- innovation characteristics (relative advantage, complexity, observability, trialability and compatibility)
- innovator characteristics (who is trying to introduce the change)
- adopter characteristics (typically distributed across a population in terms of readiness to take on new ideas)
- environmental/contextual characteristics

Change management offers another key strand of literature in this space, exploring the challenge of planning for successful adoption of internal process changes (Smith and Tranfield 1990; French and Bell 1995). These studies repeatedly highlight the importance of engaging users early and actively in order to secure acceptance and adoption. The literature includes extensive work on take up of new processes and methods and acceptance of new technologies (e.g., Preece 1995). This has been a key theme running through discussion of socio-technical systems, through

participative design and to current understanding of user involvement in design of systems which will actually be used (Trist and Bamforth 1951; Mumford 1979).

3. Challenges along the Innovation Management frontier

So far we have looked at the core themes in innovation management which have emerged as a stable knowledge base on which to organise and manage. But the field is one where the routines, or the patterns of behaviour, accepted as *best practice* are constantly being adapted and redefined in the face of a changing technological and social environment. The innovation problem remains the same - how to create value from knowledge? But the *context* within which this happens is constantly shifting. For example the innovation *recipe books* for 1980 are different to those we might find today because we now have a vast networking capability round knowledge flows across the Internet and a changed social organisation enabled by this.[2]

In this section we explore in some depth a number of the key cutting-edge issues in innovation management that are especially relevant to humanitarian aid: open innovation, user-linked innovation, innovation systems and ecosystems, and public sector/social innovation. We also cover more briefly a number of other complementary approaches.

3.1: Open innovation (OI).

This refers to the rapid acceleration of an established trend around distributed sources of knowledge; innovation has always been a multi-player game (Carter and Williams 1957). However, a combination of increased activity (estimates suggest close to $1.2 trillion is spent every year on R&D around the world), coupled with increased connectivity, has fundamentally changed the landscape (Dahlander and Gann 2008; Snow, Strauss et al. 2009). The phenomenon was labelled open innovation by Chesbrough (2003) but many organisations had already begun experimenting in this space; e.g., Procter and Gamble began to re-engineer their global R&D around 1999 under the banner *Connect and Develop* (Lafley and Charan 2008).

The past ten years have seen an explosion of experimentation around how to work in a knowledge-rich environment where even the largest organisation has to recognise that *not all the smart guys work for us (quote?).* This has focused on ways on enabling knowledge flow into and out from the organisation rather than the more

[2] . It is, of course, important to recognise that whilst there is an industry of consultants and others generating new labels for emerging trends much of the underlying innovation management discussion reflects long-established debates around strategy and implementation. We have tried in this section to highlight major trajectories which are reshaping the innovation agenda driven by significant shifts in the technological, economic and social landscape rather than the fads and fashions in popular management literature.

static picture of knowledge creation, accumulation and deployment (Bessant and Venables 2008).

There has been significant growth in using internet-enabled approaches for enabling OI; e.g., innovation markets like InnoCentive.com and NineSigma (Lakhani and Jeppesen 2007), innovation crowdsourcing (Brabham 2008; Schenk and Guittard 2011), innovation communities like those operating across smart phone platforms (Dahlander and Wallin 2006; Dahlander and Magnusson 2008), and innovation collaboration via online toolkits for mass customisation (Moser and Piller 2006; Piller 2006; Reichwald and Piller 2006). Examples include the Android operating system in mobile devices, Mozilla as a community developed browser, Linux as an operating system and Propellerhead, an online community of enthusiasts working on music software. Sites like Qirky and Ponoko allow users developing ideas and designs using 3-D printing and related technologies to share and co-create ideas, whilst for children Lego has pioneered co-creation using sites like Lego factory and now Lego Cusuo.

Importantly these have been increasingly deployed in a social innovation context; e.g., in crowdsourcing ideas across a community of patients and carers in the healthcare field (Bessant, Moeslein et al. 2012) or in improving public health (Brabham, Ribisi et al. 2014). For example GemeinsamfurdieSeltene is a platform developed in Germany to allow patients and carers of those with rare diseases (often neglected by mainstream health services because they are rare) to share experiences, ideas, treatments, etc.

Innovation contests represent another area of expansion. The original idea of offering a prize to anyone who could solve an innovation challenge is not new; John Harrison's chronometer and the invention of margarine both owe their genesis to such contests. The difference is that today they can be quickly and easily organised; they enable both *richness* and *reach* in innovation sourcing (Evans and Wurster 2000). With the rapid expansion of their use has come a growing maturity around the capabilities needed to manage them well and the purposes to which they are helpful (Ebner, Leimeister et al. 2009). Such models have been deployed in the social and *third* sector innovation arena; e.g., NESTA has several active challenges (www.nesta.org) and the Humanitarian Innovation Fund is running one across the InnoCentive platform. DFID's work with IDEO.org and OpenIDEO on the Amplify programme takes a similar approach, crowdsouricng ideas across an open innovation platform.

A key challenge in open innovation is around how to make connections; e.g., via a growing number of brokerage models (Hargadon and Sutton 1997). Building on ideas about the flow of knowledge and role of *structural holes* in such networks (Burt 1992), a variety of online and offline attempts have been made to facilitate better linkages. (See, for example, www.100%open.com or www.theinnovationexchange.com) A recent study (which explores different models in detail) suggested that in 2013 the market for such brokerage services in open

innovation was worth €2.7bn and is likely to double in size by 2015 (Piller and Diener 2013).

One important aspect of open innovation is its ability to increase the potential for knowledge flow to new sites as well as sourcing knowledge from further afield. Numerous examples exist of *recombinant innovation* (Hargadon 2003) in which knowledge already well-established in one area or sector can have considerable impact in a different and often distant one; such cross sectoral learning usually also requires brokerage mechanisms (Burt 2005). The difficulty for many organisations is that they are locked into existing knowledge networks and changing these involves a discontinuity (Henderson and Clark 1990; Kaplan, Murray et al. 2003). The challenge is to find, form and enable new networks to perform whilst simultaneously loosening ties in existing ones (Birkinshaw, Bessant et al. 2007).

This pattern of improving knowledge flow and management is also an issue across large and geographically dispersed organisations. Internal boundary spanning mechanisms are an important focal area, following Allen's seminal work (Allen 1977) and there is a resurgence of interest in communities of practice (Wenger 1999; Brown and Duguid 2000), gatekeepers, secondment and other mechanisms, and the role of employees as connectors out into wider networks (Fleming and Waguespack 2007).

Intellectual property management also becomes a key challenge in an environment in which the key shift is from knowledge creation, ownership and protection and towards more emphasis on knowledge flows and trading (Bessant and Venables 2008).

A related strand of open innovation is the resurgence of interest in employees as a source of innovation. Models of the suggestion scheme can be traced back to the 14th century and there is considerable evidence to support their impact, especially on productivity via sustained incremental process innovation (Imai 1987; Boer, Berger et al. 1999; Bessant 2003; Schroeder and Robinson 2004). However sustaining high involvement of employees in innovation requires careful investment in systems and structures to support such behaviours. Open innovation has renewed interest in employees as a source of knowledge and ideas and online communities, innovation contests and other mechanisms open up new ways to foster internal entrepreneurship (Fairbank and Williams 2001; Kleinbaum and Tushman 2008). Employees are also seen as a source of networks linking inside to outside (Whelan, Parise et al. 2011).

The idea of crowdsourcing ideas has spread to other innovation resources and in particular to new models for raising venture capital for new start-ups (Schwienbacher and Larraide 2011; Mollick 2013). Peer-to-peer lending (and increasingly donation) via sites like Kickstarter and www.catapult.org not only opens up new channels but also changes the basis on which evaluation of innovation takes place, exploiting the *wisdom of crowds* effect (Surowecki 2004). In many cases evaluation emerges simply on the basis of popularity – the assumption being that

funds flow to the 'best' ideas. On other sites there are opportunities for additional expert evaluation, for comments and co-development of ideas and for repeated filter cycles which gradually eliminate outlier ideas and focus on the more popular.

With the maturing of OI as a concept have come attempts to develop maturity models against which to assess OI capability (Lichtenthaler, Hoegl et al. 2011). On the practitioner side various tools are now offered to help assess and deploy open innovation approaches to augment innovation capability (Muller, Hutchins et al. 2012).

3.2: User-linked innovation (ULI).

For a long time user-led innovation was recognised as a source of innovation and numerous examples exist, particularly in sectors like farming and medical instruments where user ideas have provided prototypes which are then taken up and improved upon for widespread diffusion (Von Hippel 1986; Von Hippel 1988). Importantly, such users have both a high incentive to innovate (they want the functionality of the new idea) and they are tolerant of imperfections (willing to accept prototypes and then help improve on them). They represent not only a powerful source of innovations but, because the ideas originate from within the user's context and community, they increase the potential for widespread adoption and diffusion by ensuring *compatibility* (Rogers 2003).

Recent trends, especially around social networking and internet-enabled communications have accelerated this trend and the importance of user innovators; one UK study suggests that a high proportion of *hidden innovation* by users actually takes place (NESTA 2010). Examples like Linux, Wikipedia, Mozilla, Apache and Propellerhead (Dahlander and Wallin 2006) serve as reminders of the considerable potential of user communities as a source of innovation and rapid diffusion and improvement. The convergence of this user led desire for creation, coupled with enabling technologies in design and manufacture, have led to a growing movement towards mass customisation and co-creation with users (Pine 1993; Salvador, de Holan et al. 2009). Von Hippel (2005) captures the spirit of this shift as well as providing a theoretical underpinning and some practical tools to work in this space.

Part of this discussion has focused on communities as a source of latent ideas and on novel mechanisms (e.g., netnography) to access these (Bartl 2007). A wide range of organisations are engaging with users to co-create product and service ideas (e.g., Lego, Adidas, Self) and this approach is also being explored in the business-to-business marketplace (Reichwald, Moeslein et al. 2007; Neyer, Doll et al. 2008). These models are also finding increasing application in the field of social and public sector innovation in areas such as healthcare (Pickles, Hide et al. 2008; Bason 2011; Kuenne, Moeslein et al. 2013). Tools for enabling higher levels of user participation are increasingly available and framework methodologies such as design thinking are increasingly seen as relevant (Mulgan 2007; NESTA 2011; NESTA 2014).

With the growing interest in this field have come some emergent patterns amongst user innovators. For example Flowers (2014) suggest three characteristic types of user-innovation value creation: *spontaneous*, *orchestrated* or *managed*.

Spontaneous ULI occurs when user activity around a product, service (or their combination) leads to novel outcomes. The value may be in the form of ideation for future versions of a commercially produced item, modifications or extensions to the item, or new uses that lay beyond the intentions of the original design. Exceptionally, some users will spontaneously create their own entirely novel product or service. The key challenge for innovation management is knowing how firms should react and whether there is any benefit in seeking to transition such user activity to an orchestrated or managed mode.

Orchestrated ULI occurs when a firm seeks to influence the innovative behaviour of users so as to channel their creative energies into an outcome that will generate (economic, promotional, or reputational) value for the firm. Orchestration takes the form of activities that seek to harness the *cognitive surpluses* to generate value, but where the final outcomes tend to be less controllable and defined than in managed UI (e.g., opening up, or closing, *product architecture* in order to encourage or influence innovative user activity). The key challenge for innovation management in this context is to predict the direction in which firms should seek to orchestrate user activity, how they should react to unexpected developments, and if there is any benefit in seeking to transition such user activity to a managed mode.

Managed ULI occurs when a firm directly manages the innovative behaviour of users in order to channel their creative energies into an outcome that will generate value for the firm. Again, such value may be economic, promotional or reputational. In this context firms will seek to build a managed framework around user activity that feeds directly into their (i.e., the firms') own value streams. For example the German car components company Webasto works with a selected panel of *lead users* to generate, evaluate and co-develop ideas which form the basis for new concepts in sun roof and related accessories.

3.3 Innovation systems and ecosystems.

A number of frameworks have been developed in an effort to reflect and understand the sheer complexity of innovation processes, with many sharing in a common focus on the systemic qualities of innovation. This is evident, for example, in the suggestion that innovation is shaped in important ways by the national context in which it takes place (Freeman, 1987; Lundvall, 1992; Nelson, 1993; Patel and Pavitt, 1994). Studies of national innovation systems (NIS) emphasise the multiple linkages between different actors and institutions. As summarised by the OECD (1997):

> *Innovation and technical progress are the result of a complex set of relationships among actors producing, distributing and applying various kinds of knowledge. The innovation performance of a country depends to a large extent on how these actors relate to each other as elements of a collective system of knowledge creation*

> *and use as well as the technologies they use. These actors are primarily private enterprises, universities and public research institutes and the people within them.* (p. 7*)*

The concept of NIS was an important milestone in the growing challenge to simplistic linear input-output models of innovation that effectively black-boxed the innovation process by ignoring the detailed interactions between the actors involved. However, it quickly becomes clear that the national level is not the only geographical scale at which such interactions occur. Working at a finer level of granularity, there are those who have identified regional patterns in innovative activity, highlighting the role of more localised clusters of activities, actors and institutions (e.g. Cooke, 2001; Markusen, 1996). At the same time, it is obvious that the web of interactions involved in innovation are not constrained by national boundaries, with the production, flows, and use of knowledge taking on a decidedly transnational and even global character. Consequently, rather than making assumptions at the outset about the appropriate geographical scale to focus on, it is preferable to follow the specific interactions of any particular innovation system regardless of where they take place. Since innovation systems are necessarily constituted by the activities and interactions of those involved, determining the landscape and boundaries of any given system is largely an empirical matter of mapping what is there. Influencing and developing innovation systems, however, also requires an understanding of the *dynamics* of the system which is more often addressed within the literature on *ecosystems*.

While sharing a similar systemic orientation to the NIS literature, the ecosystem concept can be distinguished by its use of analogies drawn between socio-economic and biological ecosystems (Lansiti and Levien, 2004; Moore, 1993, 1996). According to Moore (1993), a key feature of any ecosystem is *co-evolution.* Thus, in the case of a business ecosystem, the activities of any single organisation cannot be considered in isolation. They are caught up in a whole network of interdependencies, whereby change in one part of the system can have far-reaching, and often unexpected effects, in other parts of the system. In this interlinked environment, *companies co-evolve capabilities around a new innovation: they work cooperatively and competitively to support new products, satisfy customer needs, and eventually incorporate the next round of innovations* (Moore, 1993, p. 76). Also, just as natural ecosystems are structured around different roles and functions, so too are innovation ecosystems. This is typically based on some degree of co-specialisation whereby firms and other organisations engage in different, yet complementary activities (Zahra and Nambisan, 2012). However, this interdependent specialisation can work both to support and constrain innovation. For example, Adner and Kapoor (2010) have shown how innovation challenges either upstream or downstream from a focal firm can act as a bottleneck in value creation.

It is here that the innovation ecosystems metaphor begins to part company with its biological counterpart because there is scope for actors intentionally to shape the strategy and direction of the system. As Moore (1993) has argued:

> *... it's precisely in the role of conscious direction that a strictly biological metaphor is no longer useful. Business communities, unlike biological communities of co-evolving organisms, are social systems. And social systems are made up of real people who make decisions; the larger patterns are made up by a complex network of choices, which depend, at least in part, on what participants are aware of. (*pp. 85-86)

Of course, the complexity and nonlinearity of ecosystem interactions means there are limitations to such conscious direction. In addition, the capacity of actors within the ecosystem to influence it is not evenly distributed. In particular, the innovation ecosystems literature often highlights the central role of a core firm or keystone player that plays a dominant part in orchestrating the activities of the system, typically by shaping the structure of incentives and risks (e.g. Lansiti and Levien, 2004; Moore, 1996; Nambisan and Sawhney, 2011). There are close parallels here with the study of business model innovation and so-called platform strategies (Gawer and Cusumano, 2002, 2013; Lambert and Davidson, 2012). The latter are concerned with the formation of shared *architecture*s that create the opportunity for multiple complementary innovations. Gawer and Cusumano (2013) define external or industry *platforms* as:

> *... products, services, or technologies developed by one or more firms, and which serve as foundations upon which a larger number of firms can build further complementary innovations and potentially generate network effects. There is a similarity to internal platforms in that industry platforms provide a foundation of reusable common components or technologies, but they differ in that this foundation is open to external firm. (*p. 420)

They go on to point out similarities between an industry platform and a dominant design, both of which establish standards that influence the expected form and characteristics of a family of products (Abernathy and Utterback, 1978). However, they also suggest differences between the concepts. While a dominant design tends to emerge as a result of relatively undirected evolutionary dynamics, industry *platforms* are subject to more purposeful decision making. This contrast between more emergent and strategically directed industrial configurations has been picked up in the innovation ecosystems literature. Zahra and Nambisan (2012), for example, have identified four different types of ecosystem that reflect some of the current changes in the innovation landscape. These indicate quite different distributions of roles and activities, with varying implications for the nature of strategic management within each ecosystem. The four models are as follows:

1) *Orchestra* - This is equivalent to a platform strategy whereby a keystone player establishes a shared architecture around which the activities of different specialist firms can be orchestrated. Examples of keystone players include Microsoft and Google. The keystone company plays an important role in shaping the overall ecosystem.

2) *Creative Bazaar* - In this ecosystem, a focal company searches for, integrates, and exploits external technologies, products, and ideas, potentially drawn from across the entire global marketplace or bazaar. In this case, the dominant firm is still strategically directed in leveraging external knowledge, but it has less control over the activities of the myriad other firms that make up the ecosystem.

3) *Jam Central* - The third ecosystem model is more organic and emergent than the previous two. It involves horizontal collaboration between independent entities seeking to develop opportunities in a radically new field that is often quite separate, and potentially disruptive, for existing ecosystems. These collaborations have an improvisational character, with relatively decentralised forms of governance.

4) *MOD Station* - This ecosystem is similar to, and may coexist with, the platform approach of the Orchestra model. In this case, a dominant firm provides a product or platform architecture around which *modding* communities of innovators coalesce. Although the keystone firm may adopt different stances towards these external communities, some seeking to control their activities more than others (e.g. the alternative ways that Google and Apple have structured platforms for mobile app development), the *modding* communities are not subject to close control and evolve along their own trajectories and according to their own institutional logics.

There is obviously a degree of stylisation in these models and they are by no means exhaustive of the ways that innovation ecosystems can be configured. However, they do suggest how different distributions of roles and activities, as well as power, knowledge, and resources, throughout the ecosystem can have important implications for its shape and evolution. It is also important to consider these models from a dynamic perspective. One of the criticisms levelled at some of the NIS literature has been the tendency for rather static analyses of the overall innovation system, despite looking at the detailed dynamics of knowledge flows within the system. The notion of an innovation ecosystem, in contrast, directs attention not only to the internal structure and operation of the system, but also its evolution through time, as well as in relation to other ecosystems. Moore (1993) argued that innovation ecosystems develop through a series of stages that, just like biological ecosystems, tend to reflect a progressive movement from lower to higher levels of structure and organisation. He named these stages: *birth*, *expansion*, *leadership*, *self-renewal* (or death). This indicates a common pathway for the development of an ecosystem from the initial emergence of competing niche innovations, to their selection and expansion into wider markets, maturity and stabilisation with incremental improvements, and then either their renewal or obsolescence and replacement by alternative innovations. If Moore (1993) is correct in suggesting that innovation ecosystems tend to become more structured and stabilised over time, then one of the challenges for firms operating within this

environment is how to manage the benefits of ecosystem involvement at the same time as recognising the dangers of lock-in and stagnation (c.f. Christensen, 1997).

3.4: Disruptive and discontinuous innovation.

A significant challenge to existing incumbents is when shifts of triggers in the environment demand or offer radically different responses to the dominant. Such triggers may be the emergence of new technologies or markets (Utterback and Acee 2005; Christensen, Anthony et al. 2007; Augsdorfer, Bessant et al. 2013), new competitors, or shifts in the regulatory context. Their key characteristic is that they shift the pattern from *steady state* innovation to a period of discontinuity in which new responses often involving new actors or networks play a role.

Disruptive innovation is a term originally coined by Clayton Christensen and it occurs when new signals at the fringe of existing markets or technology spaces suggest radically new directions. These are often taken up by non-traditional actors: established incumbents are often slow to respond because of the path dependency and *lock in* associated with their existing value networks.

In response, incumbents tend to reinforce their innovation routines (behaviour patterns) and the signals they receive from within their existing networks support this (Prahalad 2004; Day and Schoemaker 2006).

Disruption occurs when these two trajectories collide, with the new players working from the fringe destabilising the existing market conditions and creating a new basis within which innovation takes place. Such conditions favour the new entrants and pose significant challenges for established players; a good example is the way in which low cost airlines changed the market for short-haul flying. The early players worked at the fringes of the mainstream effectively learning a new approach based on meeting the needs of a peripheral potential market of people who did not yet fly. Learning and developing responses to meet their needs then opened up the possibility to spread the model to challenge the existing airline market on the basis of simpler and significantly lower cost propositions.

This highlights the underlying problem of established *cognitive frames* and the role of knowledge networks in maintaining these frames, and avoiding *cognitive dissonance*. All organisations make sense of the world in terms of models and assumptions which shape what they do, what they pay attention to, and why. These *mental models* focus attention on key technologies, competitors, markets, and so on, but in the process set up the risk that the organisations can be *blind* to other stimuli not consistent with those models (Kaplan, Murray et al. 2003). The example of Polaroid is a case in point; although they were very early to spot the technological shift around digital imaging they were unable to adapt their view of the world to see the different market and application space which was opening up (Tripsas and Gavetti 2000).

Linked to this are the issues associated with what Henderson and Clark (1990) termed *architectural* and *component* innovation). Organisations construct

knowledge networks to provide technological and market information and these represent important channels along which innovation can be developed. However, when changes in the environment change the interrelationship between knowledge sets – what they term an *architectural shift* – then the old knowledge networks are no longer relevant and may even get in the way of building new ones to carry new signals supporting the new architecture.

Evidence suggests that established organisations find it difficult to shift their *mind-sets* or the underlying knowledge architecture. Disruptive innovation represents a major field of study and a key implication is that established organisations need to retain or develop capacity for corporate entrepreneurship – for search and operation in the *fluid* state (Tushman and O'Reilly 1996). The difficulty for established players is the need to let go and reinvent themselves via new; what is known as finding, forming and performing challenges (Birkinshaw, Bessant et al. 2007).

The problems faced by incumbents in doing this present fundamental challenges to their culture and routines (Christensen 1997). There is an extensive discussion of the difficulties which established organisations find themselves in when confronted by discontinuity. As noted, this can arise from the emergence of new technologies, new markets, new regulatory frameworks, etc., but the effect is the same in that the old established routines for innovation management fail to work. The problem is compounded because the tendency is to reinforce the old routines rather than search for new ones – for example, redoubling efforts to get close to existing customers when the challenge is actually to find ways to engage with those in a newly emerging market with very different characteristics.

Christensen set up the challenge for established incumbents as the *innovator's dilemma* but of course this represents a time of opportunity for new entrants who do not have the organisational or cognitive baggage which might impede their developing new routines. The literature has an extensive exploration of the challenge of *ambidexterity* and, in particular, the need for internal entrepreneurship, different structural arrangements for corporate entrepreneurship and different parallel routines associated with this (Tushman and O'Reilly 1996; Birkinshaw and Gibson 2004). There are major challenges involved in resolving these tensions and the literature around corporate entrepreneurship explores the ways in which such venture groups search, select and implement and how these often conflict with the mainstream.

3.5: Public and social innovation

(a) Public sector innovation.

In the private sector, the need to implement new products, processes or organisational methods is often viewed as a *survival imperative* – innovate or fail. It is interesting to contrast this with the findings of a recent report by Su Maddock (Maddock 2008) on public-sector innovation:

> *for years, officials' speeches have talked about the need for creativity,*

> *entrepreneurialism and innovation in public services, and there are plenty of innovative people working in departments and agencies. But despite the talk, innovation is very rarely taken seriously. There are few people in the public sector whose job it is to find innovations or to fund them, grow them, assess them and spread them about. Innovation has had nothing like the focused attention paid to performance management. And, unlike in the private sector, very few people get to the top because of innovations they have pioneered.* (p. 4)

This suggests that public-sector innovation cannot really be described as a *survival imperative*, as in the corporate sector – in fact, it has traditionally been seen as, at best, an optional extra. The same report suggests a lack of individual capacities, attention and incentives for innovation in the public sector.

The need for innovation in the public sector is clear but there are problems attached to its execution. As Hartley (2005) points out the challenge is in balancing not only risk and reward as in the private sector but also in maintaining *reliability* as public services must be dependable. This sets up an innate bias towards *playing safe* and reduces the incentive to take risks, which is a problem compounded by the fact that many public sector innovations are highly visible and the consequences of failure can be career limiting.

Hartley also makes the point that public sector innovation takes place in a highly contested space; unlike the pattern in business where there is often a dominant strategic logic, public sector innovation involves multiple actors with different perspectives.

Despite these limitations there is growing interest and activity in the public sector innovation space; Bason and Bekkers provide rich accounts of different approaches in a variety of public sectors and across several countries (Bason 2011; Bekkers, Edelenbos et al. 2011). Bason's book also highlights the role which a catalytic agency (in his case *Mindlab*, established by the Danish ministries of Taxation, Economic Affairs and Employment) can play in mobilising and enabling such innovation across a broad front. Albury (2004) and colleagues have looked at the potential in a number of UK sectors as well as addressing some of the core issues around diffusion and scalability. This is a theme picked up by Hartley and Downe (2007) who examined the role of *beacon* councils as innovation leaders highlighting new pathways for innovation which had the potential to become dominant designs. Research for the Sunningdale Institute suggested that there are multiple models for the innovation process within the health sector rather than a *one size fits all* approach, and within these models there exists considerable scope for mobilizing innovation (Bessant, Richards et al. 2010). Research by NESTA suggests that the *toolkit*; for public service innovation needs to draw upon methods which work with users and in particular emphasizes techniques drawn from the world of service design (NESTA 2014).

(b) Social innovation

Social innovation – innovation for the greater good – has a long tradition, with examples dating back to some of the great social reformers. For example, in the UK the strong Quaker values held by key entrepreneurial figures like George Cadbury led to innovations in social housing, community development and education as well as in the factories which they organized and managed (Hirst 2002). As Mulgan and colleagues (2007) point out*:*

> *The great wave of industrialisation and urbanisation in the nineteenth century was accompanied by an extraordinary upsurge of social enterprise and innovation: mutual self-help, microcredit, building societies, cooperatives, trade.*

The tradition continues with a growing recognition of the importance of social entrepreneurship and an understanding of the underlying business models which can support the generation of sufficient returns to make a social enterprise sustainable in the long term (Murray, Caulier-Grice et al. 2010). A key characteristic of social innovations is that they are primarily motivated by the goal of meeting a social need, and that the innovation is predominantly diffused through third-sector organisations whose purposes are social (Mulgan, et al., 2007). An understanding of social innovation broadens the motivations for innovation beyond profit and public service – social innovation can be driven by goals such as equity, rights and the alleviation of suffering.

Infrastructure investments (like the Big Society Capital fund in the UK and specialist venture funds like Acumen in the USA) provide an alternative source of capital, and co-ordinating agencies (e.g, the Young Foundation) provide further support for the mobilisation and institutionalisation of social innovation. The literature on entrepreneurship increasingly recognises the motivational and identity characteristics behind social entrepreneurs and their desire to make a difference rather than a fortune (Gruber and Fauchart 2011).

That social innovation takes place is well-documented; of more significance is a focus on the *nature* of innovation which emerges from this process. Ramalingam and colleagues (2010) suggest that social innovation involves three specific elements:

- Social innovations are usually new combinations or hybrids of existing elements, rather than being wholly new in themselves.

- Implementing them involves cutting across organisational, sectoral or disciplinary boundaries. They create new social relationships between previously separate individuals and groups, contributing to the diffusion and embedding of the innovation, and increasing potential for further innovations.

Social innovation is also seen as building on the inherent capacities of individuals and communities, which makes the notion of open innovation especially relevant. This process is arguably long established in the social sector, but without conscious efforts to establish innovation intermediaries and networking mechanisms to

support identification, scale-up and dissemination of innovations. Leading proponents of public- and social-sector innovation have argued that it should become a core activity in these sectors (Mulgan and Albury, 2003; NAO, 2000). They also recognise that, in the absence of the profit motive, it is essential to provide other incentives for innovation.

3.6: Complementary approaches.

3.6.1: Design thinking.

Although design methods date back many decades there has been a resurgence of interest in these approaches, driven in part by the growing profile of design in companies like Apple (Gregory 1975; Corfield 1979; Bessant, Neely et al. 2006). Importantly design thinking is an approach rather than something specifically linked to product design and the tools and methods are of particular relevance in engaging stakeholders at an early stage and in working with them to explore prototypes. This has value in developing innovations which have user perspectives built in and thus stand a better chance of widespread adoption and diffusion.

Studies of design thinking range from the theoretical (Verganti 2009) through to the technique-oriented accounts by design practitioners (Kelley, Littman et al. 2001) and into the world of users where these approaches have been of value (Von Stamm 2003; Brown 2009). A key theme in this is working with users and tools like ethnography, empathic design, prototyping and storyboarding are important additions to the front-end innovation management toolkit.

Once again such approaches have been widely applied outside the commercial sector (Bate and Robert 2006; Bevan, Robert et al. 2007), in public services and in social innovation (Mulgan 2007; Murray, Caulier-Grice et al. 2010). Of relevance is the concern in such activities to aim for wider scaling of innovations. The model offered by Robin Murray and colleagues, for example, has multiple stages which include prompts, inspiration and diagnosis, proposals and ideas, prototypes and pilots, sustaining, scaling and diffusion, systemic change.

3.6.2: New entrepreneurship approaches.

Entrepreneurship is increasingly being seen as involving learned skills, rather than being personality or trait-based. This has led to an expansion of courses on entrepreneurship and the development of a robust toolkit to support such learning, which has been called *scaffolding* (Shane 2003). Whereas the focus used to be on the Business Plan this is increasingly seen as a static device which relies on being able to assemble information ahead of what is an uncertain development process along technological and market fronts. Instead emphasis is shifting to considering the *process* of planning – for example by using business models as a narrative structure for engaging and prototyping (Osterwalder and Pigneur 2010). Approaches like the *lean start-ups* and similar structured methodologies help to make explicit the underlying approach and process for working in uncertain environments (Ries 2011) via rapid experimentation and learning. Key tools and terms emerging from this space include the notion of *agility*, *fast failure*, *minimum viable product*, *pivots* and

scrums. All of them describe tools and approaches which lend themselves to planned fast experimentation allowing exploration of novel ideas whilst minimising unnecessary risks. Many of these ideas are being taken up in the wide discussion surrounding social entrepreneurship.

3.6.3: Platform and complex project systems.

Large-scale innovation activities such as major construction projects or the roll out of mobile communication networks involve multiple players and require co-ordination of innovation as well as physical inputs where multiple actors converge around a core problem and operate in symbiosis. The project becomes the unit of analysis rather than product, and there is a shift towards providing solutions to problems rather than pushing products (Davies 1997; Davies and Hobday 2005). As such activities depend on creating and managing systems of interacting players so the role of systems integrator and the tools and methods associated with working at this level become important (Miller, Hobday et al. 1995). This approach is also becoming relevant as organisations seek to build and sustain platforms. This might be internal architectures which allow multiple generations of products, or external (such as the i-Phone or Android) where the platform requires the creation and management of a system of interacting players (Gawer and Cusumano 2002).

3.6.4: Service innovation.

The service sector has been explored for some time in innovation studies (Barras 1986) and research on service innovation has begun to explore issues like service productivity and the economic impact it has via global value chains on development and growth (Meliciani and Savona 2014) (Bessant, Moeslein et al. 2014). However it is growing in importance as researchers explore the extent to which such innovation is similar to, or different from, that associated with products. One particular dimension is the role of users; whilst some *back office* service innovation is analogous to process innovation elsewhere the main difference in innovation in service offering is the key role played by the customer/user in the process.

Barras argues, building on Abernathy and Utterback's model, that there is a 'reverse product cycle' in which early emphasis is placed on process innovation and only later do services become formalized into 'product' packages which can be commoditized (Barras 1986). Others see service innovation as part of a continuum running from commodities at one end through increasing levels of customization to an opposite extreme in which the individual and personal experience is they key output (Pine and Gilmore 1999; Voss, Roth et al. 2008). Much of the recent discussion in the world of manufacturing innovation has looked at 'servitisation' and the move to wrap services into the overall innovation offering, arguing for the emergence of a field of 'service science' (Maglio, Spohrer et al. 2008; Chesbrough 2011).

At the heart of this discussion is a recognition of one of the key differences in service innovation which is the role of the user (Bessant and Davies 2007). Whereas a manufactured product can be designed and produced with the user acting as only a passive bystander, the service transaction places them at the centre (Tidd and Hull 2003). Interaction with users, deep understanding of user needs and co-creation

with users are all features of the service innovation agenda which Vargo and Lusch argue is an alternative 'dominant logic' to that of manufactured products (Vargo and Lusch 2006).

Three core themes characterise much of the discussion around service innovation:

- The nature of service innovation and in particular the evolution of thinking around designing services rather than products (including both the 'servitisation' and 'experience economy' themes

- The design of service experience as a journey rather than a single event

- The role of user input to that design and the use of user experience as a key source of innovation

In this context the tools of service innovation become important since they focus on ways of understanding and characterizing the user experience and working with these insights to create a more effective offering. Concepts like the 'service journey', 'outcome-oriented innovation' and a wide range of design tools are deployed to build a sense of co-creation within service innovation. This literature draws close links with user-led innovation and the ideas of co-creation as well as to the concept of outcome oriented innovation, described as what jobs people need to have done and products as tangible services (Ulnwick 2005).

3.6.5: Inclusive innovation.

New terminology has been adopted for a range of inclusive innovation activities with various names such as *frugal*, *grassroots*, *jugaad*, *bottom of pyramid* (BoP) *innovation*, all of which have some degree of roots back in *appropriate technology* and intermediate technology (Schumacher 1973; Prahalad 2006; NESTA 2012; Radjou, Prabhu et al. 2012). The challenge around designing for, with and by users opens up significant new possibilities for not only finding solutions to problems but also in ensuring those solutions are compatible with the local context and have a higher chance of successful diffusion (Smith, Fressoli et al. 2013). At the same time the systematic use of techniques such as those around *lean thinking* can be applied to the challenging new context of emerging economies where income levels are low and infrastructure weak and poorly developed (George, McGahan et al. 2012; Sonne 2012). Examples include radical improvements in healthcare productivity through applying techniques like target costing, process mapping and cellular production (Crisp 2010).

Innovations developed in this context not only have relevance for their immediate community; they may also have the potential for what has been termed *innovation blowback* and *reverse innovation*, where lessons learned in these contexts can have implications and possibly disruptive effects back in developed economies (Seely Brown and Hagel 2005; Govindarajan, Trimble et al. 2012).

3.6.6: Networked innovation.

Increasingly there is use of systems language and the recognition that the locus of operation and control may move from the individual enterprise (20th century model) to the distributed network, orchestrated and co-ordinated by key players. Examples exist around supply chain governance (Dyer and Nobeoka 2000), complex product systems integrators, platform orchestrators and ecosystem managers (Gereffi 1994; Gann and Salter 2000; Gawer and Cusumano 2002). An important part of this discussion is that with the shift away from the individual firm as the central organising agency so questions emerge of who shapes the architecture, who controls the system, how can it be shaped and co-ordinated? This connects with our earlier detailed discussion around *ecosystems* for innovation and raises some important policy issues for external actors, whether governments, agencies, or NGOs, in terms of the roles they can play in convening, co-ordinating and developing such systems.

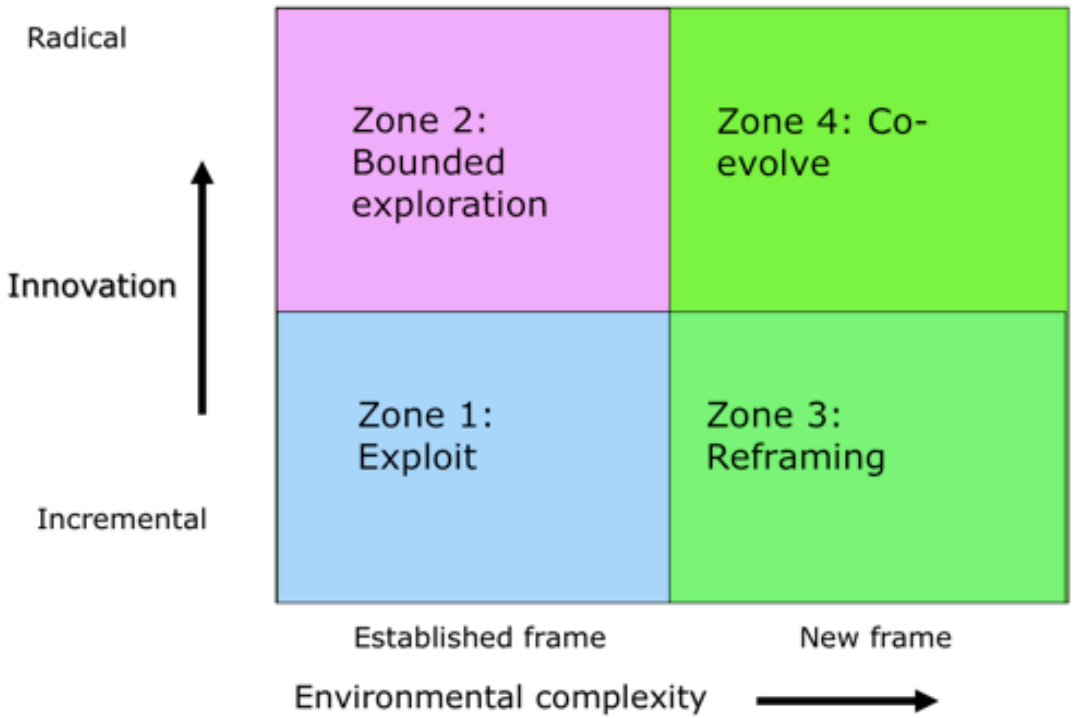
3.7: Navigating diverse models: the innovation management matrix.

Many readers may at this stage be feeling rather overwhelmed with the diversity of approaches and perspectives on innovation and its management. Fortunately there are a number of model frameworks which try to draw together core themes and present them in ways which can illuminate and focus thinking around key areas of strategic decision-making. For example, the question of 'what types of innovation are there?' can be explored using frameworks like the 4P's of innovation (Francis and Bessant 2005; Ramalingam, Scriven et al. 2010), whilst 'how does innovation take place?' can benefit from using a process model like that presented in figure 1 of this report.

Of particular relevance here are models which can help inform strategy – understanding the context in which innovation is taking place and the implications that has for the approaches needed for its effective management. For heuristic purposes, we present here a tool developed by the authors to navigate this space: the innovation management matrix (figure 2) which is defined by two axes. The vertical is the degree of novelty involved, running from incremental (doing what we do but better) through to radical innovation (doing something completely different). The horizontal is a measure of environmental complexity, defined as the number of elements in the environment and their interaction, running from simple to complex.

This is, of course, a massive simplification but it helps organise our understanding of relevant routines – behaviour patterns which become embedded in structures, processes, etc. – and the ways in which we approach innovation management under different conditions. In particular it provides a *contingency model* for managing innovation; it is not that any approach is *right* or *wrong* but rather that there are different approaches required to deal with the different kinds of challenges identified in the matrix. Its role is thus to help us deal with the *wood and trees* problem identified in section 1 and to better conceptualise and map the different strands of innovation management.

Figure 2: A contingency model for innovation management



Zone 1 (bottom left) of this model is a simple environment, typified by predictable trajectories, known competitors, well-understood markets, established technological sources, etc. Innovation here is about *exploit* and favours established incumbents since it brings well-oiled experience and leverages prior knowledge. It plays on well-established routines and exploits strong ties within existing networks; it is predominantly about incremental improvement innovation.

Zone 2 (top left) is *exploring* within this broad frame, pushing the trajectory but not jumping off it. Innovation here involves calculated risks, bigger investments in learning and spreading the search net more widely but it also still assumes that core framework conditions do not change. Examples here might be Intel building a next generation chip, GSK finding a new blockbuster drug, or Microsoft pioneering a new move in operating systems. Innovation here is closer to radical but still within a bounded frame.

By contrast Zones 3 and 4 (right hand side) are characterised by complexity – interactions and secondary effects resulting from these interactions. They are less prone to managed and planned innovation because they represent evolving situations which bring in new elements – new stakeholders, new technologies, different market constituencies, etc. In general working in this space is less about predictability and planned innovation and more about exploration and experiment. In short it requires much more of an entrepreneurial orientation.

The key differences between the two sides are around the need for entrepreneurial mind-set and behaviours on the right hand side and the importance of systematic

and organised approaches on the left. Not surprisingly if the same organisation is trying to exhibit both kinds of behaviour it can result in considerable tensions – the *ambidexterity* challenge discussed by several writers.

Zones 3 and 4 correspond to the fluid state where many things are possible, multiple experiments are involved and there are many failures which can lead to learning. There is a gradual emergence of a dominant design which can then be refined and provide a stable innovation which can then diffuse. In complexity theory terms this corresponds to the identification of an *attractor basin* and the subsequent process of emergence is one of feedback and amplification around this core node. It is a process of co-evolution amongst the elements in the interaction.

Innovations which begin here and emerge as dominant designs can move leftwards towards a stable state. For example in the case of low cost airlines, complexity came from the challenge of bringing in new elements – people who didn't fly - and adding them to the mix. The fluid state involved considerable experimentation around a different configuration, mixing all the ingredients around flying, planes, passengers, processes. Eventually this stabilised to a core business model which looks very different and which emerges as a result of extensive learning with a new market.

So innovation in such complex environments is not the result of a master plan but rather an emergence channelled by active entrepreneurs working in the space. The emerging new toolkit of *lean start-up* is relevant here based on equipping entrepreneurs for learning fast with new markets, experimenting, failing and testing, deploying *minimum viable products*, pivoting and hunting towards stable and viable options.

In the next section we look at the literature which specifically deals with the question of humanitarian innovation and emerging themes in this space.

4. Humanitarian innovation: An overview

4.1: Overview of the literature.[3]

The humanitarian sector is a relative newcomer to innovation, in terms of both practices and literature. There were no publications focused on the subject until 2009, making humanitarian innovation literature around a century younger than the overall innovation management field. The paucity of quality research is perhaps best illustrated through the systematic literature searches conducted for this review. Of the two major journals which include a focus on international humanitarian aid, one, *Disasters*, cites the term *innovation* 145 times, of which 13 related to specific innovations, and 10 of these related to innovations in disaster preparedness. The other, the *Journal of Humanitarian Assistance*, has only 10 instances, of which 2 relate to specific innovations. Neither journal had any instances of the term *innovation management*. There has been a rise in newer titles focusing on specific issues, such as the *Journal of Humanitarian Logistics and Supply Chain Management*, where the term innovation is much more commonly used. On the innovations side, the terms *humanitarian* and *disasters* have periodic flashes of interest, most notably after Haiti, when MIT's *Innovations* journal ran a dedicated special issue on the challenges of recovery and the role of innovation entrepreneurs in areas such as banking and infrastructure (Auerswald and Quadir, 2010).

4.2 ALNAP study and HIF approach to innovation management.

Work that specifically focuses on using frameworks and concepts from mainstream innovation management to think about humanitarian aid effectiveness is very small indeed, numbering less than about ten pieces of work in total. In a formative study published in 2009, ALNAP drew on the notion of different stages of innovation and different types of innovation (Ramalingam, Scriven and Foley, 2009). That study picked up on five distinct cases of innovation, and analysed them in terms of how the ideas progressed from recognition through to diffusion, making it the first systematic assessment of innovation management in the sector. The study closed with a framework for humanitarian innovation that showed that innovation forms and processes were embedded in three supporting areas (see figure 3):

- Capacities, including of innovation entrepreneurs and leaders; field and operational staff; researchers and evaluators, and external experts, including the private sector;

[3] This review does not include a comprehensive description of the innovation related activities being undertaken by various UN agencies and other humanitarian aid donors and NGOs as these are well documented in Betts and Bloom (2014). Furthermore, it is a prime example of a field in which there are numerous active blogs. As explained in footnote 1, while we did scan this literature a decision was taken that they fell outside the scope of this review.

- Relationships, including with affected populations, within aid agencies, between international and national actors, with researchers and academics, with the private sector, and between operational agencies;
- Contextual factors relating to the sector, including culture of risk, financing, codes and standards and incentives.

The study showed that for the five case studies, the turning point in innovation management involved not just a series of windows of opportunity for a new idea or practice, but also serious constraints on the existing standard operating procedures, so that there was little choice but for a new approach to be attempted. This embryonic view of the humanitarian innovation system provides a precursor for the present study, in that the focus is now to understand *how* these diverse elements get mobilised in support of the core innovation management process.

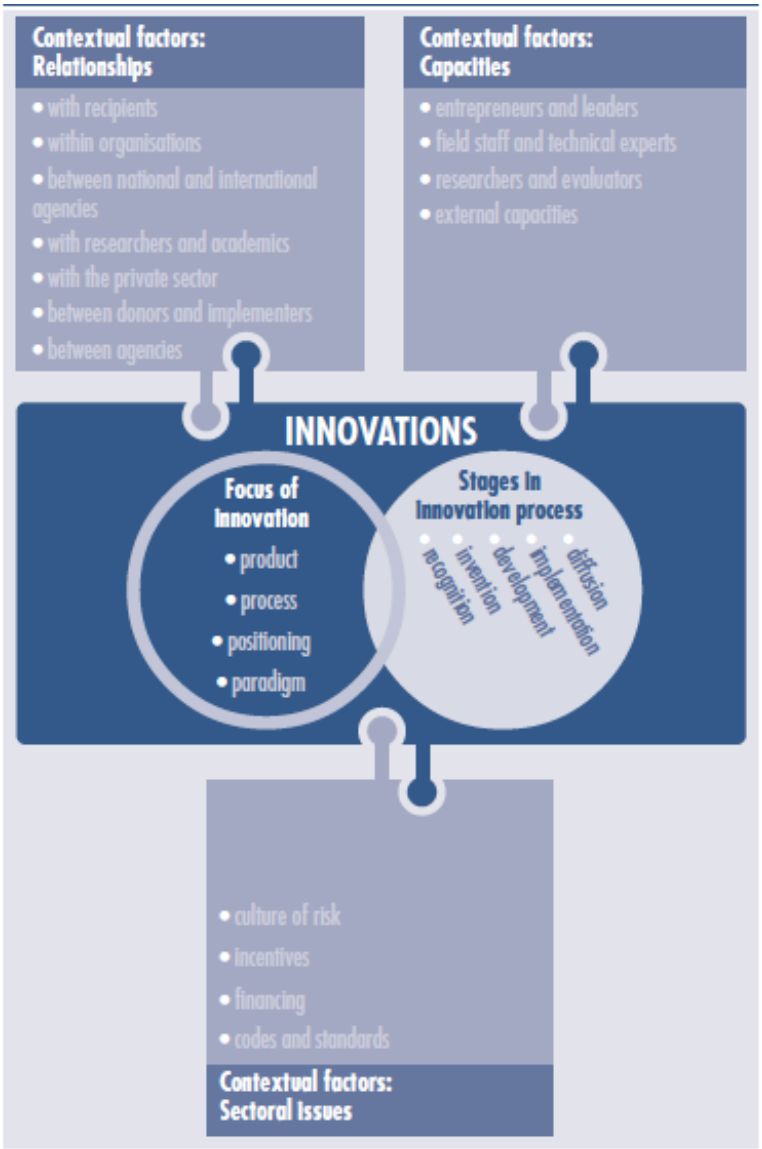
The Humanitarian Innovation Fund which was one of the key outcomes of the 2009 ALNAP study took the key ideas of innovation processes and attempted to make them concrete by the provision of structured finance for different stages of a range of on-going innovation processes. Supported largely by DFID, it remains the most sustained attempt to bring innovation management into the sector as a whole. However, as is clear from a recent review (Willits-King, 2014), the current focus on financing innovation processes may be necessary but not sufficient for strengthening the overall innovation ecosystem.

4.3: A slowly growing general literature.

Since the 2009 study, there have been a handful of general reviews that have explored different aspects innovation management per se. The University of Oxford's Humanitarian Innovation Project (OxHIP) has published a review of the nature of innovation (Betts and Bloom, 2013). This highlights the need for more bottom-up, user driven innovation especially amongst refugee groups. OxHIP (2014) also has a work-in-progress review of the progress of humanitarian innovation policies and practices, with an emphasis on the state of the art, and an overview of organisational approaches to innovation.

There have also been some influential reviews of humanitarian aid which include a focus on innovation. By far the most prominent has been the Humanitarian Emergency Response Review led by Lord Paddy Ashdown of the UK Government's aid efforts (HMG, 2011). This contained a dedicated chapter and recommendations on innovations, and directly led to DFID's evidence and innovation strategy (DFID, 2012). More recently, UNOCHA focused on digital innovation in their 2013 flagship review of global humanitarian aid, which *imagines how a world of increasingly informed, connected and self-reliant communities will affect the delivery of humanitarian aid. Its conclusions suggest a fundamental shift in power from capital and headquarters to the people [that] aid agencies aim to assist.* (UNOCHA, 2013) Though a new generation of technologies was seen as vital, what was also important was the shift in aid agencies themselves: *If aid organisations are willing to listen, learn and encourage innovation on the front lines, they can play a critical role in building a more inclusive and more effective humanitarian system.*

Figure 3: An emerging framework for humanitarian innovation



Source: ALNAP (2009)

4.4: Sector-specific reviews and case studies.

There have been numerous sector-specific reviews of innovation and R&D. Most notable have been the MSF review of medical innovations (MSF, 2011) which presented a series of self-assessed case studies of new humanitarian-specific treatment protocols for cholera, meningitis, sleeping sickness, malaria and AIDS. The focus is on MSF's contribution to a variety of innovation processes, and sheds important light on how these processes, if successful, *upset existing relationships*

between institutions, between practitioners, and between researchers thereby producing tension and shifting alliances. This is described vividly as a political process with numerous twists and turns in the innovation process, arguments for and against change, and the need for firm and focused advocacy to move innovations from the experimental phase into therapeutic use (MSF, 2011). In particular, they highlight the role of MSF as *forcing* innovation to happen.

Other sector reviews have taken a rather different stance, looking not at successes but at what still needs to be done: the potential of innovation to improve practices. For example, the HIF has commissioned a review of the gaps in emergency water and sanitation that would be the focus of targeted innovation management processes (Bastable, 2013). The Shelter Centre has convened similar processes in emergency shelter (Shelter Centre, 2014).

There have also been stand-alone case studies of specific innovation processes. Most have been developed by the institutions already mentioned here: ALNAP have produced seven case studies by way of follow-up to the original report (ALNAP, 2014), there are a number of HIF project reports (HIF, 2014), and several OxHIP reviews (OxHIP, 2014).

4.5: Emerging trends in humanitarian innovation.

This section draws on the available literature to highlight some emerging trends. It is worth noting that an in-depth coverage of these issues is not possible given the aforementioned limits of the literature.

4.5.1: Steady evolution of innovation practices.

Overall, innovation practices do appear to be slowly evolving in the sector: the growing use of design-led approaches in public, social and development innovation is now diffusing into the humanitarian sector (HIF, 2013; OxHIP, 2012). At the current time, this seems to take *user-led* as far as front-line workers, with few concrete examples of aid recipients being involved in innovation processes (OxHIP, 2012). There are however, more examples of innovations that seek to re-orient the aid relationship with the recipient playing a more central role, such as cash. The success or failure of such efforts fundamentally depends of the ability of aid agencies to move from being *top-down deliverers* to open-source curators and facilitators (ALNAP, 2012).

4.5.2: Technology viewed as prime enabler.

There is an equal amount of excitement and cynicism about the role of technology (ALNAP, 2009; UNOCHA, 2013): as an innovation in its own right, and as a supporting factor in innovation management processes. Some prominent international organisations with an interest in humanitarian innovation have not moved very far beyond the deployment of mobile technologies in responses. The challenge here is that this may lead to simply bringing mobile technologies into existing processes, rather than seeking to significantly change these processes. Separately, there has been a lot of interest in big data approaches, on the role of UAVs, 3D printing, and

other cutting-edge technologies (UNOCHA, 2013). These vary considerably in terms of their potential for deployment in operations.

4.5.3: Tension between top-down and emergent innovation.

There is an emerging tension between *top-down* planned interventions and bottom-up emergent innovations: it can be argued that many of the most top-down efforts are analogous to innovations in large companies and focus on incremental developments of established ideas. The corollary also seems to hold true: some of the emergent, user-led innovations such as cash have proved radical precisely because they emerge in through direct consideration and inclusion of end-users and their needs (ALNAP, 2009; MSF, 2011).

4.5.4: Tension between open and closed approaches.

There is also a tension between open and closed innovation processes. Many agencies now have dedicated innovation departments, and focus on strengthening innovation in their own field or sector of expertise – UNHCR in shelter, WFP in food, and so on. The sectoral global clusters are seen as having a potential role to play in facilitating open innovation across the key sectors, but this raises questions about innovations that cut across sectors and silos (HERR, 2011). In parallel, there has been an emergence of a more collective approach to innovation, especially in new technological approaches. The Digital Humanitarian Network is a central player in this space as a *network of networks* (Digital Humanitarian Network, 2014).

4.5.5: Growing interest in role of private sector.

There is a growth in private sector interest in humanitarian innovation, albeit limited to high-profile natural disasters (HERR, 2011). Increasing numbers of aid agencies are seeking to partner with the private sector across the innovation process, whether in terms of helping to recognise opportunities or challenges, or at a later stage in terms of developing and implementing new innovations.

5. Bringing innovation management to humanitarian aid: key challenges from the literature

Given the above exploration of key themes in the innovation management literature, we can point to a number of lessons that can be draw out which might have relevance to humanitarian innovation ecosystems. First of all there are some core generic trends which are reshaping the innovation landscape and which may offer new opportunities for different approaches in the HI case – for example the massive opening up of innovation to multiple players and the increasing potential for engaging users at both front end and in diffusion of innovation.

At the same time the challenge remains of how to operate in a highly uncertain and complex environment and to enable not just incremental improvements in efficiency but also radical solutions to crisis situations.

5.1: The core capacity challenge.

One of the core strands in the *mainstream* innovation management literature deals with the accumulation of innovation management capability (variously expressed under labels like *absorptive capacity*). This literature suggests that there is considerable scope for identifying and training the relevant skills within in individuals and groups to enable innovation to take place, and there has been extensive growth in courses to meet this need. This skills base extends across the innovation spectrum and covers both entrepreneurial start-ups and innovation operations within established businesses (Tidd and Bessant 2013). There is also considerable experience around building this through targeted inputs of education/training supported by rich library of relevant tools and techniques, case examples, etc.

Within the humanitarian sector it appears that these concepts are neither systematically understood nor applied in dealing with questions of innovation management, except in a post hoc fashion in analysing case studies. There is this potential scope for exploring the development and implementation of skills and capability building in this space. However, given the global and distributed nature of the sector this capacity building needs to extend beyond simply providing a library of tools and provide instead a clear understanding of the process of innovation and how an effective ecosystem can be organised and managed.

There may also be a case for exploring the role of intermediaries in the system – agents who act as gatekeepers or *translators* across the knowledge network – and how they can be identified and supported. For example, translating technical ideas from the worlds of *big data* into workable solutions which build on user insights and needs requires a degree of intermediation and brokerage. This connection between problem 'owners' and problem solvers may well extend beyond the theme of brokerage common to much of the open innovation discussion and implies a more developed capability to translate between the two worlds.

5.2: The ambidexterity challenge.

Humanitarian innovation takes place in an environment of high uncertainty, a complex system of interacting elements. Whilst there may be some recognisable patterns similar to things seen in the past each crisis is, to some extent, unique. So the kind of innovations needed to respond to the crisis will emerge from that particular crucible, depending on actors working in that space. This is essentially the kind of environment in which entrepreneurs operate and much of their approach of probe and learn, experimentation, fast failure and learning, pivoting, etc., is characteristic of the kinds of improvisation which case studies of HI reveal takes place.

At the same time there is the more planned approach to innovation which sees the regularity in the patterns and develops improved ways of dealing with them. Improving versions of existing solutions are relatively commonplace, such as incremental innovation around logistics and distribution techniques, or refined product concepts based on learning from previous situations. But, there is a limited amount of *R&D* supporting this – knowing that the next humanitarian crisis will require solutions to logistics, food distribution, water and sanitation, etc. means that innovations can be developed for that *market* ahead of when they are actually needed. So the system, represented by the major humanitarian agencies, although innovative, is largely top-down and operates in a planned fashion which resembles the behaviour of large corporations in mature markets.

These involve two very different kinds of approach to innovation and table 1 sets them up as extreme archetypes in terms of their implications for managing innovation in humanitarian contexts.

Table 1 Archetypes for innovation management

Type 1 Incremental innovation	***Type 2 Radical innovation***
Operates within mental framework based on clear and accepted set of rules of the game	No clear rules – these emerge over time High tolerance for ambiguity
Strategies path dependent	Path independent, emergent, probe and learn
Clear selection environment	*Fuzzy*, emergent selection environment
Selection and resource allocation linked to clear trajectories and criteria for fit	Risk taking, multiple parallel bets, tolerance of (fast) failure
Operating routines refined and stable	Operating patterns emergent and *fuzzy*
Strong ties and knowledge flows along clear channels	Weak ties and peripheral vision important

Source: adapted from (Phillips, Noke et al. 2006)

These two innovation strands can be seen working in parallel in some of the reported cases of humanitarian crises, and both are necessary. The entrepreneurial

operation is likely to lead to radical innovation but has the problems of scaling and systematising whist the planned approach runs the risk of being locked into old trajectories and unable to change or adapt. The challenge of *ambidexterity* which is widely discussed in the mainstream innovation literature appears to operate in the HI space as well. Existing incumbents (the aid agencies) are well prepared for incremental innovation in the *steady state*, utilising a rich resource base and operating networks based on strong established ties. In our model (see figure 2) they are very much associated with the left hand side and able to operate well in that context.

But the right hand side of the model requires different approaches that are much more entrepreneurial and explorative. New signals about new innovative solutions which are better suited to the specific context are available but it requires a different model for working with them. Established incumbents face several problems in working in this space – their perceptual frameworks process the information in terms of prior models and experience. Novel solutions may be rejected because of *not invented here* and other *immune system* responses, resource allocation mechanisms may not be flexible enough to cope with experimental ideas, risk aversion may well be embedded in structures for decision-making and operations. This tendency, typical of large corporations, is possibly exaggerated in aid agencies where there is a sense of social responsibility to the donors and to the perceived welfare of the recipients; caution becomes endemic.

Recasting the HI problem as one of *ambidexterity* means we can look at the extensive literature on how to deal with this *innovator's dilemma* – riding both the horses of experimental entrepreneurialism and steady state managed innovation. It's not a case of either/or but rather HI needs both approaches and a managed balance between them, plus enabling structures and skills to support parallel innovation management routines.

5.3: The entrepreneurship challenge.

The few case studies of radical innovation in HI suggest the process is a classic entrepreneurial search and pivot around emerging possibilities in the crisis space. Innovation is the result of co-evolution and *users* are a key part of the process. Mapping these cases on to the *lean start-up* kind of roadmap for innovation suggests that radical innovation development in HI is similar to a start-up business. Extensive interaction, probe and learn, planned experimentation and fast learning from failure, launching a *minimum viable product* as an attempt to deal with a crisis but also learning from that and refining and pivoting. The *jugaad* mind-set of improvisation is also relevant here, making do via a bricolage process rather than importing resources from an external context.

This places emphasis on the need to support humanitarian innovation entrepreneurs. This might be via training and skills development (so they can match their passion and commitment to social change with relevant tools and techniques to manage the innovation process), via *venture* capital/resources to enable small-scale experimentation, via *licence* to experiment for those entrepreneurs working within

large agencies (a kind of *corporate entrepreneurship* group), via fast track decision-making to support this, etc. There is an extensive literature around supporting entrepreneurs, both in start-up mode and in corporate venturing settings on which development of such support might draw (Akrich, Callon et al. 2002; Burns 2011; Baron 2014).

5.4: The user challenge.

The literature stresses the importance of users in innovation, both as key sources of ideas and as enabling configuration of solutions which are compatible with their context. This second point is of particular relevance to the diffusion question; innovations won't succeed unless they spread and one of the big barriers to spread is compatibility in Roger's terms. Diffusion theory also stresses that when innovations arise from within the context of application and are carried by *people like us* (homophily) they are more likely to be accepted than when they originate outside and are carried by external agents. The change management literature (which is essentially concerned with the adoption of process innovations inside organisations and social systems) stresses the importance of user involvement, not simply *selling and telling* but actively soliciting ideas and inputs to configure the planned process change to suit its context.

So in the HI context, and borne out by the published case studies, is a strong line around the need for user engagement. Entrepreneurs as change agents and catalysts working with users can facilitate co-creation of viable and scalable solutions. This places emphasis on the tools and techniques for such user engagement and particularly the relevance of participative design approaches which embed this methodology.

5.5: The open innovation challenge.

Although innovation has long been recognised as a multi-player game there have been dramatic shifts in the landscape since the turn of the twentieth century. In particular the explosion of knowledge production and its global distribution has forced a rethink which shifts emphasis from knowledge production to knowledge flows. This open innovation concept has major implications for the way the innovation process operates, pushing it more towards a networked/ecosystem basis and requiring new modes and routes to connectivity. There are considerable opportunities in this space for humanitarian innovation, opening up the challenges to a wide range of players and enabling knowledge flows into and out from the sector. The issue of how best to enable this experimentation with different brokers, bridges and knowledge catalysts (especially via the Web-enabled space) becomes a key priority.

5.6: The incentives and structures challenge.

As we saw in section 3 the challenge in public and social innovation lies in the need to balance risk, reward and reliability – and this creates challenges for the structures and incentives put in place to enable innovation. There is considerable scope for learning from this experience and from some of the experimental models like

Mindlab in Denmark which attempt to rethink the ways in which innovation could be organised, supported and rewarded.

5.7: The ecosystem challenge.

As we have seen innovation is a multi-player game and increasingly is being managed on a system level. Examples like Dell and Toyota highlight the organising and convening power of key actors and in the area of complex product systems there is a growing recognition of the value of systems integration capability.

Research on innovation systems suggests that it is more than simply mapping the key actors in a regional or national system; innovation ecosystems are constructed social systems and seem to work best when there is clear governance and tangible roles. This argues for further exploration of the roles which could be played by major aid agencies, NGOs, and so on, and the potential for *keystone actors* who can help to make the ecosystem more productive.

6. Emerging conclusions

Overall, and consistent with the rationale for this study, there is growing interest in humanitarian innovation not just as the outcomes of successful processes, but as a *system* that needs to be strengthened if innovation investments are to be of maximum benefit. This is based on an understanding that the classical linear model simply does not work in most humanitarian settings. A more sustained attempt to bring an ecosystem approach to humanitarian innovation could have the following benefits:

- It can aid the understanding of specific innovation pathways of particular ideas and approaches through the system, in order to get a more precise and nuanced understanding of what enables or inhibits take-up in different contexts;
- It can help understand how different technical knowledge domains operate in terms of innovation sub-systems;
- It can help understand the role of different actors currently in the system – from investors; brokers; capacity builders; individual entrepreneurs; mainstream deliverers – and the gaps that may need to be filled, for example, where are the keystone actors?; and,
- It can help explore the role for systemic innovation in the humanitarian sector, in terms of game-changing or paradigmatic innovations, and the barriers to these.

Realising these potential benefits means confronting the broader systemic issues that have long plagued the sector: the fact that the sector is a quasi-market which is shaped more by supply than by demand; the entrenched positions taken up by leading players, and the knock-on issues of dysfunctional competition and fragmentation in aid efforts; the clear limits placed on innovations such as cash that seem to carry potential to transform the sector.

These broader problems raises the key conundrum: the history, composition and dynamics of the humanitarian sector make it an ideal candidate for a more *ecosystem* approach to innovation, but those self-same dynamics may limit the ultimate success of such an approach.

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