The Future of the Management of Innovation: Trends and Challenges

Achim Hecker & Franz Huber
Seeburg Castle University

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1. Introduction

The contributions in this book illustrate that innovation management encompasses a variety of dimensions and fields of application. There is widespread agreement among policy makers, managers and academics that understanding and managing innovation is a key challenge for future success of businesses and economies. The increasing speed of economic and societal change, including transformative forces such as digitalization, creates much demand for innovation and innovation management. Against this backdrop, it comes with no surprise that the academic field of innovation studies, as well as the discussions on innovation management among practitioners, are flourishing. The focus of the present chapter is to comment on trends and future challenges of innovation management. It is worth mentioning that commenting on the future of managing innovation on a couple of pages involves limitations. First, the future is open and to some extent unpredictable. Second, as innovation includes many fascinating dimensions, it is impossible to provide a comprehensive overview. We aim to address these issues (i) by focusing on trends which are already ongoing and can be projected with some degree of certainty, and (ii) by focusing on topics which are related to our own research.

In the first part of the chapter, we discuss three fundamental dimensions for the future of innovation management: the importance of non-technological innovation (section 2), innovation dynamics (section 3) and global systems of innovation (section 4). The remaining sections stress substantive trends, which will shape innovation management: managing innovation for environmental sustainability (section 5) and digital innovation (section 6), before we conclude in section 7.

2. Managing Non-Technological Innovation

The study and management of innovation was, for a long time, confined to the technological development of new products and production processes. "Historically, research on innovation types has followed a technological imperative (...) focused on a narrow definition of product and process innovations associated with the R&D function in manufacturing organizations (...). Studies of organizational or administrative innovations have been relatively scarce" (Damanpour, Walker, & Avellaneda, 2009, p. 651). A recent survey of the past 27 years' innovation literature finds that out of 524 articles published in leading management journals, no more than 3% deal with innovation in administrative processes, organizational structures and management practices (Crossan & Apaydin, 2010).

Recently, researchers and practitioners increasingly question such a narrow notion focusing exclusively on technological innovation. They point to the obvious fact that innovation is not restricted to the development of new products and production processes but also finds fertile ground in services as well as a firm's organizational structures, administrative processes and managerial practices (Birkinshaw, Hamel, & Mol., 2008; Damanpour & Aravind, 2012; Hamel, 2007). Numerous examples – such as financial services; the divisional structure; the Tayloristic workplace organization; cost accounting and capital budgeting; Total Quality Management or the Toyota production system – illustrate the relevance of non-technological innovation for firm performance as well as economic growth.

New studies are now beginning to make up for this bias towards product and process innovation by delving into the topics of antecedents, characteristics, and consequences of non-technological innovation. Quantitative studies employing statistical methods to determine general patterns of non-technological innovation behavior across a large number of diverse firms are hampered, however, by a lack of available data. In contrast to technological innovation, organizational and service innovations are usually not patentable, which obviates patent statistics as source of quantitative data for these innovation types. As these types do not rely on conventional resources and processes of research and development, statistics on R&D inputs are likewise of little relevance. Furthermore, most surveys on firms' innovation behavior follow the mainstream of innovation research by focusing exclusively on technological forms of innovation, notably on the development of new products and production processes.

This situation has somewhat improved with the integration of specific items relating to organizational and service innovation into the Community Innovation Survey as one of the largest innovation surveys worldwide. Recent studies have

made use of this data to advance our understanding of determinants and effects of organizational innovation (e.g., Battisti & Stoneman, 2010; Evangelista & Vezzani, 2010; Ganter & Hecker, 2013a; 2013b; 2014; Hecker & Ganter, 2013; 2014; Mol & Birkinshaw, 2009; 2012; Mothe & Nguyen-Thi, 2012). These studies sow the seeds of an emerging new field in innovation research which holds promise to significantly contribute to a more complete picture of innovation management that comprises technological as well as non-technological forms of innovation.

For the future of innovation management, we expect important insights on a number of key issues on the emerging agenda of research on organizational and service innovation, which include: (i) Investigating drivers and contingencies of non-technological innovation at the firm, industry and country level as well as interdependencies between factors from these levels. This also comprises detailed studies on the impact of national institutions (e.g., product-, labor-, and financial market regulations, industrial and labor relations, educational system, legal regime, public (research) infrastructure, as well as national culture) in addition to a firm's industrial and organizational context on its non-technological innovation conduct and performance. (ii) Determining interdependencies between factors and processes leading to non-technological and technological innovation and deriving insights about complementarities between various innovation types. As interdependencies between innovation types usually unfold over time, research on this topic will also contribute to a better understanding of complex trajectories of innovation adoption and innovation dynamics more generally (see also the following section). (iii) Researching the impact of organizational innovation on firm performance. While the relevance of technological innovation for firm success is largely uncontested, performance implications of organizational and management innovations are still controversially disputed and lack robust evidence.

These insights will lead practitioners of innovation management to a more complete understanding of innovative activities within their organization. Whereas most organizations maintain resources dedicated to developing product innovation (e.g., research personnel, R&D labs) or process innovation (e.g., production engineers, quality circles) and at the same time sustain institutionalized processes for their development (e.g., stage-gate innovation processes, continuous improvement processes), both are usually non-existent with respect to the development of non-technological forms of innovation. Rather, particularly organizational and management innovations are often the result of initiatives undertaken by entrepreneurially inclined employees who depart from customary ways of doing business, trying something new, usually without being asked or expected to do so and sometimes even without being given permission by higher management to do so (Hecker, 2015). They therefore fall into the realm of internal

venturing and intrapreneurship. Analyzing them through the theoretical lens of an augmented notion of innovation management comprising technological and non-technological advance promises to unleash the organization's full innovation potential.

a. Managing Innovation Dynamics

Innovation is a dynamic phenomenon. Current innovation behavior of firms is influenced by previous innovation decisions and determines future innovation capacity (e.g., Damanpour et al., 2009; Flaig & Stadler, 1994). Complementarities between different (types of) innovations unfold over time and constitute a path-dependent sequence of innovation activities and events (Ganter & Hecker, 2013; Hecker & Ganter, 2014). Innovation projects can, therefore, not be managed or analyzed in isolation, but must be understood from the whole context of concomitant activities and path-dependent innovation trajectories.

However, the study and management of innovation dynamics is still in its infancy. Most research on innovation still focuses on single innovation events and mainly relies on a cross-sectional set-up for empirical study. Innovation efforts in organizations are mainly managed as insulated projects without sufficient consideration of interdependencies and intertemporal complementarities. One reason for this lacuna in current research and management practice may lie in the lack of available data covering a sufficient period of time to capture intertemporal patterns of innovation activities. Another reason is the remarkable increase in complexity once intertemporal relations are taken into account. As the number of possible innovation paths increases exponentially in their considered path length, so does the number of factors influencing a single innovation decision when allowing for intertemporal complementarities.

Nonetheless, there have been attempts to advance our knowledge of innovation dynamics ranging from a micro-perspective (e.g., scrutinizing the genesis of a particular innovation within an exemplary firm) to mapping the temporal diffusion of innovations across firms, industries, and countries. With respect to sequential and combinative patterns of innovation types, early studies focus on the dynamic interrelation of product and process innovation and link this interrelationship to the life cycle of technologies and markets (Abernathy & Utterback, 1978; Ansoff & Stewart, 1967; Utterback & Abernathy, 1975). While product innovation refers to the market introduction of a product or service that is new or significantly improved, process innovation aims at increasing the efficiency of internal production and delivery processes. During the early development of technologies and markets, product innovations are key to reconcile technological options and user demands and shape core characteristics of valuable applications. Once a

dominant product design has emerged, the focus shifts from product definition and differentiation to production performance and costs. As a consequence, product innovation dominates early phases in the life cycle of a technology, whereas process innovation is particular pertinent to later stages. As industries significantly vary in their technological trajectories and life cycles, these considerations imply that adoption patterns and sequences should significantly differ across industries.

More recent studies on innovation dynamics have advanced these early attempts by additionally tracing the relationship between technological and non-technological innovation types in a dynamic setting (Damanpour et al., 2009; Ganter & Hecker, 2013b; Hecker & Ganter, 2014). They show optimal type composition and adoption sequence to be path-dependent and determined by firm-level attributes including functional differentiation, specialization, firm size, and organizational slack. In addition, Damanpour et al. (2009) shows less of an industry-specific innovation pattern that is beneficial to organizational performance, but more an organization's divergence from industry norms in adopting innovation types. These results suggest that there is not only considerable heterogeneity of innovation sequences across but also within industries (at least for some sectors).

Another stream of literature has shed some light on innovation dynamics from a different angle by researching patterns of innovation persistence (e.g., Cefis, 2003; Cefis & Orsenigo, 2001; Ganter & Hecker, 2013b; Geroski, Van Reenen & Walters, 1997; Hecker & Ganter, 2014; Malerba & Orsenigo, 1999; Mañez, Rochina-Barrachina, Sanchis & Sanchis, 2009; Peters, 2009; Raymond, Mohnen, Palm, & Loeff, 2010; Roper & Hewitt-Dundas, 2008). Innovation persistence describes a form of state-dependence in which previous innovation activity fosters (or constrains) current innovation behavior and success, such that great (non-)innovators have a tendency to remain in their historic state. Innovation persistence has far-reaching ramifications for topics in innovation theory and practice, strategic management, and public policy. At the macroeconomic level, persistence of innovation substantiates endogenous growth models and recognizes incumbent firms and cumulative knowledge building as important source of innovation and economic growth. At the same time it dismisses new entrants and their 'creative destruction' and therefore could represent an important argument in the longstanding debate between the Schumpeter Mark I and Mark II models (Malerba & Orsenigo, 1996). At the microeconomic level, a continuous loop of innovation represents an important instance of the 'success breeds success' hypothesis (Flaig & Stadler, 1994), and provides a major building block of sustained competitive advantage and lasting interfirm performance differences. Finally, a public policy perspective of innovation persistence underscores important lessons for designing and targeting innovation support programs. Such persistence potentially implies

intertemporal spillovers relevant for evaluating the impact of innovation programs. It also casts doubt on the wisdom of subsidizing start-up firms and new market entrants when innovation promotion is the primary funding goal.

Over the recent years, a number of studies have investigated persistence in innovative activities across different countries (e.g., Cefis & Orsenigo, 2001; Malerba & Orsenigo, 1999), for different industries (e.g., Cefis & Orsenigo, 2001; Raymond et al., 2010) including the service sector (e.g., Peters, 2009), for innovation inputs (e.g., Peters, 2009; Mañez et al., 2009) and outputs (e.g., Cefis, 2003; Geroski et al., 1997; Malerba & Orsenigo, 1999; Raymond et al., 2010; Roper & Hewitt-Dundas, 2008). Recent works by Hecker and Ganter have extended research on innovation persistence to non-technological forms of innovation and showed significant differences in persistence patterns and underlying innovation processes between product, process and organizational innovation (Ganter & Hecker, 2013b; Hecker & Ganter, 2014).

With the accumulation of time series data and further methodological advancements in longitudinal analysis, we expect the future of innovation research to bring an increased understanding of dynamic phenomena of innovation such as intertemporal complementarities between various innovation types, spillover and diffusion effects or gestation lags of changes in innovation determinants. Such increased understanding enables innovation practitioners to manage not only singular innovation projects or events, but to farsightedly shape path-dependent trajectories of innovation activities. It also helps policy makers to design institutional environments and support programs with sustainable long-term impact on innovation performance.

b. Managing Global Systems of Innovation

Innovators are not atomistic actors, but the external environment matters, ranging from the immediate environment around the local office, the local and regional environment (other firms, research institutions, policies etc.), the national environment (institutions, labor market, policies), to the global environment. Whilst regional and national innovation systems have received much attention, it has been increasingly acknowledged that global networks and global innovation systems have become vital. Previous research suggests that global networks are critical for innovation, whilst too much emphasis on the local/regional level can be problematic (Fitjar & Huber, 2015; Huber, 2012a).

It will be a key challenge for innovation management to evaluate the strengths and weaknesses of the external environment at various spatial scales and to engage with the local, regional, national and global environment in a targeted and effective manner. Importantly, the positioning in innovation systems at multiple spatial

scales can contribute to a structured approach to open innovation. Whilst the literature on open innovation and the innovation systems literature have largely been developing separately, there is potential to combine both perspectives. Granted, understanding the nature and role of different kinds of innovation systems, from technological innovation systems, regional innovation systems, national innovation systems and global production networks and other transnational linkages is challenging (Bergek et al., 2015; Binz, Truffer & Coenen, 2014). Evaluating these complexities for a specific innovation, as well as developing a strategy for positioning, in most cases will be too demanding for an individual and therefore also requires learning in broader networks.

Our empirical research suggests that the local/regional environment tends to be most important for sourcing business related knowledge for innovation, while the global networks tend to be critical for acquiring cutting-edge technological knowledge (Huber, 2013, 2012a). A key question is how to establish and maintain global networks. Our research suggests that alternative types of proximity such as social proximity, organizational proximity or institutional proximity can substitute for a lack of geographical proximity (Fitjar, Huber & Rodriguez-Pose, 2015; Huber, 2012b). For individual firms as well as for innovation policy, facilitating the establishment and maintenance of targeted international networks will be a critical factor for successful innovation. For instance, booking flights to establish temporary proximity (Bathelt & Schuldt, 2008) may be more fruitful than spending too much precious time with unstructured regional networking. Furthermore, in particular for technological dimensions in several sectors, participation in global networks can also be in virtual forms such as online discussion forums or social media, where innovators can benefit from targeted knowledge sourcing as well as from unstructured 'virtual buzz' (Bathelt & Turi, 2013). Importantly, a promising perspective for entrepreneurial teams and firms is to develop a consistent strategy of division of labor considering the variety of knowledge sourcing and collaboration opportunities for different functions, notably for exploration versus exploitation.

c. Managing Innovation for Environmental Sustainability

Environmental challenges such as climate change, environmental pollution or water shortage ironically involve an attractive side effect for business: they will generate considerable demand for new products, services and other kinds of innovation which helps addressing these issues. In addition to intelligent public policies and an entrepreneurial state (Mazzucato, 2013), there is an important role for the private sector to develop innovative solutions which help addressing the environmental problems. Environmental dimensions will increasingly become

important for firm competitiveness because of (i) environmental challenges and related tightening of environmental regulations, (ii) many scarce natural resources getting more expensive, and (iii) the increasing transparency of environmental activities where there is nowhere to hide and news travel fast in an open digital world (Winston, 2014). Future innovators will need to understand the range of strategic options of the eco-advantage playbook (Esty & Winston, 2009). The review by Adams, Jeanrenaud, Bessant, Denyer & Overy (2015) provides a useful overview of these sustainability[1] oriented options for innovation (see Table 18.1).

Table 18.1. Model of sustainability oriented innovation (Adams et al., 2015).

Approach	**Operational Optimization "Eco-Efficiency"**	**Organizational Transformation "New Market Opportunities"**	**Systems Building "Societal Change"**
Innovation Objective	Compliance, efficiency "Doing the same things better"	Novel products, services or business models "Doing good by doing new things"	Novel products, services or business models that are impossible to achieve alone "Doing good by doing new things with others"
Innovation Outcome	Reduces harm	Creates shared value	Creates net positive impact
Innovation's Relationship to the Firm	Incremental improvements to business as usual	Fundamental shift in firm purpose	Extends beyond the firm to drive institutional change

A first approach is about improving eco-efficiency through operational optimization. This involves incremental innovation to reduce environmental harm per unit of production with a view of either pro-actively reducing economic costs or reactively complying with new environmentally driven regulatory environments. The business model remains unchanged but firm competitiveness can be gradually improved. Internal mechanisms for operational optimization have already been adopted by many firms, but there is considerable scope to fully embrace the environmental dimension, for instance by improving awareness and involvement of employees, for creative solutions in the future.

[1] Whilst the term sustainability involves multiple dimensions and is often used as a fuzzy term, for the purposes of this paper we will focus on the environmental aspect of sustainability. We understand green innovations as those that either reduce environmental pollution or enable the use of renewable sources of energy.

A second approach is more demanding and involves a fundamental organizational transformation to pursue new market opportunities. Here, the focus is on developing products, services or business models which improve environmental performance and serve customer needs. Ideally, if one can help customers to address a need, want or desire whilst helping the environment, there is considerable scope for financially successful business models (Esty &Winston, 2009). This usually requires considerable engagement with external stakeholders and a strong support from senior management across departments (Adams et al., 2015). Considering environmental sustainability in business strategy has become mainstream (Kiron, Kruschwitz, Haanaes, & Von Streng Velken, 2012) and most large companies integrate it into their innovation activities. Yet, the scope of environmental innovation varies and future innovators will need to convince increasingly critical or indifferent consumers and the public that their activities go beyond 'greenwashing' (Delmas & Burbano, 2011).

The third approach is the most demanding because it shifts the focus to a more systemic level, where environmental innovation cannot be done by one organization alone but has to be developed in cooperation with a range of actors. As the literature on the multi-level of sustainability transitions has illustrated (Geels, 2004; Smith, Voss, & Grin, 2011), the greening of socio-technical regimes requires institutional change by a range of related actors (engineers, business people, end users, and policy makers etc.). Socio-technical regimes stabilise existing trajectories in terms of "cognitive routines", "regulations and standards", "adaptation of lifestyles to technical systems" and "sunk investments in machines, infrastructures, and competencies" (Geels & Schot, 2007). As a consequence, the successful change or replacement of dominant regimes requires a change on several fronts. This also implies that a focus on technological innovation as such is never sufficient but technology has to be understood within broader social contexts. This type of systemic eco-innovation requires inter-organizational collaboration and active engagement with stakeholders.

One of the challenges is how to monitor and consider changing environmental legislation and policies and pro-actively shape them. Whilst Fagerbert, Laestadius & Martin (2015) rightly argue that new environmental policies which stimulate eco-innovation will be vital for the future of Europe and the world, there is considerable uncertainty as to how this will pan out in time and space. Future innovation for sustainability needs to be sensitive towards regulatory changes in different cities, regions and countries. Pro-active engagement with policy makers in the forms of lobbying or participation with political pilot schemes can be decisive activities for the growth stage.

Furthermore, establishing mechanisms to inform and convince consumers to use green alternatives is a critical hurdle. Proponents of sustainability transitions

often argue that the consumers need to accept constraints and restrictions, and simply "(c)atering to people's desire for comfort, convenience and low cost may not lead sustainability transitions. In our view, sustainability transitions require that people accept constraints and are willing to live and behave differently" (Kemp & Van Lente, 2011, p. 124). However, within a pleasure-seeking consumer-centered society, prohibiting 'lavish' lifestyles which the consumers enjoy is often difficult or even unrealistic. Against this backdrop, it will be a key challenge to develop value propositions which are compatible with the consumers' needs, wants and desires. For this purpose, collaboration with organizations which control complementary assets for convincing consumers to use the green alternatives may often be vital.

Creative linkages with entertainment industries may offer one avenue. In our ongoing research, we have investigated the potential contribution of motorsport for the emergence and diffusion of clean technologies. Motorsport's focus on maximizing speed and efficiency could potentially be directed towards green innovation outside of motorsport. Green innovation in motorsport can act as an important vehicle to increase the attractiveness of green cars. Yet our research shows that bridging motorsport and non-motorsport requires the right institutional settings: First, motorsport regulation needs to provide explicit incentives for developing solutions that reduce the use of natural resources or enable the use of renewable energy sources. Second, public funding arrangements are needed to provide further incentives for motorsport and cleantech to come together and collaborate. This confirms the argument by Mazzucato (2013) that (i) networks matter for innovation and government has responsibility for facilitating networks, and that (ii) government funding plays an important role for enabling risk-taking and growth fostering innovation.

Granted, the debate on corporate sustainability often tends to over-emphasize win-win situations without carefully considering potential trade-offs (Hahn, Figge, Pinkse & Preuss, 2010). Corporate success, environmental sustainability and social responsibility do not always go hand in hand and the future innovation management should show sensitivity towards this whilst pursuing realistic approaches. It should be mentioned that it is a contested question to what extent eco-innovation can lead to true ecological sustainability within the context of a capitalist, growth-based economy (Bowen & Hepburn, 2014; Jackson, 2009; Jordan, 2008). As nearly all forms of consumption currently contribute to greenhouse gas production or environmental pollution, this question will depend on the challenge of producing energy and electricity out of renewable sources.

d. Managing Digital Innovation

An additional trend, which will inevitably shape the future of innovation management, is the digitalization of the economy. In line with many commentators, we believe that this will transform nearly all existing industries and it will shape the opportunity space for new start-ups. Therefore, competence in integrating the digital dimension into innovation management will be vital. On the basis of their research Westerman, Bonnet, & McAfee (2014) show that even non-technology-driven industries (for instance, finance, manufacturing or pharmaceuticals) require digital mastery to develop more profitable businesses. Digital mastery includes the dimensions of building digital capabilities and building leadership capabilities. Building digital capabilities has to focus on integrating digital technologies into (i) creating a compelling customer experience, (ii) developing core operations and (iii) reinventing business models. Successful digital transformation also requires developing appropriate leadership and organizational capabilities for crafting a digital vision, engaging the whole organization, governing the transformation and building technology leadership capabilities (Westerman et al., 2014).

The issue of developing economically viable business models is also a key challenge for new start-ups who are centered on a purely digital product or service (Sawy & Pereira, 2013; Weill & Woerner, 2013). It has become difficult to build a business model merely on intellectual property, and alternative sources for revenue generation will become critical. In an online world much is expected to be free, and this obviously is a key hurdle for successful innovators. For instance, making money out of publicly available open data epitomizes this challenge. Here, creative open innovation strategies can be the basis for viable business models. For example, issuing open data can create awareness and 'traffic', which can be utilized for selling alternative products/services, for advertising revenues or for access to complementary data. Creating value out of 'big data' can provide further opportunities for business models (Davenport, 2014; Walker, 2015). Here, the technical capability of warehousing data, linking data and applying smart mathematical methods of data analytics for analysis, prediction and prescription has to be translated into viable value propositions and robust monetization.

Furthermore, the digital space also enables new forms of coordination between supply and demand as the emerging sharing economy illustrates (Belk, 2014; Botsman & Rogers, 2010; Grinevich, Huber, Baines & Eder, 2015). This facilities economic transactions between strangers and has the potential to transform a range of industries. As Frenken, Meelen, Arets & Glind (2015) have clarified, the sharing economy in a narrow sense is about "consumers granting each other temporary access to under-utilized physical assets ("idle capacity"), possibly for money".

This is in competition with other types of 'sharing' in the form of the second-hand economy, the on-demand economy and the product-service economy. Importantly, for the future of innovation management it is important to disentangle, and to understand the different types and functioning of sharing mechanisms. In this space, future innovation has to develop more sophisticated mechanisms of establishing trust among strangers via more elaborate online rating mechanisms and safety procedures.

Overall, the capability to evaluate and engage with emerging political regulations, develop and communicate attractive value propositions and establish effective open innovation strategies will be essential for successful innovation management in the digital future. Importantly, digital innovation will not only concern purely digital products but will infiltrate all industries. With new technological trends such as the Internet of Things (IoT) and Industry 4.0 etc. we will see an integration of digital and physical objects in production, distribution and consumption processes, which are transforming competition (Porter & Heppelman, 2014). Whilst many small- and medium sized companies in traditional industries, including the German and Austrian 'Mittelstand', have become curious observers of these ongoing trends, they will need to proactively embrace them in order to remain competitive in the future.

4. Conclusion

This chapter has sought to reflect on selected key topics and challenges for innovation management in the foreseeable future on the basis of our own research fields. We highlighted that research and practice still requires more engagement with non-technological forms of innovation as well as the dynamic context of innovation. Also, we argued that navigating through global systems of innovation will be a critical challenge. Furthermore, we elaborated on two trends that will generate considerable demands for innovation in the future: ecologically sustainable solutions and digital innovation. Each of these trends requires specific knowledge about the strategic landscape as well as specific operational knowledge and competencies. Due to the scope of the chapter, we could only touch upon selected issues. Again without any claim to completeness, other important topics for the future of innovation management include organizational forms of co-creation between large companies and start-ups (Docherty, 2015), constraints driving innovation such as frugal innovation (Rao, 2013), reverse innovation as innovation from a developing country later introduced in an advanced country (Zedtwitz, Corsi, Søberg, & Frega, 2015) or inclusive innovation which benefits the disenfranchised (George, McGahan & Prabhu, 2012).

The future of innovation management will face considerable challenges because of the high pace and often high complexities of technological, social and economic change. A first consequence of this is that hardly any individual organization will have all the knowledge and capabilities for developing successful innovations. In the vast majority of cases, future innovation will depend on effective interactions between different organizations and bringing together of complementary knowledge and capabilities. In such innovation systems, it is not only private companies with their talent, creative culture and organizational competencies that will be driving innovation; also public institutions and the state will proactively shape the innovation trajectories (Bowen & Hepburn, 2014; Mazzucato, 2013). Higher education establishments can add systematic research insights and develop new qualifications for innovation but will also depend on collaboration with the private sector to keep up with the fast changing developments.

A second consequence of the high pace and complexities of change is that we have to embrace failure as a 'natural' and necessary part of our innovation system as only selected entrepreneurial and innovative attempts will turn out to be economically successful. Our social, economic and political institutions need to learn to accept, deal with and benefit from failure. Yet, this does not give innovation managers and researchers a carte blanche to pursue random activities, but academic research and the practice of innovation management can develop clear strategic navigation tools and practical guidelines for dealing with an uncertain and dynamic world.

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