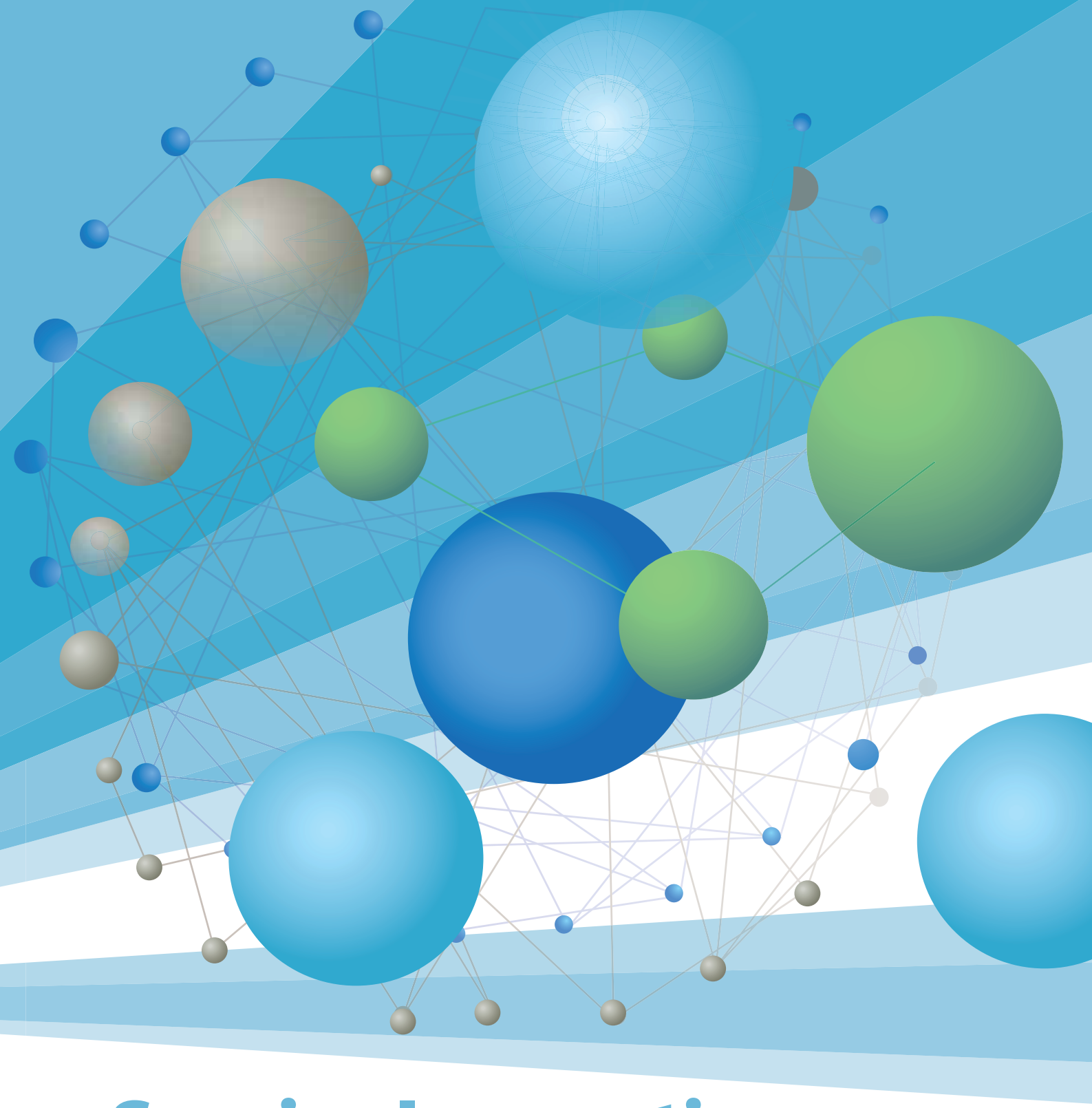


Service Innovation
Yearbook
2010–2011

European Commission
Information Society and Media

Cataloguing data can be found at the end of this publication.

Luxembourg: Publications Office of the European Union, 2011

ISBN 978-92-79-17351-6
doi:10.2759/37106

Printed in Belgium

Printed on elemental chlorine-free bleached paper (ECF)

3.8 Open innovation: The case of the innovation Value Institute

Introduction

Over the last decade, significant research has emerged in two areas related to innovation: firstly at the macroeconomic level with the debate on the role and composition of national innovation systems (NIS) and secondly at the operations level with the argument that enterprises must move from 'closed innovation' to 'open innovation' models. The aim of this paper is to examine a case of the practical implementation of open innovation, i.e. the Innovation Value Institute (IVI). Furthermore, the IVI is a 'triple-helix' collaboration between actors drawn from academic, industrial and public service sectors with a focus on one important technology for practitioners and for the region; the management of Information Technology. The paper now proceeds as follows. Firstly, the research context is outlined in terms of the evolving Irish economy. A literature review is then presented from the areas of enterprise innovation models, national innovation systems (NIS) and information technology (IT) governance. Finally, the conclusions, implications for practice, policy and research are outlined together with suggestions for future work.

Background

This section will provide the background to this study by reviewing the changing nature of the Irish economy, the regional context in which the industrial case study is based and the influence of government on the development of the ICT industry.

National and regional context

Over the last 40 years, Ireland has leapfrogged from a traditional agrarian economy to a deliberately created information economy [1]. The initial impetus was fuelled by foreign direct investment (FDI) from North American multinational corporations (MNCs) setting up offshore manufacturing facilities to avail of low tax incentives, a young educated workforce and proximity to their growing number of European customers. However, this initially successful model is increasingly being threatened by the low cost economies of Eastern Europe, India and China. Irish enterprises rapidly need to build new sources of competitive advantage to sustain employment and standards of living. An important national study undertaken in 2004 highlights this situation. The Enterprise Strategy Group's report 'Staying Ahead of the Curve' states that the application of research and development (R&D) and technology to the 'creation of new products and services, now require comprehensive and intensive development and will mark the decisive new orientation of Irish enterprise policy' (Enterprise Strategy Group, 2004). The first strategic focus is to build capabilities and capacity in the following areas where there is currently a deficit:

- expertise in international markets to promote sales growth,
- R&D to drive the development of high-value products and services.

The second area of focus aims to ensure that high-value manufacturing and supply chain operations continue to be an essential component of the country's business environment. Furthermore, the growing importance of services in the knowledge economy and the resulting value chain realignment from selling product to providing integrated customer solutions is being recognised [2].

This report highlighted the present low level of:

- product development and patenting,
- linkage with research bodies.

The continuing slide of the Irish economy in world competitiveness rankings is another reason to make innovation a priority. Ireland is now entering a new era which, according to Porter [3], requires a transition to an innovation economy. However, some commentators are concerned at the tendency to overstate the threat from the low-cost economies given Ireland's commitment to developing a knowledge-based economy [4]. Ireland still punches way above its weight internationally attracting 2 % of total global foreign direct investment (FDI) in 2008 which amounted to circa EUR 2 billion [5]. Manufacturing is the bedrock on which Ireland's FDI was built and over the last three years more than EUR 5 billion of manufacturing projects were approved by the IDA. The present focus in on jobs which are 'capital and skills intensive' where 'labour cost is not a significant competence in demand fulfilment management' [6]. Furthermore, these manufacturing investments increasingly include product or process development activities [7].

Role of government

Having looked at the national and regional context, we will now examine the role of government in the development of the ICT industry. In general, governments have contributed to the development of the ICT industry in three areas: procurement programmes specifications for high-performance computing, and its regulatory role. Most of the early computers went to government agencies. The commercial market did not provide an effective demand for electronic digital computer until the US government indicated its preferences among industrial firms. IBM's success in meeting government specifications translated into success in the commercial marketplace. The emergence of the computing industry under government patronage created an environment that favoured the development of the minicomputer and of microcomputers that gradually replaced the mainframe that embellished the giant government computer facilities. The Internet and the World Wide Web provided a rapidly growing communications environment within which the PC flourished and it can be argued that the ICT industry would not have emerged without the intervention of the government which provided the market to enable its development.

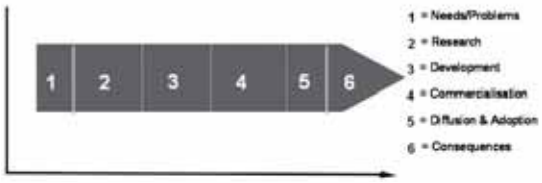
Literature review

Changing innovation paradigms

For this study we will view innovation models through two lenses. The first examines the phenomenon in terms of the design and development methodologies carried out within enterprises. The second lens deals with the economic, institutional and social context of innovation dynamics.

The process of product design has been well roadmapped [8] [9] as has product development methodologies [10] [11] [12]. A number of theses in this area have proposed an integrated approach to the management of the innovation process such as systems innovation management (SIM) [13] and a product innovation management (PIM) framework for networked organisations [14]. The practice of innovation is also taking place within radical redesign of business processes [15] and the change from 'task-based organisations' to 'process-centred organisations' [16]. World-class companies have been found to specialise or excel in one of three core value disciplines, namely operational efficiency, product development or customer intimacy [17]. The innovation-development process as defined by Rogers [18] consists of six steps (Figure 1), that encompass 'all the decisions, activities and their impact' from the initial recognition of a need, research, development and commercialisation through to diffusion and evaluation of the consequences.

Figure 1. Rogers' Innovation-Decision Process adapted [18]

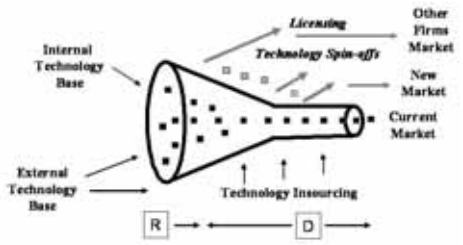


Chesbrough [19] argues that in many industries the centralised approach to R&D which he terms 'closed innovation' has become obsolete. This paradigm, he contends, must be replaced by 'open innovation' which adopts external ideas and knowledge in conjunction with the internal process. A number of factors are influencing this change such as the mobility of skilled people, the increasing presence of venture capital, emergent high-tech start-ups and the significant role of university research. One of his principles is that 'not all the smart people work for us' and he advocates that the smart people within an organisation connect with the smart people outside. Embracing the ideas and inspiration in these external links, he contends, will actually multiply the advantage of internal efforts. However, connecting external innovation to internal innovation requires a new business model with the following six functions:

- articulate the value proposition
- identify a market segment
- define structure of your value chain
- specify revenue generation mechanisms and estimate cost structure and target margins
- describe firms position in value network of suppliers and customers
- formulate the competitive strategy.

Implementation of the business model can be greatly accelerated by buying and selling intellectual property (IP). However, there always remains the hard work of converting research ideas into products and services that solve customer's problems. Interestingly he states that the presence of manufacturing, distribution and brand are assets that help the firm retain some of the value it creates. Figure 2 shows an innovation funnel adapted to illustrate an open innovation model.

Figure 2. An open innovation model — adapted from Chesbrough [19]



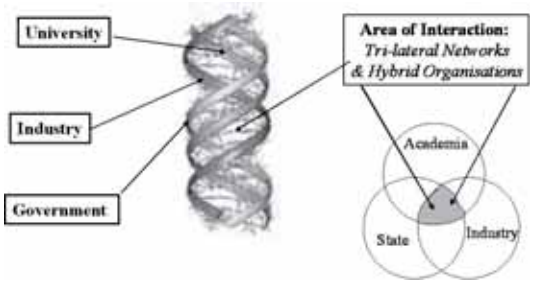
Vanhaverbeke and Cloodt [20] suggest that emerging forms of value networks must be examined at the level of different nested layers. These diverse layers span the spectrum from the individual, to firms-organisations, through Dyadss and on to inter-organisational networks and ultimately reaching national/regional innovation systems. Von Hippel [21] speaks about the democratisation of innovation where products and services users increasingly have the ability to innovate for themselves with the resulting move from manufacturing-centric to user-centric innovation processes.

Another feature highlighted by Christensen et al. [22] in their studies of the semiconductor industry is the problem of 'performance overshoot' with the realisation that Moore's Law is no longer the dominant paradigm for analysing this sector. They predict from looking 'through the lenses of the theories of innovation' that the future of the industry will be 'very different than the past'. Customers are less concerned about performance factors such as clock speed and more focused on new parameters such as 'convenience and customisation'. Furthermore, they contend that new 'specialised non-integrated firms' will provide a serious threat to the incumbents and have proposed 'disruptive-innovation' and 'value-migration' frameworks to assist the semiconductor industry to manage these transitions. Avgerou and La Rovere [23], have challenged the IS community to rethink 'long-established disciplinary divisions and conceptual categories' (p. 206). Furthermore, they propose that IS studies must place the internal organisational processes within the wider socioeconomic context.

Inter-organisational systems and the triple helix

According to Kumar and van Dissel, interorganisational systems exist to support and implement cooperation and strategic alliances between two or more [24]. Furthermore, for quite some time, the dramatic growth of inter-organisational systems (IOS) have altered the way organisations conduct business and relate to each other [25]. As this is a very broad area, this section will look at the implications for inter-organisational systems from the increased cooperation between academia, industry and government. Then an important innovation, that of self-service technology, will be briefly reviewed as it is having an increased influence on how IOS operate. The ever more important role of academia in supporting innovation in knowledge-based societies has led to the development of a number of models from national systems of innovation [26] to the Triple-Helix model of university-industry-government relation [27]. The latter is illustrated in Figure 3 which shows a helix with three layers: university, industry and government. It also shows areas of direct interaction between the two: for example, a technology transfer office (TTO) could be seen as an interface between the academic and business environments. With regard to the level of societal influences on innovation, Florida's 3-T model of technology, tolerance and talent argues that the rise of the 'creative class' is a key factor in the new economy [28].

Figure 3. Triple helix: adapted from Etzkowitz and Leydesdorf [27]

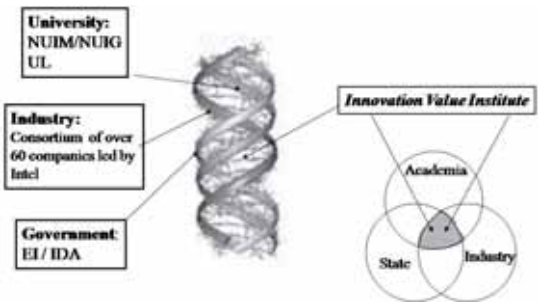


The increasing importance of the triple helix of academia-enterprise-government would argue that companies need to expand present inward-focused methodologies in order to engage with external actors. A triple helix representation of the Innovation Value Institute is shown in Figure 4 [29].

However, while the reality of the growing association between academia and enterprises is widely accepted, the nature of the involvement is still a matter of lively debate. Manimala [30] questions the emerging models of interaction that 'assigns a direct and active role' for higher education institutions (HEIs) in the 'commercialisation of their research or in the promotion of enterprises' (p. 111). Consequently, he proposes that a new paradigm is required where the focus of the HEI is on the general entrepreneurial environment. To support this view, he

formulated a set of new assumptions which, among other points, proposed that the primary objective of the HEI sector is 'creating and disseminating knowledge' and that academics are generally not really interested in becoming entrepreneurs and when they try, performance is normally 'poorer' than non-academics. It is significant that this thesis is supported by Mowery and Sampat's [31] comprehensive analysis of cross-national data on the impact of universities on National Innovation Systems (NIS) which challenges the conventional wisdom that HEIs must become major technology transfer (TT) engines in the economy. Their conclusion that the current emphasis on the 'countable' rather than the 'more important aspects' of the university-industry relationship could have 'unfortunate consequences for innovation policy in the industrial and industrialising world' [31].

Figure 4. The IVI triple helix



Self-Service Innovation

Another phenomenon worth noting here is the growth in automated inter-organisational systems. The increased deployment of self-service technology (SST) in business to customer (B2C) transactions is being driven by the diffusion of information and communications technology (ICT) and the demand to move from high-cost manual transactions to low-cost automated self-service in enterprises and the public service. According to the Gartner Group, 70 % of customer service contacts for information and remote transactions were automated by the end of 2005 with an associated increase in investment in Web SST [32]. These services are becoming increasingly critical for enterprises challenged with providing eCommerce solutions and building relationships in a world where customer and vendor do not meet face-to-face [33]. Among SST interfaces, the use of speech is regarded as ideal because it is the most 'natural, flexible, efficient and economic form of human-machine communication' [34]. However, creating conversational automated agents with responsibility for service levels and maintaining customer relationships is a complex challenge. Providing speech-enabled services requires capability in speech communication technologies, applications programming and professional services developed in the environment of customer psychology and culture. Consequently, it is proposed that the implementation of such solutions brings together many features (cognitive, emotional, relational and structural) which are relevant for the debate on the future direction of research in IT innovations. It is also argued that self-service business systems are a recent and increasingly important extension of the customer service functions in organisations and, by extension, must be included in the typology of information systems (IS). A more detailed discussion of this topic is available in reference [35].

IT project governance: managing the change

Having reviewed the changes in innovation literature that have implications for Rogers' diffusion theory, we will now consider the implications of the changing innovation environment for IT project governance. Mahring [36] describes IT project governance as 'the organisational control of an IT project'. According to various authors, the management of information technology projects has been an important and difficult problem for many years for both members of the academic community and practitioners [37] [38]. Information technology is increasingly becoming a more important part of an organisation but the failure rate of IT projects, according to Cole [38] remains high. This high failure rate results in IT projects which are either not used or which do not attain the desired effects [39]. Most companies are now very dependent on their IT capability for day-to-day operations and for maintaining market share and competitiveness. Characteristics of present-day organisational life itself and the constant flow of events in an organisation's environment create the uncertainty and fluidity of management [40] [41]. Managers can only achieve 'temporary coordination of heterogeneous individuals' [42] and, therefore, influencing thus becomes a combination of hierarchy and various types of interactions in social networks [43]. This was described by Perrow [44] as 'managing sensibly what you do not quite understand'. IT Projects, are not only concerned with task knowledge, but also with the constant pressures of reacting to, and acting upon a large number of issues at any given point and time.

A particular challenge facing IT Managers is how to evaluate the value of IT investments. Bannister's [45] review of approaches to IT evaluation identifies three strands in the literature.

- Studies that focus on the long-term historical economic impact of investments in IT. Examples include

Brynjolfsson and Hitt [46] who explored the so-called productivity paradox and the cumulative effect of investments in IS on organisations and Strassmann [47] who has argued that such effects are only really assessable over long periods, maybe as long as half a century.

- Studies on whether specific investments made over shorter periods have yielded value. These vary from the application of innovative methods to measure value realised to the use of well-established methodologies such as return on investment, comparison of how different metrics report or combinations of measures (such as the balanced scorecard [48] or the Prudential Appraisal Method [49]).

- Studies assessing whether or not a potential investment in IT is worthwhile. The time horizon here is typically fairly short, usually 5 to 10 years though, from time to time, studies will contemplate a more distant time horizon. Almost all such studies are at the level of the organisation, be it a firm or a public sector body.

A recent novel approach to IT innovation effectiveness realisation has been proposed by Peppard, Ward and Daniel [50]. The 'IT benefits management' approach advocated by the authors is defined as 'the process of organising and managing so that the potential benefits from using IT are actually realised' where 'benefits management' emphasises that benefits arise only from changes made by individual users or groups of users, and these changes must be identified and managed successfully. 'Benefits realisation' and 'change management' are therefore inextricably linked. This is the case when the project is explicitly an IT-enabled or 'techno-change' programme. A noteworthy aspect of the benefits management approach is the application of a Benefits Dependency Network (BDN). The BDN provides the framework for explicitly linking the overall investment objectives and required benefits with the business changes necessary to deliver those benefits and the essential IT capabilities that enable these changes. This approach is an example of a general trend towards a 'capability-oriented' view of IT as opposed to the 'resourced-based' view described in Section 2 above [51].

The IT Innovation Capability Maturity Framework (CMF)

The goal of the innovative IT manager is to define and identify desired innovations, and to establish activities responsible and causal to IT innovations. In the absence of a unified approach to the manageability of IT innovations, IT managers must confront either that most innovations beneficial to the firm are directly manageable, or that desired innovations will result as a by-product of otherwise unmanageable activities. Clearly, a modern IT innovation framework must address these two seemingly conflicting and disparate perspectives within a single approach.

Introduction to the IT Innovation Capability Maturity Framework (IT-CMF)

The IT Innovation Capability Maturity Framework extends directly the approach proposed by the Information Technology Capability Maturity Framework (IT-CMF) introduced previously [52] [53] [54]. The IT-CMF proposes a high-level process capability maturity framework for managing the IT function within an organisation. The framework identifies a number of critical IT processes, and describes an approach to designing maturity frameworks for each process. By comparison, other IT process frameworks including COBIT, ITIL, and CMMI do not explicitly provide a mechanism to address the topic of IT innovation. A subgroup of the Innovation Value Institute has been concerned with building and testing the CMF for the IT Innovation critical process. In the sections to follow, we present some novel findings of that work.

The IT Innovation Capability Maturity Framework accepts that innovations arising from both linear sequential processes and complex social processes coexist within the same firm. The framework unifies a single approach to address the manageability of both classifications of IT innovation. For linear sequential processes, the innovation capability describes the ability or capacity to execute in a manner than increases the probability of an IT innovation positive outcome. For complex social processes, and non-sequential activities, the innovation capability describes the pre-conditions required to increase the probability of innovation outcomes.

Broadly defined, the innovation capability is a set of actions undertaken to prepare an organisation to be more innovative. This is achieved by increasing the organisation's ability to enact defined innovation processes, and by increasing the effectiveness and relevance of non-linear activities on innovative outcomes. Preparation in the linear sequential sense involves the creation of tools and artifacts within the firm. Artifacts may be tangible, such as systems, devices, and templates, or intangible, such as activities, roles, processes, and methodologies. Preparation in the complex social sense involves affecting change on the environmental context of the firm to increase the probability of an organisation to innovate.

Specifically defined, the innovation capability consists of a description of the core capability and its primary

characteristics. Each characteristic is described by observable attributes exhibited by the firm, measurable metrics of attribute existence and performance, and expected impact on the firm's ability to increase the probability of innovative outcomes.

Background to the Capability Maturity Approach

The IT Innovation Capability Maturity Framework describes the IT innovation capability through a five-level capability maturity framework. The maturity approach has been used successfully in the IT industry to describe specific stages of progression to an optimal mode of operation.

Potential advantages of the capability maturity approach include its ability to present a structured, sequential stepwise function. Due to the simplicity of the model, maturity frameworks have seen wide adoption in the IT industry by large organisations (e.g. CMM), and have strong uptake amongst the community of practitioners. The approach is useful in describing a manageable approach to improvement, and therefore preserves the simplicity and direct-acting approaches presented by the linear sequential process innovation frameworks. Each level of the capability maturity framework also describes a set of contextual descriptions, and therefore preserves the approach presented by the nonlinear school of frameworks.

Potential disadvantages of the capability maturity approach include its tendency to adopt a somewhat instrumental, doctrinaire and mechanical approach to problems that may be quite complex. The IS Innovation CMF addresses this shortcoming in two ways. Firstly, the maturity framework is augmented with additional dimensions for each of the five levels. The maturity approach chosen introduces a set of innovation capabilities at each level. Each capability is assigned characteristics, attributes, and descriptions of representative outcomes on an organisation. Secondly, the IT Innovation CMF is augmented by linking the maturity levels to a supplementary overarching IT capability maturity framework (IT-CMF) — as described in [52] [53] [54]. Therefore, the IT innovation CMF is divided into four strategies, mirroring directly the strategies of the IT-CMF. These strategies describe the four primary activities associated with managing innovation, funding innovation activities, executing the innovation capability, and assessing the value of innovations.

Overview of the IT Innovation Capability Maturity Framework

The IT Innovation CMF is shown in Table 1. The first maturity level describes the IT innovation capability in its most immature form. The capability is initial, linear processes are unmanaged, and there is a poor understanding of the non-linear capabilities and social processes. In practice, there will be a limited adoption of new technologies, and IS managers are, in general, unaware of the potential or existing benefits of IT innovations

The second maturity level describes a sporadically managed innovation capability. An emerging capability is characterised by a small group of IT managers who recognise the value of IT innovation and act in an uncoordinated manner to increase IT innovations. In practice, IT managers will deploy innovation processes, tools, and templates within IT projects.

The third maturity level describes a defined innovation capability with a high degree of coordination. Linear processes are defined, and are executed upon to increase levels of innovation. Nonlinear activities are encouraged through contextual investments. In practice, IS managers identify dedicated IT innovation skills, participate in coordinated

Table 1. The IT Innovation CMF

	Managing IS innovation	Funding the innovation portfolio	Executing the IS innovation capability	Assessing the value of IS innovation
5. Systemic innovation	Business transformation and agility	Self-sustaining	Culture drives continuous business innovation	Confidence in value return
4. Managed innovation	Aligned to strategic business needs	Co-funded with business	Routinely delivers innovative operational improvements	Reliable, consistent measurement
3. Defined innovation	Defined IS innovation strategy	Justified business spend	Tools, processes, organisation supports value chain innovations	Defined value assessment
2. Sporadic innovation	Emerging innovation strategy	One-time spend	Occasional product improvements	Informal value measurement
1. Initial/ad hoc innovation	Undefined innovation strategy	Not explicitly budgeted	Limited impact and scope of innovations	No recognised value

innovation, and quantify the impact of IS innovations on the firm.

The fourth maturity level describes an actively managed innovation capability. IT and executive managers promote and coordinate innovation across the enterprise. In practice, IT projects, to address innovation, are managed through portfolio methods.

The fifth maturity level describes a systemic innovation capability. IT innovations are recognised by the firm contributing value to the enterprise, and the organisation is active in encouraging innovation. In practice, IT innovation is identified by senior management as a component of the business strategy and strategic plan.

Summary and conclusions

This paper reviewed trends in open innovation and focused on one particular new development in this area — the IT Innovation Capability Maturity Framework (CMF). The IT Innovation CMF has been developed as a result of an open innovation initiative and has proved to be a novel and practical mechanism for structuring the set of IT innovation activities within a firm. The framework has been found to simplify otherwise divergent and complex activities into a unified view that addresses primarily the needs of the CIO and IT manager. The practical usefulness of the framework was found to lie in its potential to organise and structure a complex portfolio of IT innovation activities in a manner that enables continuous improvement.

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