RI HUB

RESEARCH NOTE #4

RULE 4: BE FOREVER INNOVATIVE

The Ruthven Institute has developed 12 rules for business success. Based on 45 years of analysis of Australia's top 1000 companies, the Ruthven Institute has distilled the essence of a winning business strategy. Research undertaken by the University of Melbourne between 1998 and 2001 supported many of these rules. In this series, the RI Hub examines the literature to assess the validity and continuing relevance of these rules. In each of the following sections, the literature is summarised, the key issues for implementation highlighted, and the questions for future research identified.

> "Enterprises need to be innovative to stay in business, expand and be profitable. This requires different types of innovation at different times. 'Innovation' refers to the development of, constant improvement in, and commercialisation of intellectual property (IP). As one of the Institute's rules for business success, innovation is a mindset and a commitment. So in most cases, innovation is more of a slow brew than an instant coffee."
>
> Ruthven Institute (2019) *Business Success: In Brief the 12 Golden Rules*

In arguably the most influential work on the role of innovation, Schumpeter (1947) posited that economic growth occurs through a process of *creative destruction*, where innovative industrial activities play a key role in the shaping of industries and achieving profit. In the Schumpeterian model, industry participants should constantly come up with innovative and fundamentally improved products to be able to compete with their rivals. Although some of Schumpeter's assumptions and arguments concerning monopolies and perfect competition have been criticised, his ideas kicked off a voluminous literature examining the importance of innovation for today's businesses and society.

Our goal here is not to provide a comprehensive overview of this vast literature, nor is it to discuss the major theoretical frameworks of innovation. Instead, this review aims at exploring empirical evidence from prior studies that are relevant to assessing the validity of RI Rule 4. Therefore, after exploring the various definitions and measures of innovation and innovativeness, we proceed with discussing the evidence regarding the impact of innovation on firm performance and important factors that are likely to affect firms' propensity to innovate. We conclude the review with a discussion of potentially fruitful avenues for future research.

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Definition, dimensions, and indicators of innovation and innovativeness

Innovation and innovativeness in the academic literature

Innovation is most commonly defined in academic studies as the application of novel ideas to products, processes or organisational structures with the purpose of extracting value from those ideas. The commercialisation aspect of innovation is what distinguishes it from an invention (Rogers, 1988). This definition reflects only one dimension of innovation, because as Rogers (1998) points out, defining innovation precisely is problematic. Consequently, prior studies have examined other dimensions of innovation such as the speed of innovation, consistency and continuity of firms in innovating over time, and the strategy and capability of firms to introduce new products in a new market (Prajogo, 2006). The speed of innovation has become an especially important factor in today's economy as the life of many products can be measured in mere months. Based on the evidence from prior research, Kessler and Chakrabarti (1996) argue that innovation speed is most important in environments characterised by competitive intensity and technological and market dynamism. Due to increased competition from other industries and markets and how fast different technologies become obsolete, firms need to not only innovate but do so often and regularly to stay relevant.

Innovation can take many forms. Schumpeter distinguished between five types of innovation: introduction of a new product or a qualitative change in an existing product, process innovation, the opening of a new market, development of new sources of supply for raw materials or other inputs, and changes in industrial organisation. The dichotomy between product and process innovation is the most common categorisation in academic studies. Process innovation is defined as changes in throughput technology for an organisation or an operating unit (e.g. plant) that are new to the firm, industry, or market (Ettlie & Reza, 1992). Empirical evidence suggests that although product innovations are adopted at a greater rate and speed than process innovations, the adoption of product innovations is positively associated with that of process innovations (Damanpour & Gopalakrishnan, 2001). Innovation can also be technological or non-technological (such as novel organisational structures or marketing techniques) and radical or incremental (Ettlie, Bridges, & O'Keefe, 1984). Garcia and Calantone (2002) argue that product innovations at the early stages of diffusion and adoption are typically radical in nature, while those at the advanced stages of the product life cycle are usually incremental.

1 For an in-depth look at technological innovation typology, see Garcia and Calantone (2002).

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The significance of the multiple aspects of innovation raises an important question: what is the best signal of a firm being innovative? Researchers have approached this question from different angles depending on how they define innovation and innovativeness. In some studies, a firm is considered innovative if it introduces a major innovation or adopts an innovation earlier than its peers, making the timing and speed of innovation a first-order issue. Other studies have considered a firm innovative if it adopts an innovation in general, regardless of whether the innovation has been in use by other companies or industries. In yet other studies, firms have been categorised as innovative versus non-innovative based on the inputs to, or the outputs of, innovation. Bringing the different types of innovation into the picture makes such a categorisation even more complicated.

Overall, the discussion in this section highlights the difficulty of clearly defining innovation and innovativeness and points to the various possible pathways to becoming an innovative firm. Firms can achieve sustainable innovativeness – and hence sustained business performance – by fostering an organisational culture and systems that encourage creativity and support complex activities that comprise processes from ideation through to marketing the new product (Samson & Gloet, 2013). As Carter and Williams (1959) put it, "the use of science is not an optional extra to be attached to the firm, but an expression of the whole attitude of the firm".[2]

Innovation and innovativeness as per RI Rule 4

RI Rule 4 defines innovation as "the development of, and constant improvement in, intellectual property (IP)", which refers to a "cocktail of (1) skills, competencies, and unique systems, (2) patents, trademarks, and brands, (3) organisational culture, (4) customer relation protocols, (5) and visions, plans, and achievable strategies." Therefore, as per the RI guidelines, a firm is considered innovative if its innovations lead to an introduction of, or improvement in, one of these firm-specific resources.

Two observations regarding this definition are noteworthy. First, RI Rule 4 considers originality and/or uniqueness an important aspect of innovation; that is, not all changes that are new to the *company* will be considered innovations (e.g. when they have been in use by other companies for some time). Second, it views innovation as a construct that can take many forms and have multiple dimensions. Consequently, RI Rule 4 encourages firms to adopt strategies that take into account multiple types

2 See Büschgens, Bausch, and Balkin (2013) for a meta-analytical review of studies that examine how firms' innovation activities are shaped by organisational culture.

of innovation and develop an organisational culture where such an approach to innovation flourishes. Empirical evidence is consistent with this view: firms co-adopting technological and non-technological innovations are likely to have a competitive advantage and superior performance over those that focus on any one type of innovation (Damanpour, Walker, & Avellaneda, 2009; Evangelista & Vezzani, 2010).

Empirical measures of innovation and innovativeness

The empirical measures used in prior research to capture innovation vary significantly across studies depending on the dimension and type of innovation examined, and include both qualitative and quantitative measures. The quantitative proxies for product innovation can be divided into two categories based on whether they are the *inputs* to, or *outputs* of, innovative activity. The output of innovative activities includes the number of new or improved products introduced and IP statistics such as patents, trademarks, and designs, because a company applying for an IP right generally considers the knowledge to be of some value (Rogers, 1998). Jensen, Thomson, and Yong (2011) find that the presence of a patent increases the return to an invention by up to 50 percent.

Considering that firms innovate to create value, the share of income or revenue growth attributable to new or improved products can be considered another important (output) measure of firms' innovation efforts. In fact, a survey of Australian managers found that, of the innovation success measures, those related to customers, revenue, cost reduction, and profit were considered by managers to be more important than patent activity (Samson & Gloet, 2013). Innovation surveys conducted by the Australian Bureau of Statistics (ABS) also include questions asking companies for the percentage of "income from sales of new or significantly improved goods or services" (Australian Bureau of Statistics, 2018).

Arguably the most commonly used input measure (and a measure of product innovation in general) in academic studies is R&D expenditures. One problem with using R&D expenditures as an indicator of innovation is that high research spending does not necessarily translate into commercially successful innovation. Additionally, using R&D expenditures as a measure of innovation will likely overstate the concentration of technological activities toward larger firms and understate it for small manufacturing firms and service firms (Jacobsson, Oskarsson, & Philipson, 1996).

Some researchers have also considered patents to be an input – rather than output – measure as many patents do not have any value (while some are worth a lot) and many commercially valuable ideas are not or cannot be patented. The fact that quality varies significantly across patents makes them a noisy measure of innovation. Furthermore, it is relatively easier for firms to obtain a patent if they have strong research facilities, leading to a high correlation between R&D expenditures and the number of patents. Building on this argument, Trajtenberg (1990) shows that patents are a much better indicator of innovation when weighted by patent citations. Albert, Avery, Narin, and McAllister (1991) confirm this finding by documenting a strong association between citation counts for highly cited US patents and knowledgeable peer opinion regarding the importance of those patents. Hirschey, Richardson, and Scholz (2001) provide evidence that patent quality data (including, but not limited to, citation counts) improves the usefulness of the information contained in R&D expenditures. Lanjouw, Pakes, and Putnam (1998) propose an alternative way of improving the quality of patent data in empirical tests, which involves using patent counts in conjunction with the number of years a patent is renewed and the number of countries wherein protection for the same invention is sought.

It could be the case that a firm pursues an innovation strategy that relies on acquiring – rather than developing – technology (e.g. patents, licenses etc) from other companies. In such a case, expenditures on the acquisition of such technologies can be used as an indicator of the firm's innovative activities (Rogers, 1998). Intangible assets (as recognised on the balance sheet) can also be considered an input measure of innovation to the extent that they include capitalised R&D expenses and the valuations of patents and licenses. Goodwill, which is a part of intangible assets, is less likely to be a reliable indicator of innovation because it is unclear to what extent it reflects the acquired firm's innovation capabilities vis-à-vis other factors that are also expected to significantly affect the firm's future profitability. When innovation is viewed as a multi-dimensional concept as discussed above, any expenditures on marketing the new products or developing and executing novel marketing techniques, as well as those related to managerial and organisational changes can be categorised as indicators of innovation. ABS surveys on Australian firms' innovative activities are designed with this framework in mind and include questions related to multiple dimensions of innovation from novel products and processes to novel organisational structures and marketing techniques. RI guidelines are consistent with this framework as well and use multiple innovation measures to gauge a firm's innovativeness.

As should be clear by now, the quantitative measures of innovation highlighted in this section are primarily used for product and process innovations (e.g. see Jensen and Webster (2009)). Measuring organisational innovations – such as innovations in management techniques, organisational structures, and marketing techniques – often requires a qualitative assessment of the firm. Although there is some evidence to suggest that organisational innovations are particularly prominent in service industries (Tether & Tajar, 2008), product and process innovations are common in services and positively affect firm performance (discussed below).

Innovation and firm performance

How important is innovation to a firm's performance? Consistent with the RI Hub approach (see Note 1: How to Measure Performance), to answer this question we distinguish between innovation studies that look at performance through a profitability lens and those that look at investor responses to firms' innovative activities.

Firm performance as measured by accounting ratios

Differentiation through innovation can help firms to achieve a competitive advantage over their rivals and improve their profitability and productivity. Results from a McKinsey survey suggests that the overwhelming majority of managers consider innovation as a crucial factor for their companies' growth (Carden, 2005). A wealth of evidence from academic studies supports this line of thinking, and indicates that innovative firms enjoy higher profitability and market value than their non-innovative counterparts. There are two arguments as to why innovation leads to superior performance. The first view posits that it is the *product* of innovation that strengthens a firm's competitive position vis-à-vis its rivals until that product is successfully imitated by its competitors. The second view argues that the *process*, rather than the product, of innovation matters because the process of innovation transforms the firm in a way that builds up its core competencies, making it more capable and adaptable (Geroski, Machin, & Van Reenen, 1993). As per the second view, innovation itself is a product of a more fundamental change occurring within the innovating firm. It is worth emphasizing that these concepts are separate from product innovation and process innovation, which are the two types of innovation as described earlier.

Geroski et al. (1993) argue that these distinct approaches to innovation have implications for the nature of the impact of innovation. In particular, according to

the first view, the performance impact of innovation is likely to be transitory and associated with the introduction of a specific innovation. On the contrary, the performance implications of innovation are likely to be more permanent/long-lasting if there are more fundamental fixed differences between innovators and non-innovators. Using UK firms as their main sample, Geroski et al. (1993) find that consistent with the first view, major firm-specific innovations do have a significant and material impact on firm profitability both in the short-run and in the long-run. Using R&D as an indicator of innovation, Klette (1996) confirms the positive association between innovation and firm performance. Consistent with the second view, Geroski et al. (1993) also find there are large differences between innovators and non-innovators. These large indirect effects of innovation associated with the transformation of firms' internal capabilities are as much as three times larger than the direct and transitory effects of specific innovations. Their results also suggest that the performance of innovators are less sensitive to downturns than non-innovators. These findings speak to the importance of treating innovation as a process and having an organisational culture that encourages continuous innovation.

Prior studies (including the ones discussed above) examining the impact of innovation on firm performance have primarily focused on the role of technological innovation (product or process). Using data collected through a survey sent to banks, Subramanian and Nilakanta (1996) find that the number and the consistency of technological innovation adoptions positively affect ROA. The speed of technological innovation adoptions also has a positive impact on firms' market shares. Using new drug introductions in the US pharmaceutical industry, Roberts (1999) documents a positive relationship between innovation propensity and sustained profitability. Based on a survey of 194 Australian managers, Prajogo (2006) provides evidence that although no significant differences exist in innovation performance between manufacturing and service industries, the positive association between innovation and firm performance (as measured by sales growth, market share, and profitability) tends to be stronger in manufacturing industries. Coad and Rao's (2008) finding that innovation is crucial for the performance of top fast-growing high-tech firms is consistent with these results. Further studies have found a positive impact of different innovation measures on sales growth (Corsino & Gabriele, 2011; Del Monte & Papagni, 2003; Hall, 1987).

There has been less research on the impact of non-technological innovation – called administrative innovation in some studies – on firm performance. Subramanian and

Nilakanta (1996) provide evidence that the number of administrative innovations adopted by the firm positively affect ROA. Consistent with this result, Mol and Birkinshaw (2009) document a positive relationship between the implementation of non-technological innovations (a composite measure including changes in management techniques, organisational structure, and marketing techniques) by UK firms and their productivity. Damanpour et al. (2009) find that the co-adoption of service, technological process, and administrative innovations positively influence organizational performance in UK public service organizations. Similarly, Evangelista and Vezzani (2010) find that introducing technological innovations in conjunction with organisational innovations gives both manufacturing and service firms a competitive advantage (as measured by sales growth and increased market share) over firms with a narrow approach to innovation as well as non-innovating firms. Interestingly, the impact of organisational innovations appears to be stronger for manufacturing firms than for service firms.

Innovation has also been linked to firms' survival rates and market positions. Banbury and Mitchell (1995) find that incremental innovation positively affects a firm's survival chances in established industries through its effect on market share. Jansen, Van Den Bosch, and Volberda (2006) document results consistent with this finding. Specifically, their analysis of a major European financial services firm reveals that pursuing incremental – rather than radical – innovation is more beneficial to a unit's financial performance in environments characterised by a high number of competitors and intense pressures for higher efficiency and lower prices. Their results also indicate pursuing radical innovation is more beneficial for units operating in environments characterised by a high degree of change and unpredictability. Upon examining the survival rates of small US firms, Audretsch (1991) finds that the higher a small firm's innovation rate (total number of innovations divided by industry employment), the higher its long-term survival chances. Cefis and Marsili (2005) reach similar inferences using a sample of manufacturing firms from the Netherlands. They also find that process innovation is especially effective when it comes to firm survival. The positive influence of innovative activities on firm survival is consistent with the theoretical predictions of Jovanovic and MacDonald (1994). Prior research has also shown that being innovative helps firms to protect their market position or increase their market share (Evangelista & Vezzani, 2010; Geroski & Toker, 1996; Hannan & McDowell, 1990).

Despite the strong evidence on the positive impact of innovation on firm performance, a well-documented challenge of the commercialisation of innovation concerns the degree to which an innovating firm's competitors/imitators can benefit from the firm's innovations regardless of whether they are radical or incremental. Teece (1986) argues that the extent to which a firm benefits from its own innovations depends on the "regime of appropriability", which he defines as the "aspects of the commercial environment, excluding firm and market structure, that govern an innovator's ability to capture rents associated with innovation". The degree of appropriability is most affected by the nature of the technology and the efficacy of the legal system that governs the protection of intellectual property (Teece, 1986). Consistent with this argument, Brown and Kimbrough (2011) show that the success of intangible investment as a differentiation strategy is likely to be higher in industries where legal mechanisms are most effective in protecting R&D.

One stream of academic literature that has examined the appropriability of research and innovation is the R&D spillovers literature. Theoretical and empirical research suggests that R&D spending may have two counteracting effects. On the one hand, R&D increases a firm's productivity and reduces its costs. On the other hand, it generates free-rider problems due to knowledge spillovers and the inability of firms to fully appropriate their own innovations. For example, Jaffe (1986) finds that firms whose research is in areas where other firms are also actively researching have higher patents per dollar of R&D and higher return to R&D, provided that the firm is research-intensive. If the firm itself has low R&D unlike its neighbours, however, it suffers lower profits and is valued lower by the market. Bernstein and Nadiri (1989) further expand on these results by examining intra-industry spillovers of R&D expenditures and find that although they decrease the rate of R&D and capital investment, they also decrease the variable and average costs. Klette (1996) shows that knowledge spillovers also occur across the business lines within the same firm and across firms that operate under the same company. The findings from these studies suggest the spillover effects of R&D speed up the returns to innovation.

Firm performance as measured by stock performance

There is a rich literature spanning multiple disciplines that examine the differences between the market valuation of innovative and non-innovative firms and the market's valuation of a firm's investment in innovative activities. Since accounting rules require expensing many items related to firms' innovative activities (e.g. expensing R&D expenditures unless they meet certain conditions) due to reliability

and objectivity concerns, the book value of assets will rarely, if ever, reflect the value of such activities. Regardless of accounting conventions, however, evidence suggests that investors incorporate the information in R&D expenses into stock prices. For example, Lev and Sougiannis (1996) find that the hypothetical book value of R&D capitalisation, calculated as the sum of current and prior R&D expenditures minus the estimated R&D amortisation, is positively associated with stock prices and returns. That is, capitalising R&D expenditures like any other expenditures on non-current assets provides investors with value-relevant information. Empirical evidence suggests R&D expenses and intangible assets have in fact increased in value-relevance over the decades and especially moving into the new economy (Barth, Li, & McClure, 2019).

In one of the early academic studies examining the investors' valuation of firms' innovative activities, Griliches (1981) documents a significantly positive impact of a firm's R&D expenditures, patents, the unexpected changes in these two measures on the firm's market value.[3] Similarly, Pakes (1985) provides some evidence that unpredictable changes in R&D spending and patents of a firm cause the market to revalue the firm. Hirschey and Weygandt (1985) and Chauvin and Hirschey (1993) find both R&D and advertising expenditures to have systematic influences on the market value of the firm that persist over time. Bosworth and Rogers (2001) document similar results (with respect to R&D and patent data) for a sample of sixty Australian firms.

Chan, Martin, and Kensinger (1990) document two results that are relevant to this review. First, investors react positively to firms' announcements to increase R&D spending, even when these announcements coincide with negative earnings. Second, investors do not view all increases in R&D spending as positive. Specifically, such announcements prompt a significantly positive market reaction for high-tech firms but a significantly negative market reaction for low-tech firms. However, Sundaram, John, and John (1996) fail to provide evidence supporting the second result. Chaney, Devinney, and Winer (1991) confirm the main findings of Chan et al. (1990) by showing that innovating firms have better stock price to earnings ratios and that investors positively react to new product announcements. Interestingly, but perhaps not surprisingly, the latter result is more pronounced in high-tech industries. Chaney et al. (1991) also document stronger market reactions to original new product

3 Unpredictable changes in R&D expenditures and patents are the residuals from estimating models of R&D and patents, respectively.

introductions than to reformulated or repositioned products. Collectively, these findings highlight the importance of developing and constantly improving an original IP, which is consistent with the RI approach to innovation.

In addition to the studies already discussed above, a number of other papers have used patent data to examine the relationship between innovation and a firm's valuation. Hall (1999) finds that various patent measures are associated with a firm's market value and contain information above and beyond that conveyed by R&D data. Hall, Jaffe, and Trajtenberg (2005) provide further evidence supporting Hall's (1999) conclusions, and estimate that an extra citation per patent boosts market value by 3%. Interestingly, their results suggest self-citations are more valuable than external citations. Simeth and Cincera (2016) show that despite the potential knowledge spillovers to competitors, a publication of a company's research findings in scientific peer-reviewed journals has a positive impact on its market value beyond the effects of R&D and patents. The authors argue a scientific publication provides the company with privileged access to academic information networks and has signalling benefits that increase access to valuable research inputs such as hiring of PhD graduates. McGahan and Silverman (2006) find that not only a firm's own patents, but also its competitors' patents have a significant impact on its market value. In particular, important patenting by an outside inventor negatively affects the firm's market value. Consistent with Teece's (1986) arguments, their results also suggest this relationship is reversed in industries characterised by weak appropriability regimes, likely because the firm can *work around* the competitors' patents to use in its products.

Which firms are more likely to innovate?

Innovation and firm size

Once the importance of innovation for firm performance has been established, a natural next step is to understand which factors and circumstances increase a firm's propensity to innovate. Given its significance to Schumpeter's arguments on innovation, firm size has been among the most researched factors in this regard. Schumpeter asserted that large firm size is crucial for the success of innovative activities because large firms can take advantage of economies of scale in production and innovation. In theory, increased size also allows the firm more resources to experiment and permits a higher number of trials. Although more trials mean a higher number of failures, it is also likely to result in a higher number of successes. Additionally, results from the analyses of small and medium Australian

enterprises (SMEs) suggest that while the number of IP rights applications by SMEs is higher than that of large firms, they do not appear to utilise innovation culture in a strategic and structured manner like large firms do, which likely hurts their returns to innovation (Jensen & Webster, 2006; Terziovski, 2010).

Early empirical evidence on how firm size affects innovation, however, was mixed. For example, Cohen, Levin, and Mowery (1987) found firm size and business unit size to have no significant effect on R&D intensity. Results from Connolly and Hirschey (1990) indicated that R&D activities' positive influence on firm valuation was not significantly different between large and small firms. In contrast, Dewar and Dutton (1986) found that larger footwear manufacturers were more likely to adopt radical innovations than smaller ones. One potential explanation for this result is the high risk associated with radical innovation activities. Larger firms are more likely to survive the years following the radical innovation investment, during which the company is more financially vulnerable (Buddelmeyer, Jensen, & Webster, 2010). Subramanian and Nilakanta (1996) also documented a positive relationship between firm size and the mean number of innovation adoptions in the banking industry. Two meta-analytical studies have since been conducted in this area to shed light on the conflicting results, and both reviews have provided evidence consistent with the latter set of studies, namely that firm size is positively associated with the rate of innovation adoptions and organisational innovativeness (Camisón-Zornoza, Lapiedra-Alcamí, Segarra-Ciprés, & Boronat-Navarro, 2004; Damanpour, 1992).

These findings do not necessarily imply large firms always have innovative superiority over small firms. For example, Acs and Audretsch (1987) find that market imperfections significantly influence the extent to which large firms have such superiority. In particular, large firms are likely to be more innovative in industries that are concentrated, capital-intensive, advertising-intensive, and highly unionised (i.e. industries with high entry barriers and imperfect competition). They also document a negative influence of market concentration on innovation activity for both large and small firms, but especially small firms.

Innovation and other firm characteristics

A number of other firm characteristics have been linked to firms' propensities to innovate, some of which (based on their importance) are discussed below. Virtually all prior studies agree that technological and non-technological innovations are influenced by different sets of organisational factors. Dewar and Dutton (1986) find

named by the existence of an extensive knowledge base, as measured by the number of technical specialists a firm has, to be a significant determinant of a firm's adoption of both incremental and radical technological innovation. Although the study fails to document a significant relationship between decentralised decision making and innovation, many follow-up studies provide evidence of a positive association between the two (e.g. see Subramanian and Nilakanta (1996) and Damanpour (1991)).

Based on public libraries' responses to survey questionnaires, Damanpour (1987) finds that the number of job specialties is significantly associated with technological innovations, but not with administrative innovations. It has been suggested that a greater variety of specialists within an organisation provides a broader knowledge base in the organisation and increases the cross-fertilisation of new ideas (Aiken & Hage, 1971). The positive influence of this factor on innovation/innovativeness has also been documented by Damanpour (1991), Subramanian and Nilakanta (1996), and Kimberly and Evanisko (1981), among others.

For a company to maximize the benefits from having a great variety of specialists, however, it should develop an innovation strategy that uses its employees' ideas as a source of innovation and encourages the communication (formal or informal) of ideas among its employees to increase the opportunities for knowledge-sharing (Samson & Gloet, 2013).[4] This underscores the crucial role of human resource management in building a sustainable innovation culture. To achieve long-term innovativeness, firms should actively recruit employees with capabilities linked to innovation, invest in targeted skills and capabilities development for their employees, and encourage team-work among the employees (especially high-skilled) for cross-fertilisation of ideas (Samson & Gloet, 2013). Supporting this argument is the evidence from Hurley and Hult (1998) that innovativeness is positively associated with cultures that emphasize learning and individual development. Measuring and rewarding employee contributions to innovation may be necessary for such an innovation culture to persist.

Effective communication of ideas not just among the company's employees but also between the company and its outside partners will drive innovation further. Using California hospitals as their main sample, Goes and Park (1997) provide evidence of

4 Survey evidence from Samson and Gloet (2013) indicates that this is one of the major factors distinguishing innovation leaders from non-innovative firms.

a positive impact of inter-organisational relationships on firms' innovative activities. Damanpour's (1991) meta-analytical review shows this relationship to be a common finding in prior studies.[5] Samson and Gloet (2013) further find that innovation leaders differentiate themselves from innovation laggards by heavily engaging in various forms of collaboration with outside partners and by strongly focusing on creating value for customers through their inputs, feedback, and ideas. Prior studies have proposed a number of channels through which networking and cooperations might influence innovative processes. Chiefly among them are risk sharing, obtaining access to new markets and technologies, pooling complementary skills, and safeguarding property rights when complete or contingent contracts are not possible (see Pittaway, Robertson, Munir, Denyer, and Neely (2004) for a review of this literature).

It is clear that to improve innovation performance on multiple fronts, innovation should be incorporated into, and made a high priority in, a firm's business strategy. This points to the crucial role of senior leadership in achieving high innovation performance. Consistent with this argument, Gahan et al. (2020) find that competent leadership generates firm capabilities that drive innovation, especially in dynamic environments.[6] Evidence also suggests that firms successful in innovation performance have strategic leadership of innovation embedded within their organisations (Samson & Gloet, 2013). This will increase the likelihood that the organisation is open to change and have proper knowledge management systems in place – factors that have been shown in prior studies to be important drivers of innovativeness (Damanpour, 1991; Samson & Gloet, 2013).

Conclusions and future research opportunities

The studies discussed in this review represent only a small portion of the innovation literature that spans multiple disciplines. Through the discussion of these studies, this review aimed at exploring relevant evidence to address two questions that are important for assessing the validity of RI Rule 4: (a) what are the dimensions of innovation and how to measure them; and (b) how does innovation affect firm performance. It also provided a discussion of which firms are more likely to innovate.

5 See Damanpour (1991) for the list of studies examining these links.

6 The role of leadership in driving firm performance will be explored in greater detail in one of our future research notes (Rule 11).

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The collective evidence from various studies suggests that innovation is a multi-dimensional construct comprising product, process, and organisational (i.e. organisational structure, management or marketing techniques etc.) innovation. Although engaging in product or process innovation alone is likely to improve a firm's performance, firms that adopt organisational innovation in conjunction with the first two tend to outperform firms that do not. When interpreted in light of the evidence that extensive knowledge base and effective communication of ideas are important determinants of innovation, this finding suggests that to achieve sustained profitability firms should foster an organisational culture where innovative ideas and activities are continuously encouraged and supported. RI's guidelines are consistent with this interpretation.

Despite the voluminous literature on innovation, some areas remain underresearched. First, we still do not have a good understanding of how and under what circumstances organisational (especially management) innovation affects firm performance – in terms of both profitability and market value. Implementing a major organisational change is both very risky and time-consuming. Which path should managers take when implementing such a change: a management technique/organisational structure that has already been successfully implemented by other companies or a more radical one that could yield higher returns but involves considerable uncertainty? What are the conditions under which managers need to make either choice for a higher success rate? Is the average implementation time an important factor affecting the success rate of these decisions?[7] The duration of organisational changes is certainly not the only implementation challenge. Many firms set out to be innovative but eventually fail. Despite this, however, the factors that contribute to such an outcome haven't received as much attention in the academic literature.

Second, there is surprisingly little research on how a firm's decision to diversify or stay focussed affects its innovative activities. This strategic decision affects several firm-specific factors, from risk to default to competitiveness (see Research Note 2), which are likely to affect the firm's innovative activities. We believe addressing these questions would make significant contributions to the innovation literature.

7 Survey evidence suggests that managers see lengthy development times as one of biggest obstacles to innovation (Samson & Gloet, 2013).

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