
Management Indicators and Measurement of Innovation: Review of the Literature

Hugo Ferreira Braga Tadeu¹ and Jersone Tasso Moreira Silva

Abstract

Several studies have demonstrated the necessity of indicators for innovation management, so as to control investments in R&D with greater efficiency. Nevertheless, the review of the literature suggests that the debate on the theme is still very incipient. In this sense, this study has for its object the answer to the following questions: (i) what does the review of the literature say on innovation management indicators? and (ii) how does one measure the results of innovation? To answer the 2 (two) questions, innovation management is analysed as a consequence of the market context and of the organizational strategy, being broken down into indicators. The methodology proposed is qualitative, resulting from searches in international periodicals. It suggests that rates of innovation are greatest when the innovation strategy is well understood and the alignment with other business areas more effective, being something more relevant than solely technological innovation. The conceptual model obtained is theoretical, and may be broken down into new studies for various sectors of interest and with different results.

Key words: management indicators, measurement of results, innovation



Available online
www.bmdynamics.com
ISSN: 2047-7031

INTRODUCTION

Several studies bring home the need for the development of innovation management indicators, in order to obtain the best results for investments in R&D (Research and Development) and consequently for organizational strategy. However, innovation indicators are usually utilized to analyse the economic behaviour of countries, highlighting the disbursements with education, university research, number of articles published and requests for patents. Consequently, the amount of information about these data is vast, and can be found in reports of sources such as The Conference Board, WEF (World Economic Forum) and WIPO (World Intellectual Property Organization).

According to Bessant (2003), innovation management indicators are proposed to report organizational behaviour and not economic variables, which justifies this article, as this fact points in the direction of analyses of the capacity for entrepreneurial response to the environment in which it is inserted, comprising adjustments necessary for sustained long-term growth. It is assumed that innovation management indicators are a function of the market context, the innovation strategies and the operational processes.

The innovation management indicators in the organizations presented here are the result of the review of the literature in important international periodicals for the theme researched, which makes the article consistent and relevant. Nevertheless, it is suggested that the article proposed should be the object of breaking down into new studies, with the adoption of business cases.

Over the past few years several studies have been carried out to evaluate the impact of organizational innovation, citing Tadeu and Salum (2013). The object of this article, therefore, is to analyse the innovation indicators in management, through the implementation, control and measurement of results in companies of diverse sizes, public and private.

This study is divided into 6 (six) sections: the first is the introduction, followed by a review of the literature describing the innovation management indicators, and the methodology presenting the implementation, control and measurement. The results of the management innovation indicators are found in section 3, the results of the research in section 4 and finally, the conclusions in section 5.

¹ Fundação Dom Cabral, Brazil, Innovation and Entrepreneurship Centre
E-mail: hugo.tadeu@fdc.org.br

REVIEW OF THE LITERATURE

The innovation management indicators dealt with in the present article should respond to the organizational strategy, being controlled and measured, in such a way as to create a capacitating context favourable for the development of new products, processes and technologies. Through the review of the literature determining factors for the practice of innovation management are identified.

The aspect vital for the adoption of the innovation management indicators is the complementation of the organizational strategy, broken down into innovation strategy itself recognized by the agents directly or indirectly involved in this process. Nevertheless, in various organizations, innovation is associated only with R&D activities, a fact resulting from the recent studies related to the economics of innovation and not really innovation management. Tushman and Nadler (1986) argue that the strategy of innovation is a fundamental aspect in order that new products, processes and services can be developed properly. Complementing, Vidal, Lapiedra-Alcami and Chiva-Gomez (2004), suggest that a well-formulated innovation strategy is not enough, without the alignment with operational capacity, as a condition for an innovative environment.

The implementation of the innovation strategy, continuously controlled and measured is another theme little explored in the literature. After a research process on an international basis, Anderson and West (1998) presented a measurement proposal for works undertaken in R&D teams. Avlonitis, Papastathopoulou and Gounaris (2001) on the other hand propose a study on the innovation of products in financial services, with an approach aligning financial indicators and market analyses.

Burgelman, Christensen and Wheel-Wright (2004) present innovation management, its strategies and results indicators applied to the technology sector, something repeated in other texts examined. Given the acceleration of the economy and of knowledge, the need for studies in other economic sectors becomes evident, sectors such as energy, biotechnology, automotive and aerospace, with considerable investments in innovation, according to the Global Innovation Index (2012).

The results of the review of the literature obtained in other studies talk of significant investments in R&D but of an absence of innovation management indicators, in accordance with Table 1, which in theory, could represent a risk for management practices, according to Johannessen, Olsen and Lumpkin (2001).

The studies on innovation as R&D, specifically, result from the fact that this is a recurring theme in the literature and from the observation that the economics of innovation presents significant importance in knowledge generation. The importance of this question for innovation is very large, but attention should be paid to the fact that the absence of management of innovation practices can result in a decrease of organizational competitiveness, minimizing investments.

Table 01. Key words and Innovation Management Indicators

Key words	Burgelman, Christensen, and Wheel-Wright, (2004)	Bessant (2003)	Avlonitis, Papastathopoulou and Gounaris (2001)	Anderson and West (1998)	Tushman and Nadler (1986)
Market context	X	X	X		
Organizational strategy	X	X	X	X	X
Innovation management strategy	X	X	X		
Implementation of innovation	X	X	X	X	X
Measurement of Innovation	X	X	X	-	-
Control of results of innovation	X	X	X	-	-
Culture and	X			X	X

innovation management					
Processes for innovation management	X	X	X	-	-
Technological tools for innovation management	X	X	X	-	-
Innovation as R&D	X	-	-	X	X
Innovation management indicators	X	X	-	-	-
Economics of innovation	-	-	-	X	X
Innovation management	X	X	-	-	-
Case Study	Technology	-	Financial	-	-

Source: the authors

MEASUREMENT OF THE INDICATORS OF INNOVATION MANAGEMENT

Innovation indicators should be associated with the following factors: established strategy, favourable environment for creative practices, organizational culture and constant investments in new products, processes and technology, in accordance with Bowers and Knorakian (2014). Complementing, Lofsten (2014), suggests that the innovation strategy should be aligned with organizational strategy, thus stimulating the conditions necessary for sustained growth.

Typically, the innovation strategy comprises a proper analysis of the market, of operational limitations, of the management indicators and of the human competencies established, according to studies proposed by Martins and Terblanche (2003). In this case, the adoption of control indicators, citing the BSC - Balanced Scorecard, would be advantageous, provided that the alignment between business units is perceived, thus avoiding dysfunctions of business planning.

Research undertaken by Moon and Choi (2014), suggests that the implementation of innovation strategy is only feasible, if there exists an environment and organizational culture favourable for it, thus stimulating practices that build knowledge management, in addition to the performance indicators cited above.

To measure the impact of innovation management, in addition to the adoption of the innovation strategy, the market analysis, the operational limitations and the human competences, Schaltegger, Freund and Hansen (2012), argue that the visionary companies are those that aggregate control and sustainability practices to their management indicators, stimulating entrepreneurial growth. For Treur and McMurray (2012) on the other hand, the creation of innovation committees is vital, proposing, evaluating and deliberating on relevant innovation projects and the results attained.

For Samson and Lawson (2008), the possibility of the inefficiency of organizational innovation is pointed to, given the uncertain international environment and the capacity for the increase of company investments in countries in which the regulatory environment is favourable.

Finally, Philbin (2013) utilizes the relationship between innovation growth and the positive effects of better short-term operational performance of the organization. These effects can only become possible if the margins of contribution of the business are greatest, given the productivity gains and technological intensity.

In conformity with the authors above, Hornsby, Kuratko, Holt and Wales (2013), expect the growth of innovation practices to arise from a favourable regulatory environment, stimulating the opening of new companies (primarily those technologically-based) and from the increase in the dynamism of large organizations, these being the ones responsible for significant investments in R&D. In addition to these factors, only through the better performance of production capacity and of services, can organizations

invest more in innovation. The positive relation between innovation, productivity and investments would generate results favourable for the market.

METHODOLOGY

The present study is a piece of qualitative research comprising a review of the specialized literature, carried out between October 2013 and February 2014, in which international periodicals were consulted, periodicals such as Enterprise and Innovation, European Journal of Innovation Management, Innovation and Development, International Journal of Entrepreneurship and Innovation Management, International Journal of Innovation and Sustainable Development, International Journal of Innovation Management, Journal of Technology Management & Innovation and The Journal of Product Innovation Management, in accordance with Figure 01. The examination of these periodicals attests to the search for up-to-date research, future tendencies and aspects related to its applicability for the organizational environment.

Following this, we sought to study and understand the principal parameters, and form of application employed, found in the studies on innovation management indicators, control and measurement of results.

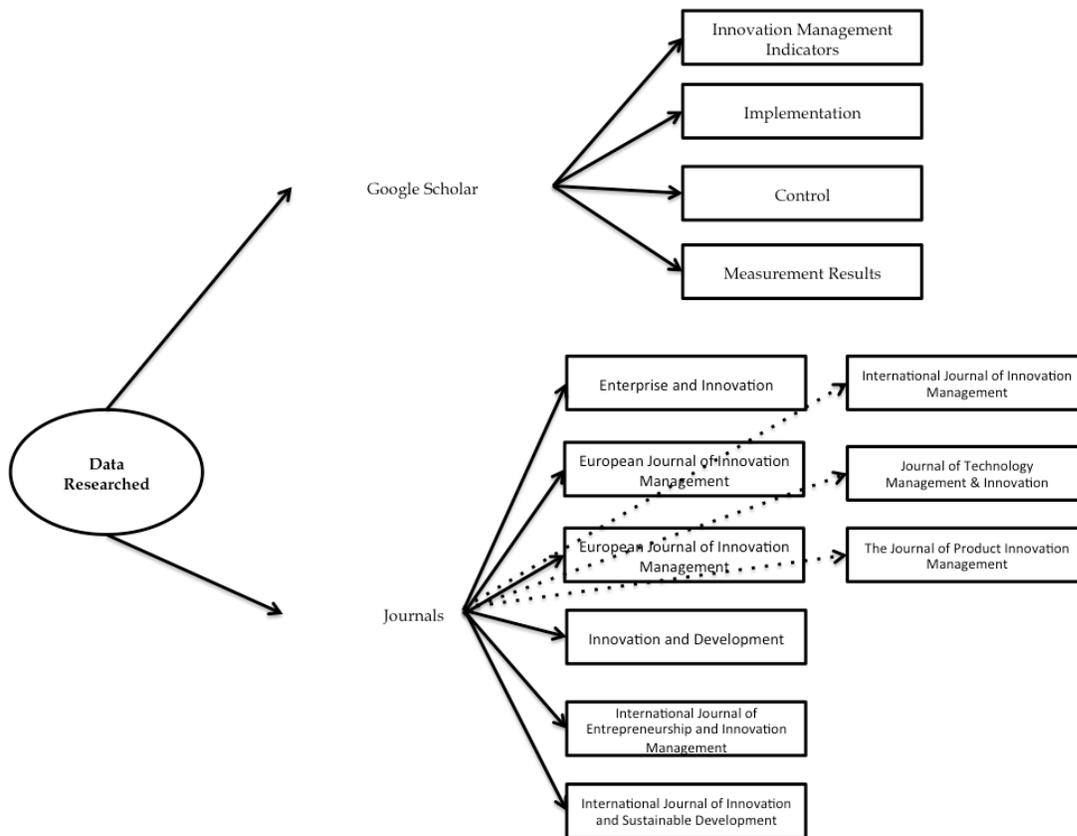


Figure 01 - Review of the literature
source: authors

RESULTS: Organizational Innovation Indicators

The organizational innovation indicators suggested derive from studies of Ford and Paladino (2013), being an initial approach and subject to adaptations to the business context. Their proposal consists in correlating market analyses with organizational strategy data, innovation strategy, processes, indicators and results.

According to Michelfelder and Kratzer (2013), there exists the possibility of an absence of synchronism between the strategic planning and innovation practices, which can influence the development of new products, processes and market results. The option in this article was the integrated analysis of all the factors that can influence innovation, investigating the significant conditions and those that could result in a final model for the adoption of innovation indicators.

Figure 02 presents the concepts associated with market analyses, they being:

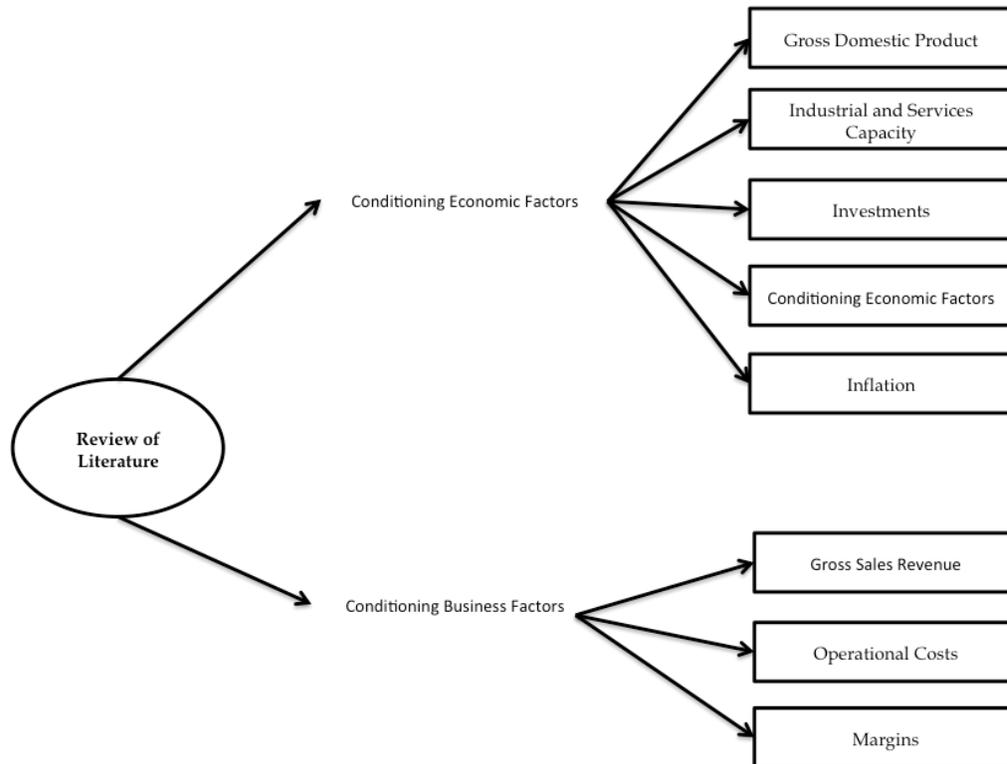


Figure 02 – Market analyses after review of the literature

Source: the authors

Figure 02 suggests that:

- Conditioning economic factors: relationship between macroeconomic variables, putting the market in evidence and its capacity for growth.
- Conditioning business factors: important data, and that help in decision-making for investments, highlighting innovation practices.

In the literature, these two groups are analysed in constant relationship. In this article, these two groups together with corporate strategies, innovation strategies, processes and results indicators suggest the measurement of R&D activities, in accordance with Figure 03.

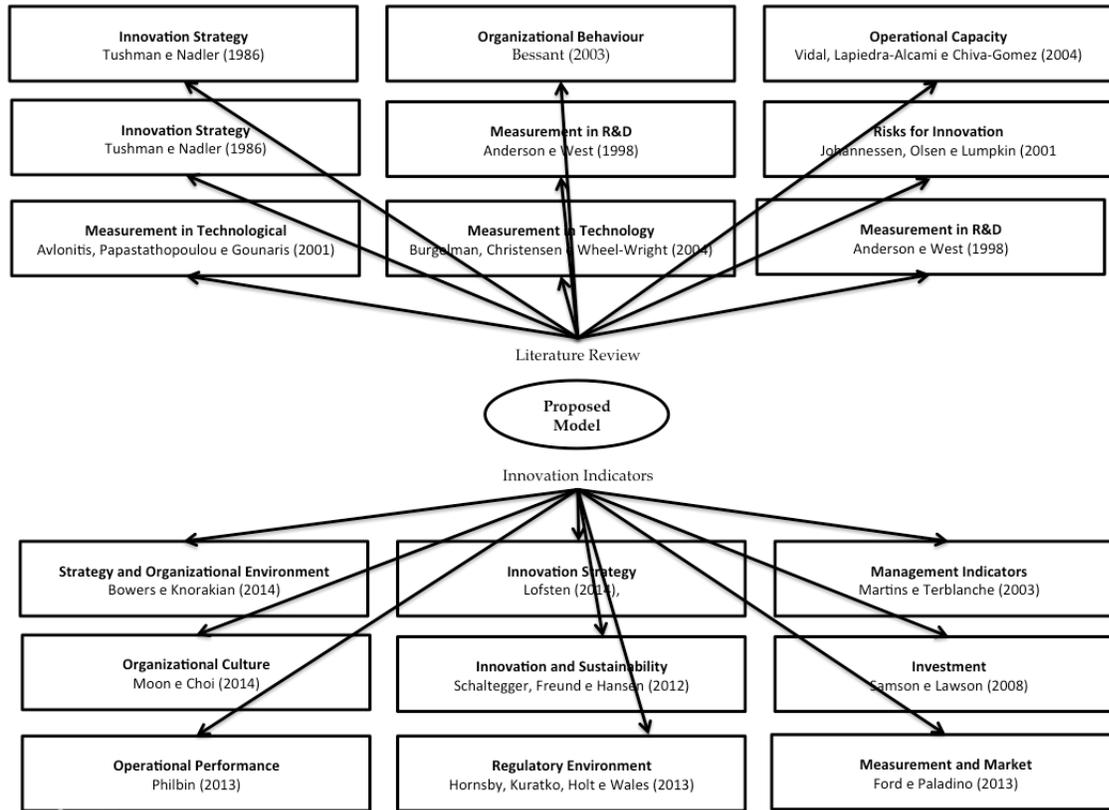


Figure 03 - Conceptual Model proposed for Innovation Indicators

Source: the authors

Figure 03 suggests that there exist relationships between strategy, organizational environment, management indicators, organizational culture, sustainability, operations and innovation indicators. This indicates that positive results for innovation are not exclusive to R&D activities, but also depend on good management practices.

CONCLUSION

This article has analysed various studies on the need to implement innovation management indicators in organizations. The search for innovation indicators that represent the strategy adopted, broken down into analyses of economic results, innovation culture, processes, and not just R&D practices, is the keynote of the present study.

The evidence obtained by the review of the literature suggests that the implementation of innovation indicators should be associated with market analyses, operational limitations and management of human competences, as a complement to management models, citing the BSC as an example.

The results achieved suggest that there is a clear relationship between the organizational strategy adopted, and the innovation strategy, processes and indicators, in achieving results suitable for innovation practices. The absence of synchronism between these functions can influence in the sense of less capacity for innovation.

In conclusion, the innovation indicators should represent the economic factors and business conditioners, placing the market in evidence, its capacity for growth and entrepreneurial decision-making, stressing operational and innovation practices.

REFERENCES

- Alegre-Vidal, J., Lapiedra-Alcami, R. and Chiva- Gomez, R. (2004). "Linking operations strategy and product innovation: an empirical study of Spanish ceramic tile producers". *Research Policy*, Vol. 33, pp. 829- 839.
- Anderson, N.R., West, M.A. (1998). "Measuring climate for work group innovation: development and validation of the team climate inventory". *Journal of Organizational Behavior*, Vol. 19, pp. 235-258.
- Avlonitis, G.J., Papastathopoulou, P.G. and Gounaris, S.P. (2001). "An empirically-based typology of product innovativeness for new financial services: success and failure scenarios". *Journal of Product innovation management*, Vol. 18, 324-342.
- Bessant, J. (2003). "High Involvement Innovation: Building and Sustaining Competitive Advantage Through Continuous Change". Chichester: John Wiley.
- Bowers, J., Knorakian, A. (2014). "Integrating Risk Management in the Innovation Project". *European Journal of innovation management*, Vol. 17, pp. 25-40.
- Burgelman, R.A., Christensen, C.M e Wheel-Wright, S.C. (2004). "Strategic Management of Technology and Innovation", 4th edition. New York: McGraw Hill/Irwin.
- Ford, D., Paladino, A. (2013). "Enabling Innovation Through Strategic Synergies". *Journal of Product and innovation management*, Vol. 30, pp. 1050-1072
- Global Innovation Index. (2012). Source: < <http://www.globalinnovationindex.org>>
- Hornsby, J. S., Kuratko, D. F., Holt, D. T., Wales, J. W. "Assessing a Measurement of Organizational Preparedness for Corporate Entrepreneurship". *Journal of Product and innovation management*, Vol. 30, pp. 937-955
- Johannessen, J., Olsen, B., G.T. Lumpkin (2001) "Innovation as newness: what is new, how new, and new to whom?". *European Journal of innovation management*, Vol. 4, 20-31.
- Lawson, B., Samson, D. "Developing Innovation Capability in Organizations: a Dynamic Capabilities Approach". *International Journal of innovation management*, Vol. 5, pp. 377-400.
- Lofsten, H. "Product Innovation Process and the Trade-Off Between Product Innovation Performance and Business Performance". *European Journal of innovation management*, Vol. 17, pp. 61-84.
- Martins, E.C., Terblanche, F. (2003). "Building Organizational Culture That Stimulates Creativity and Innovation". *European Journal of innovation management*. Vol. 6, pp. 64-71.
- Michelfelder, I., Kratzer, J. (2013). "Why and How Combining Strong and Weak Ties Within a Single Interorganizational R&D Collaboration Outperforms other Collaboration Structures". *Journal of Product and innovation management*, Vol. 30, pp. 1159-1177.
- Moon, H, K., Choi, B. K., (2014). "How an organization's ethical climate contributes to customer satisfaction and financial performance: Perceived organizational innovation perspective". *European Journal of innovation management*, Vol. 17, pp. 85-106.
- Philbin, S, P (2013). "Emerging Requirements for Technology Management: a Sector Based Scenario Planning Approach". *Journal of Technology Management and Innovation*, Vol. 8, pp. 34-44.
- Schaltegger, S., Freund, F., Hansen, E. G. "Business Cases for Sustainability: the Role of Business Model Innovation". *International Journal of Innovation and Sustainable Development*, Vol. 6, pp. 95-106.
- Tadeu, H. F. B., Salum, F. A (2013). "Estratégia, Operações e Inovação - Paradoxo do Crescimento". (Strategy, Operations and Innovation - the Paradox of Growth) Editora Cengage Learning.
- Tushman, M; Nadler, D (1986). "Organizing for Innovation". *California Management Review*, Vol.28, pp. 74-92.
- Treuer, K., McMurray, A. "The Role of Organizational Climate Factors in Facilitating Workplace Innovation". *International Journal of Entrepreneurship and innovation management*, Vol 15, pp. 292-309.