

Innovation Management Systems

Subjects: Others | Management | Engineering, Industrial

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Standardized innovation management systems (SIMS) are homogeneous management systems which accelerate the conversion of an organization's innovation strategy into effective actions. Thus, SIMSs ensure that innovation means not mere shiny novel inventions, but rather an organization's ability to recognize and pursue new areas of opportunity while reacting to fluctuating conditions in its environment. In 2006, the Spanish Association for Standardization and Certification (AENOR) issued the Spanish UNE 166002: 2006, the first innovation management standard, as sets of principles intended to aid organizations in navigating the multifaceted process of innovation, schematizing their activities and improving management efficiency.

Keywords: innovation management ; innovation management system ; innovation management standard ; innovation culture ; systematic innovation management ; innovation gaps ; UNE 166002: 2006 ; ISO 56000

1. Introduction

We can describe innovation as the development of new products or the significant improvement of new goods or services. It can also be defined as new marketing, organizational, or business strategies ^[1]. In the innovation management systems literature, innovation is commonly considered to be a fundamental dynamic of the enhancement of corporate competitiveness ^[2]. Perhaps for this reason, the innovation process is deemed an indispensable corporate process which has to be appropriately managed in order to foster business performance in the aspects of business profitability, productivity, quality of service, and customer and employee satisfaction ^[3], and to achieve a reasonable return on investment for the resources required by the these processes.

Standardized innovation management systems (SIMS) are homogeneous management systems which accelerate the conversion of an organization's innovation strategy into effective actions ^{[4][5]}. Thus, SIMSs ensure that innovation means not mere shiny novel inventions, but rather an organization's ability to recognize and pursue new areas of opportunity while reacting to fluctuating conditions in its environment ^[6]. In 2006, the Spanish Association for Standardization and Certification (AENOR) issued the Spanish UNE 166002: 2006, the first innovation management standard, as sets of principles intended to aid organizations in navigating the multifaceted process of innovation, schematizing their activities and improving management efficiency. In the same context, other countries have developed similar standards, such as the BS 7000-1: 2008 standard (BSI, 2008) in the UK (first edition in 1989), while some countries have amended the Spanish standards, such as Portugal (IQP, 2007), Mexico (NMX, 2008), Brazil (ABNT, 2011) and Denmark (Dansk Standard, 2010).

Two systematic literature reviews for innovation management systems were conducted. One analyzed 27 articles in order to build a tentative interpretative framework of innovation management systems which critically highlights and discusses their most common elements and aspects ^[7], and the other focused exclusively on models that graphically represent innovation management ^[8].

MRQ2. Have innovation management standards matured from a practical point of view?

2. Methodology: Article Selection

Our approach to the literature review was designed to be organized, clear and reproducible ^[9]. The systematic literature review was conducted for the papers appeared between 1 November 2020 and 1 February 2021, and began with a search for peer-reviewed journal articles in scientific journal databases, as this review process is a tool for quality management that verifies the information presented by these articles ^[10].

We chose the Mendeley and Google Scholar search engines, as they are the main free tools for academic research that have expanded their research capabilities in recent years ^[11].

The final sample was analyzed using an Excel datasheet [12], and the final database includes information such as the type of author (single author or collaboration), the type of paper (conceptual or empirical), the design, the type of research performed (survey, theoretical, data analysis), the applied methodology, and the key findings and contributions of each article.

After that, we pre-tested and shared the coding scheme with two field scholars in order to reach a consensus on the final information to be used. We synthesized the evidence, providing a clear perception of the status of the innovation management systems/standards literature. This systematic clustering process represents a consistent approach for future research.

3. Descriptive Results: Analysis

The database of the results allowed the extrapolation of some interesting information, even at a general level. First of all, the annual distribution of the articles reveals that the subject was of less importance before 2012; seven articles were published in 2012, and the article frequency peaked at 24 articles from 2015 to 2017, as shown in **Figure 1**.

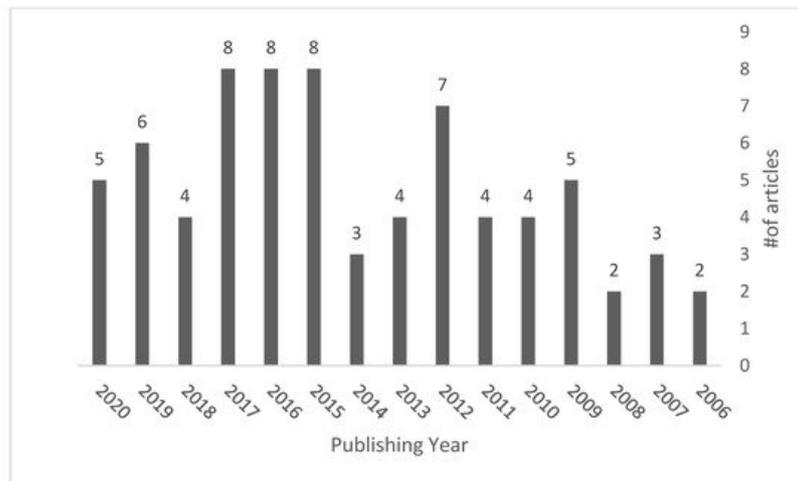


Figure 1. Number of articles per year.

In addition to the 57 other academic journals represented, the Journal of Engineering and Technology Management, Procedia: Social and Behavioral Sciences and Technovation are the most relevant journals which have published articles on this topic, with three articles each. In total, 32 articles were published in the journals with scores of more than 0.5 (impact factor 2019), as shown in **Table 1**.

Table 1. Journals, conferences and article numbers.

Journal Name	Impact Factor 2019	Case Study	Theoretical	Survey	Total
Journal of Engineering and Technology Management	--	3	0	0	3
Procedia: Social and Behavioral Sciences	--	0	3	0	3
Technovation	0.756	2	0	1	3
European Journal of Innovation Management	1.676	1	0	1	2
International Journal of Innovation Management	2.113	1	1	0	2
Procedia Economics and Finance	0.629	0	1	1	2
Vine		1	1	0	2
IEEE International Technology Management	0.524	1	0	0	1
Advances in Intelligent Systems and Computing		1	0	0	1
Canadian Journal of Administrative Sciences	4.691	1	0	0	1
Chinese Management Studies	1.6	0	1	1	2
Creativity and Innovation Management	1.667	0	1	0	1

Journal Name	Impact Factor 2019	Case Study	Theoretical	Survey	Total
R and D Management	3.727	0	0	1	1
Dyna (Spain)	1.263	0	1	0	1
Edulearn15: 7th International Conference on Education and New Learning Technologies	----	1	0	0	1
Engineering Management Journal	----	0	1	0	1
European Management Review	----	0	0	1	1
International Association for Management of Technology Conference,	----	0	1	0	1
Industrial Management and Data Systems	----	0	0	1	1
Information Technology and People	0.996	0	1	0	1
Innovar	----	0	1	0	1
Innovation and Ontologies: Structuring the Early Stages of Innovation Management	7.6	0	1	0	1
International Journal of Advanced Engineering and Management Research	4.111	0	1	0	1
International Journal of Economics and Management Engineering	----	0	1	0	1
International Journal of Innovation Science	----	0	0	1	1
International Journal of Management Reviews	4.028	0	1	0	1
International Journal of Operations and Production Management	6.395	0	0	1	1
International Journal of Quality and Reliability Management	2.734	0	0	1	1
ISPIM Innovation Symposium	3.347	0	1	0	1
Journal of Business Research	----	0	0	1	1
Journal of Cleaner Production	----	0	0	1	1
Journal of Construction Engineering and Management	1.305	0	1	0	1
Journal of Innovation Management Caetano JIM	----	1	0	0	1
Journal of Software: Evolution and Process	----	1	0	0	1
Journal of the Knowledge Economy	--	0	1	0	1
Management Research News	--	0	0	1	1
PICMET: Portland International Centre for Management of Engineering and Technology	--	0	0	1	1
Proceedings of the 8th European Conference on Innovation and Entrepreneurship	--	0	1	0	1
Processes	1.963	1	0	0	1
ProQuest Dissertations and Theses	--	1	0	0	1
Public Enterprise Half-Yearly Journal	--	0	0	1	1
R and D Management	2.908	1	0	0	1
Recent Advances in Business Administration		0	1	0	1
Revista Estudos e Pesquisas em Administração	--	1	0	0	1
Scientometrics	5.425	1	0	0	1
Technological Forecasting and Social Change	--	0	0	1	1
TMQ Techniques, Methodologies and Quality	--	1	0	0	1

Journal Name	Impact Factor 2019	Case Study	Theoretical	Survey	Total
Total Quality Management and Business Excellence	2.77	1	0	0	1
VTT Publications	0.731	1	0	0	1
Espacios	3.815	0	0	0	0
Research Policy	1.867	0	0	0	0
American International Journal of Business Management (AIJBM)	6.606	0	0	1	1
Technology Analysis and Strategic Management	--	1	0	0	1
Systems Research and Behavioral Science	2.181	1	0	0	1
Romanian Journal of Ecology & Environmental Chemistry	--	1	0	0	1
Journal of Environmental Treatment Techniques	0	1	0	0	1

The articles were created in a various geographical regions. As shown in **Figure 2** , 52% of the articles were from Europe, 10% were from Asia, 10% were from South America and 22% had no geographical identifications.

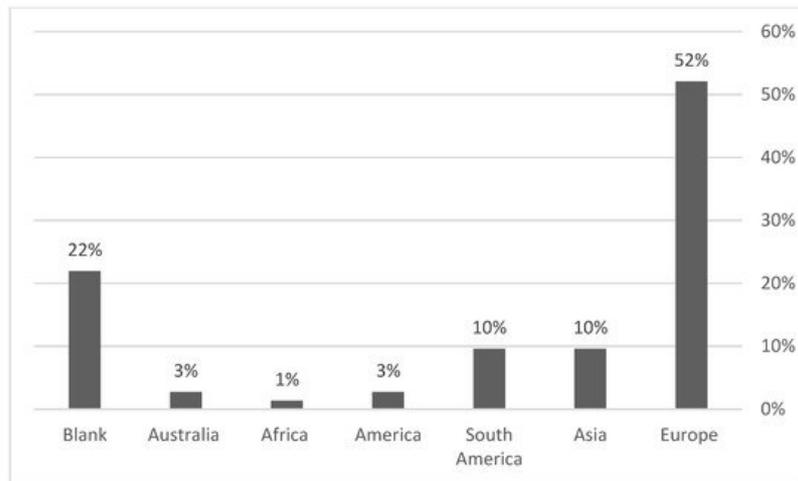


Figure 2. Geographic scope analysis.

The highest proportion from any one country was from Spain, at 14%. This result maybe related to the fact that Spain was the first country to introduce innovation management standards (Spain 2006 UNE 166002:2006–R&D&I Management: Requirements of the R&D&I management system) ^[13].

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4. Comprehensive Review of IMS/St

Furthermore, 33% of these articles (eight articles) developed a new model, but five of them did not verify the outcomes ^[4] ^[14]^[15]^[16]^[17], although each of them declared the unique characteristics for their models.

In studies of this group, various fields were studied , i.e., services ^[18], communications, construction, industry, nanotechnology ^[19], education ^[20], labs ^[21], mobile industry ^[22], aerospace ^[23] and countries (Peru, Colombia, Spain, France, etc.). Just one study examined the main innovation challenges of managing uncertainty and risk, and the difficulty of cross-functional coordination ^[24].

Table 2. Group C1: experimental quantitative studies/IMS and performance ($n = 12$).

Title	Year	Main Findings	Model's Added Value	Study Classification	Sample Size	Subject
A Measurement Scale for Product Innovation Performance	2006	The operational measures developed here satisfy the criteria for unidimensionality, reliability, and validity.		Survey	132 out of 253 targeted	Performance
Do Standardized Innovation Management Systems Matter for Innovative Capability and Business Performance?	2020	Significant connections exist between standardized innovation management systems, innovative capability and business performance.		Survey	217	Performance
An Innovation Management System to Create Growth in Mature Industrial Technology Firms	2015	New model	Penetrate the glass ceiling of exploitation and establish new undisputed growth flows. A systematic process to establish innovation streams outside of the existing comfortable exploitation region can be followed by management teams in mature technology industries. Highly important in the efforts to pursue profitable growth.	Interview-survey	28, from 6 firms	Performance
Does Innovation Lead to Performance? An Empirical Study of SMEs in Taiwan	2007	Innovation is poorly related to company sales, although administrative innovation has become the most important element in explaining sales rather than technological innovation.		Survey	763 out of 877	Performance
Emerging Technologies Beyond the Chasm: Assessing Technological Forecasting and Its Implications for Innovation Management in Korea	2016	There is a gap in the process of commercialization. Interaction between innovation practitioners is about overcoming the gap. Government support is quite helpful.		Survey	218 out of 256	Inn-Performance
Importance of an Innovation Management System	2013	When the company has not yet reached a reasonable size and is willing to certify IMS, this is often overloading it. Commercialization and diffusion for product/service and innovation achievements benefit even more from reinforcing a formal innovation management system when IMS organizational strategy of innovation is applied.		Survey	4 + 5 certified	Performance

Title	Year	Main Findings	Model's Added Value	Study Classification	Sample Size	Subject
Innovation Management Techniques and Tools: Its Impact on Firm Innovation Performance	2018	Using IMTs in the companies could predict their innovation success, particularly when considering incremental innovation results.		Survey	566	Performance-management
Innovation Types and Innovation Management Practices in Service Companies	2007	In the telecommunications and financial sectors, product innovation is emphasized more than in the transport and retail sectors, while service innovation is emphasized more in the retail and transport sectors. Radical and incremental innovations are related to innovation performance. Radical innovations are related to innovation management practices.		Survey	47% of 214	Performance
Organizational Innovation as an Enabler of Technological Innovation Capabilities and Firm Performance	2012	Development of technological innovation capabilities is encouraged by organizational innovation. Organizational innovation and products and processes technological capabilities will contribute to outstanding company performance.		Survey	144	Performance
The Impact of Standardized Innovation Management Systems on Innovation Capability and Business Performance: An Empirical Study	2016	Innovation management Standards have a strong positive relation with the company's Innovation Capability (IC) and Business Performance (BP).		Survey	1000	Performance
The Performance Implications of the UNE 166.000 Standardized Innovation Management System	2019	All types of innovation and its achievements are endorsed by the implementation of SIMS. The relationship between administrative and technological development is positive.		Survey	200	Performance-St
The Sources of Management Innovation: When Firms Introduce New Management Practices	2009	Management innovation is the product of the internal context of the company and the external quest for new information, as management innovation correlated with the co-occurrence of "context and search" is negatively affected. Management innovation positively affects company performance in the form of subsequent productivity growth.		Survey	3668 out of 8172	Performance

Further details of all of these studies are shown in **Table 6** .

Table 6. Group C2: experimental quantitative studies/IM standards or IM systems ($n = 8$).

Title	Year	Model	Main Findings	Study Classification	Study Purpose	Sample Size	Subject
Are National Systems of Innovation Converging? The Case of Cen/Ts 16555	2015		The standard of innovation management is ineffective due to the lack of consensus among European countries	Interviews	Analyze the recent efforts to standardize innovation management at European level as a practical test of the degree of internationalization of national innovation systems	33	Standard
Chief Technology Officer's Views and Behaviors in the Dual Innovation Management System	2009		Successful CTOs strive actively to obtain technical information and information about their companies' social environment. Consider and act based on their philosophy and knowledge. Show great attention in nurturing human resources.	Survey	Describe the concept of Dual Innovation Management System, consisting of two innovation management systems, one for processing existing business areas and the other for developing new business areas	50	Management
Management Innovation Through Standardization: Consultants as Standardizers of Organizational Practice	2012		When agendas and methods are standardized, the management innovation process within the organizations may have a significant effect, in other words, the more standardized company innovation processes are, the more incremental innovations take place in the organization rather than more exploratory and revolutionary changes Standardization is a key feature of the organizations	Survey	Argue that consultant-led management innovation is usually highly standardized	90 in 30 organization	Management
Management of Innovation Processes in Company	2015	1	Successful realization of the innovation processes requires a supportive environment for innovation creation.	Survey	Analyze the literature and research in detail to create a model for the company's innovation processes management	321	Management

Title	Year	Model	Main Findings	Study Classification	Study Purpose	Sample Size	Subject
Managing the Implementation of Innovation Strategies in Public Service Organizations—how Managers May Support Employees' Innovative Work Behavior	2019		Understanding innovation strategies, encouraging management, risk tolerance culture and autonomy are valuable innovation management tools Strategic management communication and economic rewards are not related to any stage of innovative work behavior	Survey	Identify which management strategies public managers can use to enhance their employees' innovative behavior.	1405	Management
Organizational Innovation Management: An Organization-Wide Perspective	2007	1		Survey	Develop and validate an organization-wide OIM framework.	201 out of 2100	Management
Organizational Innovation: The Challenge of Measuring Non-Technical Innovation in Large-Scale Surveys	2008		Four key reflections for assessing organizational innovation: (1) Complexity of organizational innovation; (2) Life cycle of organizational innovation; (3) Extent of use of organizational innovation; (4) Quality of organizational innovation.	Survey	Measure and monitor organizational innovations by large-scale surveys. Define and measure the organizational innovations in more detail by classifying them and comparing the different approaches of measuring them.	1450	Management
The Role of Management Innovation in Enabling Technological Process Innovation: An Inter-Organizational Perspective	2013		Explain the interlinkages of the two innovations types over time. Management innovation theory extended by conceptualizing management innovation in an inter-organizational context.	Survey	Address the gap that the role of management innovation in promoting technological process innovation in the inter-organizational context has not been fully explored.		Management

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