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Jin Chen, Alexander Brem, Eric Viardot, Poh Kam Wong

Standards, models, and methodologies for innovation management

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Emigdio Alfaro
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STANDARDS, MODELS, AND METHODOLOGIES FOR INNOVATION MANAGEMENT

Emigdio Alfaro

Commonly, the innovation processes prioritized creativity (Alfaro, 2017a, p. 35) but not standardization due to the belief of the obstacles presented by standardization for the innovation (Alfaro, 2017b, p. 37; Castillo-Rojas, Karapetrovic, and Heras, 2012, p. 1085); however, in this chapter, the reader will learn that the standards, models, and methodologies for managing the innovations could accelerate the innovations with a real focus on value generation and not prioritizing the creativity processes by themselves, which commonly are not integrated with the strategic planning (Alfaro, 2017b, p. 32) and could be failures of diverse types and not only financial failures. This chapter includes the following themes: (a) problems associated with the lack of standards and methodologies for managing the innovation in the organizations, (b) standards for managing the innovation, and (c) models and methodologies for the innovation management. There are diverse problems related to (a) innovation processes, (b) innovation products, (c) innovative business models, (d) project management problems of the innovative projects, (e) lack of prioritizing of the value generation of the innovations, (f) lack of regulatory framework for norming the innovation processes, and (g) lack of investments for the innovation.

After the literature review, diverse standards for managing innovation of diverse countries were found, such as (a) China, (b) the United States, (c) the United Kingdom, (d) Portugal, (e) Spain, (f) Russia, (g) Germany, (h) Denmark, (i) France, (j) Ireland, (k) Mexico, (l) Brazil, and (m) Colombia; also, standards for managing innovation from Europe were found. Additionally, the following innovation management models were found: (a) Integrated Service Innovation Method (iSIM), (b) Open Innovation Maturity Model for the Government, (c) Innovation Capability Maturity Model (ICMM) of Essmann, (d) Integrated Innovation Maturity Model (I2MM), (e) Model for measuring the Business Model Innovativeness, and (f) the Open Business Model and are presented in this chapter. Finally, the following methodologies were presented: (a) Methodology of Innovation Management for Obtaining the Level 3 of I2MM (MIM3); (b) Methodology for Evaluating the Value Generation of Information Technology (MEVGIT), which could be adapted and applied not just for innovations on information technologies; (c) Lean Product Innovation Management; (d) Lean Startup; (e) Very Lean Startup; (f) Design Thinking; (g) Living Lab Methodology; (h) Goodyear's Business Model Innovation Process; (i) FastWorks Framework; (j) Lean Innovation Model, Seeking Solutions Approach; and (k) 3-Stage Roadmap.

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Problems associated with the lack of standards, models, and methodologies for managing innovation in organizations

The problems associated with the lack of standards, models, and methodologies for managing innovation in organizations are explained in this section. For that purpose, it is necessary first to understand the value generation of the standardization of the innovation.

The value generation of the standardization of the innovation

To introduce the problems associated with the lack of standards and methodologies for managing the innovation, it is important to understand the following themes: (a) How do the innovations of the organizations generate value? (b) How do the standardization process and the standards contribute to the value generation of the organizations? (c) How does the standardization of the innovation generate value for the organizations? All of these aspects are treated in the following paragraphs. After the corresponding explanation, a list of problems associated with the lack of standards and methodologies for managing innovation in organizations is exposed.

Regarding the manner in which innovations generate value for organizations, it is important to remember the considerations for the value generation of the organizations. In this respect, Alfaro (2017a) explained that for the cases of for-profit organizations: "the value generation is represented as the improvement of the financial indicators, which require the improvement of the stock value, the improvement of the profitability or the improvement of the net present value of the firms" (p. 132) and indicated that for the cases of nonprofit organizations, "the value generation is represented mainly by the improvement of the value for the target population, and not only by the improvement of the financial indicators." (p. 132). Alfaro (2017a) also explained that "[t]hese considerations must be taken into account for evaluating the value generation of the diverse types of operations and projects in the organizations" (p. 132), including the innovations. In this regard, Caetano (2017) explained: "Innovation management enables organizations to focus on competitiveness and successful performance" (p. 8). Then, the innovations generate value for the organizations introducing significant changes in the processes or products, which will be appreciated by the markets or will improve the effectiveness of the processes or the perceived quality of the products.

Regarding the contribution of the standardization process and standards for the value generation of the organizations, de Casanove, Morel, and Negny (2017) explained: "Organizations set up a framework to support the achievement of the targets of their core businesses and the replicability of the activities. A management system defines this framework with an organization and a set of policies, processes, and procedures." (p. 4), and Caetano (2017) stated that "[s]tandardization can enhance organizational capabilities in order to be aligned with national and international best practices as well as to develop internal competences, routines and processes that can leverage an innovation journey towards excellence" (p. 8). However, due to the complexity of the standardization process, "[d]etermining the value of a standard within a procurement project is complex and likely to require multiple dependent factors to be modelled in a structured and transparent manner" (Revie et al., 2016, p. 4). To that end, Vollebergh and Van der Werf (2014) explained that "[s]tandards and standardization processes play a key role in technological change" (p. 230).

Vollebergh and Van der Werf (2014) indicated that a standard is "a document that specifies characteristics of technical design or rules of behavior" (p. 231) and that a categorization of standards according to their specific role in the society includes (a) standards for measurement and reference, (b) standards for (minimum) quality and safety, and (c) compatibility and interface

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standards (p. 231). Regarding standardization, Vollebergh and Van der Werf (2014) provide the following definition: "Standardization is 'the action of bringing things to a uniform standard' (David, 1987, p. 212). The process of standardization can be initiated by government, but firms and consumers may also demand uniformity regarding a particular good or service." (p. 232), and David and Greenstein (1990) identified four types of standardization processes: (a) unsponsored standardization, (b) sponsored standardization, (c) agreed through voluntary standards-writing organizations, and (d) initiated or mandated through government intervention (p. 232). Then, the standardization permits organizations and their products into remain in the markets and also permits them to work according to the government rules, avoiding legal and normative problems.

De Casanove, Morel, and Negny (2017) explained that "[w]orking on innovation requires a specific set of tools and methods. This set is different from the ones used in new product/service [development]" (p. 3) and that "[t]here are more uncertainties and more unknowns in innovation than in the development of a new product. Managing an innovation project requires developing the learning curve of the team" (p. 3). To that end, Caetano (2017) stated that "[a]t national and international levels, evidence demonstrates the importance of standardization, as a body of knowledge, to contribute to business innovation and to increase competitiveness and realization of value" (p. 8). Caetano (2017) also explained that "[a]s a voluntary process, standardization is recognized as a potential driver for innovation. Several studies highlighted that it can help companies to demonstrate their innovative products features and to increase business value creation (Swann, 2010)" (p. 8). The standardization of the innovation is considered by various authors as a necessary condition for improving the innovation.

About the use of standards for innovation, de Casanove, Morel, and Negny (2017) pointed out that "[t]hese standards provide best practices to support implementation of the innovation policies as well in Small to Medium Enterprises (SMEs) as in worldwide groups including public institutions, universities, research centers or non-profit organizations" (p. 3). de Casanove, Morel, and Negny (2017) also explained that "[b]y using these documents, organizations can increase their awareness of the value of an Innovation Management, expand their capacity for innovation, and ultimately generate more value for the organization and its stakeholders" (p. 9) and that "[t]he use of a systematic approach to managing innovation is a good stepping stone for any organization aiming to become more innovative" (p. 9). The value generation of the standardization of the innovations of the organizations can be explained due to the fact that the standardization process will permit innovations to be generated and will improve the innovation processes for the organizations continuously. The lack of standardization of the innovation processes would delay this improvement and consequently, would reduce the value generation of the organizations. In this respect, de Casanove (2014) explained the use of standards in the innovation process as follows:

> How do we use standards in our innovation process? First, standards can be considered as the state of the art, the soil of your seed for innovation. Then, when you are developing your innovative project, you need to have partnerships and if you have partnerships, it means that you also need interfaces. Standards will bring you these interfaces. Finally, we come to the valuation of your product. In this case, you also have to organize your market and I think that's one of the key advantages of standardization. Standards can support the organization of a market, meaning that when you have a performance standard, it helps to bring clarity to the market and may eliminate those competitors who have very low-performance products. I have in mind a case where we contributed to the development of a performance standard and our customers used it in their

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> request for proposals. They can indeed use this standard to say "we want a product with this level of performance". As a result, some of our competitors providing very low-performance products were pushed out of the market.
>
> *(p. 95)*

There are no contradictions between the standardization and the existence of innovation processes due to the fact that the standardization is not an obstacle to creativity, which is commonly cited as the most important aspect related to innovation. The standardization does not block to creativity; conversely, focusing standardization on innovation could improve the results of the innovation in diverse aspects such as the (a) quantity of innovations, (b) creativity of the innovative solutions, (c) customer satisfaction with the innovations, (d) satisfaction of the people who produce or offer the innovative goods and services, and (e) the financial results of the innovations, which must be the most important aspect to be taken into account in for-profit organizations (Alfaro, 2017a, p. 132).

The problems related to the lack of standards, models, and methodologies for innovation management

Various authors have explained the different problems related to the lack of standardization of the innovation processes (Alfaro, 2017b; Liedtka, 2015; Gupte, 2015; Pinget, Bocquet, and Mothe, 2015; Attia, 2015; Stošić and Milutinović, 2014; Castillo-Rojas, Karapetrovic, and Heras, 2012). Alfaro (2017b) explained the common issues related to the innovation processes of the organizations as follows:

- The lack of integration of the innovation processes to the strategic planning of the organizations. (p. 32)
- The innovation processes obtained good new products (goods or services, or both); however, the solution didn't include the complete business model to which the innovative product would be a part of, and as a consequence, the innovation failed. (p. 33)
- The innovation processes obtained good new products; however, the personnel of the organization don't know which needs of which users will be satisfied or which problems will be solved with the new products, or the costs are very high. (p. 33)
- The project management of the innovative projects has the common type of problems which are presented in the diverse types of projects, related to: integration management, scope management, time management, cost management, quality management, human resources management, communications management, risk management, acquisitions management, and stakeholders management. (p. 33)
- For the innovation processes, the creative processes and not the value generations of the organizations are prioritized. (p. 35)
- The lack of regulatory framework for norming the innovation processes in the organization. There is not a regulatory framework which norms the following aspects: incentives (monetary or non-monetary), roles, committees, intellectual property rights, participation of the benefits after the new products are developed or put in the market, accounting processes for registering the innovation processes and products, etc. Also, the individual contracts commonly did not include anything about the innovation processes or innovative products that the personnel must realize, without the cases of people who have contracts for innovative or intellectual processes or areas, such as: research and development areas in industries, research areas in universities, etc. (p. 35)

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- The lack of motivation or incentives to the personnel of the organization, for proposing new ideas or innovative projects. (p. 35)
- The lack of time and opportunities for the personnel of the organization, for presenting new ideas or innovative projects. The personnel of the organization are commonly fighting the daily labors and don't have time in the regular labor time for the innovative processes or the creation of new ideas or products. (p. 35)
- The lack of training and competencies (knowledge, abilities, and attitudes) for creating and developing new ideas or innovative projects. (p. 36)
- The lack of investment or expenses on infrastructure, equipment and other resources, for prototyping and testing the new ideas. The elaboration of prototypes requires investment or expenses in infrastructure, equipment and other resources (materials, personnel, and investment), which commonly is promised but not budgeted or simply is not budgeted or is not sufficiently assigned. (p. 36)
- Absence of a collaborative culture which permits the synergies among the workers of the organization for improving the ideas of innovative projects. Each worker wants to shine by herself or himself, and doesn't want to collaborate with coworkers for improving the ideas of innovative projects. (p. 36)
- Many workers of the organizations feel that the standardized norms and procedures limit them for introducing new ideas of innovative projects. In this sense, many workers are fearful of realizing actions out of the standardized norms and procedures for avoiding the future and negative reactions of their bosses who commonly act in a negative way in front of the presentation of new ideas, considering them as a waste of time, effort, and money. (p. 37)
- The innovation processes are developed without the validation of the satisfaction of the needs to the early adopters or consumers with similar characteristics, with the innovative products (goods, services, or both). (p. 37)
- The introduction of the innovative products into the market doesn't have a previous validation with early adopters with similar characteristics to the target consumers. As a result, the consumers of the target market don't buy the innovative product and the organization fails in its introduction, with the corresponding waste of time, effort, and money. (p. 37)

Liedtka (2015, p. 930) indicated the cognitive biases and their innovation consequences as follows:

- Projection bias (projection of past into future): failure to generate novel ideas
- Egocentric empathy gap (projection of one's own preferences onto others): failure to generate value-creating ideas
- Focusing illusion (overemphasis on particular elements): failure to generate a broad range of ideas
- Hot/cold gap (current state colors assessment of future state): undervaluing or overvaluing ideas
- Say/do gap (inability to accurately describe one's own preferences): inability to accurately articulate and assess future wants and needs
- Planning fallacy (overoptimism): overcommitment to inferior ideas
- Hypothesis confirmation bias (look for confirmation of hypothesis): disconfirming data missed
- Endowment effect (attachment to first solutions): reduction in options considered
- Availability bias (preference for what can be easily imagined): undervaluing of more novel ideas

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Gupte (2015) explained that "[i]n reality, focusing on customers before a product idea is difficult, because most entrepreneurs and innovators work from passion first – they have an idea and they then try to make a business of it" (p. 52). Gupte (2015) also indicated that:

> In some cases they may not have an idea, but their experience, skills and interests determine what kind of products they are inclined to make. In fact, that last sentence carries the germ of success for the initial idea – experience and interest will often point an Entrepreneur to the problems that need to be solved in order to have a real business with real customers.
>
> *(p. 52)*

Pinget, Bocquet, and Mothe (2015) studied the perceptions of barriers to environmental innovation (EI) in small and medium-sized enterprises (SMEs) with a sample of 435 chief executive officers of French SMEs and concluded the following:

- First, with regard to perceived barriers, SMEs engaged in EI believe that they face more barriers than other SMEs (those that pursue "dirty" TIs and noninnovators). They also perceive those barriers as more intense than the other two groups of SMEs do. Only the intensities of financial and market-related barriers do not differ between environmentally innovative and technologically innovative SMEs. These results indicate a key distinction of environmentally innovative SMEs: because of the complexity of EI, they must deal with many more dimensions than technologically innovative SMEs. (p. 147)
- Second, environmentally innovative SMEs perceive knowledge barriers as more intense and more numerous than technologically innovative SMEs, possibly due to the higher level of complexity and novelty of the knowledge required to innovate (De Marchi, 2012; Petruzzelli, Dangelico, Rotolo, and Albino, 2011), but also because EI is more knowledge- and information-intensive (Horbach, Oltra, and Belin, 2013). EI often relies on knowledge and competences that are not core to firms (De Marchi, 2012; Marin, Marzucchi, and Zoboli, 2014). (p. 148)
- Third, regarding the antecedents of EI, we confirm the effect of regulation, in that firms in polluting sectors tend to introduce more EIs. Beyond these regulatory aspects, firms that have the highest probability of introducing EIs are those that are the most mature in their environmental strategy. Three major antecedents relate to firms' strategies: belonging to a cluster, R&D cooperation, and environmental monitoring. (p. 148)

Attia (2015) indicated that "[t]here are two main general barriers to collaboration between university and industry" (p. 116) and explained each of the barriers as follows:

> The first one is orientation-related barriers, which we focused on measuring three elements directly related to the orientation of university research and researchers. These three elements are: university research is extremely orientated towards pure science, long-term orientation of university research (concerns over lower sense of urgency of university researchers compared to industry researchers) and mutual lack of understanding about expectations and working practices (Bruneel, d'Este, and Salter, 2010).
>
> The second barrier is transaction-related barriers, which are related to conflicts over intellectual property, and dealing with university administration. The measurement of transaction-related-barriers includes the following four elements from the question on barriers: industrial liaison offices tend to oversell research or have

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> unrealistic expectations, potential conflicts with university regarding royalty payments from patents or other intellectual property rights and concerns about confidentiality, rules and regulations imposed by universities or government funding agencies and absence or low profile of industrial liaison offices in the university (Bruneel, d'Este, and Salter, 2010).
>
> *(p. 116)*

Pinget, Bocquet, and Mothe (2015) stated the limitations of their study as follows: "We did not separate product and process EIs, so further research should delineate whether barriers differ with changes in the type of EI (process/product) or its beneficiary (firm/client)" (p. 148). Pinget, Bocquet, and Mothe (2015) also stated "[n]or did we distinguish incremental from radical innovations; incremental innovation is much less resource- and competency-demanding than radical innovation is, which destroys previous products and skills" (p. 148). Additionally, Stošić and Milutinović (2014) identified four levels of uncertainty for innovation projects according to the industrial sector: (a) low technological uncertainty for low-tech projects, (b) medium technological uncertainty for medium-tech projects, (c) uncertainty for high-tech projects for high technological projects, and (d) super high technological uncertainty for super high technological projects (p. 100). Based on Stošić (2013) and Keegan and Turner (2002), Stošić and Milutinović (2014) indicated some characteristics for comparing innovation and conventional projects as follows:

- as opposite to the conventional projects, innovation projects start with poorly defined and sometimes ambiguous objectives, which become more specific in the following phases of the project;
- since the failure is one of the possible outcomes, innovation teams are more involved in management of project risk, in sense of being proactive about it. They must quickly overcome failures and orient on the new, more attractive options.
- project teams have to be made up of different people among whom exist high level of confidence (their work does not always result in success);
- ideas presented in innovation projects have to be sold to sponsors (function in project teams for innovation), which is not characteristics for conventional projects. (p. 99)

Castillo-Rojas, Karapetrovic, and Heras (2012) explained that "[t]here is conflicting evidence in the academic literature about the relationship between the utilisation of such MSSs and organisational performance in general" (p. 1076). Castillo-Rojas, Karapetrovic, and Heras (2012) also indicated that "[t]here is also doubt about the more specific question of whether the implementation of MSSs promotes or hinders a firm's development of innovative products and processes" (p. 1076). Previously, Castillo-Rojas, Karapetrovic, and Heras (2012) named MSSs for "management system standards" (p. 1075). Additionally, Castillo-Rojas, Karapetrovic, and Heras (2012) pointed out that "[w]hile a number of new MSSs for innovation are emerging, such as UNE 166002: 2006 and CWA 15899: 2008, the question of whether MSSs promote or hinder innovation processes in an organisation remains unresolved" (p. 1078). Finally, after their study with 249 Spanish organizations registered to both ISO 9001 and ISO 14001, Castillo-Rojas, Karapetrovic, and Heras (2012) concluded that "[o]n the contrary, the more the organisations had been pushed by their external stakeholders to implement these standards, the more prevalent is the perception that MSSs are a barrier to innovation" (p. 1085) and that "[t]hus, when the decision of MSSs implementation was made under external pressures, namely 'External Requirements', the perception of them as innovation inhibitors arises" (p. 1086). As a summary, the problems discovered are detailed with their respective authors in Table 24.1.

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Table 24.1 Identified problems associated with the lack of standards, models, and methodologies for managing organizational innovation

Problem	*Authors who commented about the problem*
Working on innovation requires a specific set of tools and methods	(De Casanove, Morel, and Negny, 2017, p. 3)
Managing an innovation project requires developing the learning curve of the team	(De Casanove, Morel, and Negny, 2017, p. 3)
Lack of training and competencies (knowledge, abilities, and attitudes) for creating and developing new ideas or innovative projects; projection of past into future; failure to generate a broad range of ideas; reduction in options considered; environmentally innovative SMEs perceive knowledge barriers as more intense and more numerous than technologically innovative SMEs	(Alfaro, 2017b, p. 36; Liedtka, 2015; p. 930; Liedtka, 2015, p. 930; Liedtka, 2015, p. 930; Pïnget, Bocquet, and Mothe, 2015, p. 148)
Projection of own preferences onto others	(Liedtka, 2015, p. 930)
Lack of integration of the innovation processes to the strategic planning of the organizations	(Alfaro, 2017b, p. 32)
The innovative solution did not include the complete business model to which the innovative product would be a part of; most entrepreneurs and innovators work from passion first – they have an idea and they then try to make a business of it	(Alfaro, 2017b, p. 33; Gupte, 2015, p. 52)
The personnel of the organization don't know which needs of which users will be satisfied or which problems will be solved with the new products, or the costs are very high; they may not have an idea, but their experience, skills, and interests determine what kind of products they are inclined to make	(Alfaro, 2017b, p. 33; Gupte, 2015, p. 52)
Existence of common project management problems in the innovation projects: integration, scope, time, cost, quality, communication, human resources, risk, acquisition, and stakeholders related problems; innovation projects start with poorly defined and sometimes ambiguous objectives, which become more specific in the following phases of the project; innovation teams are more involved in the management of project risk in the sense of being proactive about it; project teams have to be made up of different people among whom exist a high level of confidence; ideas presented in innovation projects have to be sold to sponsors	(Alfaro, 2017b, p. 33; Stošić and Milutinovic, 2014, p. 99; Stošić and Milutinović, 2014, p. 99; Stošić and Milutinović, 2014, p. 99; Stošić and Milutinović, 2014, p. 99)
For the innovation processes, the creative processes and not the value generations of the organizations are prioritized	(Alfaro, 2017b, p. 35)
Lack of regulatory framework for norming the innovation processes in the organization; transaction-related barriers, which are related to conflicts over intellectual property, and dealing with university administration	(Alfaro, 2017b, p. 35; Attia, 2015, p. 116)
The effect of regulation, in that firms in polluting sectors tend to introduce more EIs; when the decision of MSSs implementation was made under external pressures, namely "external requirements", the perception of them as innovation inhibitors arises	(Pinget, Bocquet, and Mothe, 2015, p. 148; Castillo-Rojas, Karapetrovic and Heras, 2012, p. 1086)

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Problem	*Authors who commented about the problem*
Lack of motivation or incentives to the personnel of the organization for proposing new ideas or innovative projects	(Alfaro, 2017b, p. 35)
Many workers of the organizations feel that the standardized norms and procedures limit them from introducing new ideas of innovative projects; the more prevalent is the perception that MSSs are a barrier to innovation	(Alfaro, 2017b, p. 37; Castillo-Rojas, Karapetrovic, and Heras, 2012, p. 1085)
The innovation processes are developed without validating the satisfaction of the needs to the early adopters or consumers with similar characteristics, with the innovative products	(Alfaro, 2017b, p. 37)
The introduction of the innovative products into the market doesn't have a previous validation with early adopters with similar characteristics to the target consumers; inability to accurately articulate and assess future wants and needs; hypothesis confirmation bias	(Alfaro, 2017b, p. 37; Liedtka, 2015, p. 930; Liedtka, 2015, p. 930)
The lack of the evaluation of the value generation of innovations; undervaluing or overvaluing ideas; overcommitment to inferior ideas; undervaluing of more novel ideas	(Alfaro, 2017a, p. 132; Liedtka, 2015, p. 930; Liedtka, 2015, p. 930; Liedtka, 2015, p. 930)
SMEs engaged in EI believe that they face more barriers than other SMEs	(Pinget, Bocquet, and Mothe, 2015, p. 147)
Orientation-related barriers in universities: orientation to pure science, lower sense of urgency of university researchers compared with industry researchers, and mutual lack of understanding about expectations and working practices;	(Attia, 2015, p. 116)
Four levels of uncertainty for innovation projects in the industrial sector: low, high, super, and super-high technological uncertainty for high-technological projects	(Stošić and Milutinović, 2014, p. 100)

Standards for managing innovation

Diverse standards for managing innovation have been developed in various parts of the world. Table 24.2 shows the standards identified for managing innovation. Some of these standards are explained in this section.

ISO 50500 Series of Innovation Management

De Casanove, Morel, and Negny (2017) explained the ISO 50500 series as an international standard on innovation management and indicated that the ISO 50500 series "would [start] being published in 2018 and will provide best practices to support implementation of innovation policies as well in Small to Medium Enterprises (SMEs) as in worldwide groups including public institutions, universities, research centers or non-profit organizations" (p. 6). de Casanove, Morel, and Negny (2017) also explained:

> To achieve this goal, the work is focused in particular on a management system for innovation and all the tools and methods associated to this system (such as but not limited to open innovation, design innovation, strategic intelligence, creativity management and also self-assessment of innovation management).
>
> *(p. 6)*

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Table 24.2 Identified standards for managing innovation

Standard	*Country/region*	*Authors who commented on the standard*
GB/T 29490:2013 Enterprise Intellectual Property Management	China	(De Casanove, Morel, and Negny, 2017, p. 5)
GB/T 33250:2016 Intellectual Property Management for Research and development organizations	China	(De Casanove, Morel, and Negny, 2017, p. 5)
GB/T 33251:2016 Intellectual Property Management for higher education institutions	China	(De Casanove, Morel, and Negny, 2017, p. 5)
ISO 50500 Series for Innovation Management (in development)	United States	(De Casanove, Morel, and Negny, 2017, p. 5)
ISO/TC 279 Innovation Management	United States	(De Casanove, Morel, and Negny, 2017, p. 4; ISO, 2013)
CEN/TS 16555 Innovation Management	Europe	(Caetano, 2017, p. 10)
CWA 15899:2008 Standardization of an innovation capability rating for SMEs	Europe	(Mir and Casadesús, 2011b, p. 53)
EFQM Framework for Innovation	Europe	(Mir and Casadesús, 2011b, p. 53)
BS 7000 Design Management Systems	United Kingdom	(British Standards Institute, 2008)
NP Series of R&D&I Management	Portugal	(Mir and Casadesús, 2011b, p. 53)
UNE 166002 R&D&I Management	Spain	(AENOR, 2014; Gil, Varela, and González, 2008)
GOST R 54147:2010 – Strategic and innovation management – Terms and definitions	Russia	(Mir, Casadesús, and Petnji, 2016, p. 27).
DIN 77100:2001 – Patent Valuation – General principles for monetary patent valuation	Germany	(De Casanove, Morel, and Negny, 2017)
DS-hæfte 36:2010 – User oriented innovation management	Denmark	(Mir, Casadesús, and Petnji, 2016, p. 27)
FD X50–271:2013 – Innovation management – Guide for innovation management implementation	France	(Mir, Casadesús, and Petnji, 2016, p. 27)
FD X50–272:2014 – Guidelines for the implementation of open innovation	France	(De Casanove, Morel, and Negny, 2017, p. 5)
FD X50–273 – Implementation of sustainable development in the innovation process	France	(De Casanove, Morel, and Negny, 2017, p. 5)
FD X50–274:2015 – Innovation Management – Creativity management	France	(De Casanove, Morel, and Negny, 2017, p. 5)
FD X50–146:2010 Innovation Management – Intellectual Property Management	France	(De Casanove, Morel, and Negny, 2017, p. 5)
NWA 1:2009 – Guide to good practice in innovation and product development processes	Ireland	(Mir, Casadesús, and Petnji, 2016, p. 27)
NMX-GT-003-IMNC-2008 – Technology Management System Requirements	Mexico	(De Casanove, Morel, and Negny, 2017; Mir, Casadesús, and Petnji, 2016, p. 27)

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Standard	*Country/region*	*Authors who commented on the standard*
ABNT NBR 16501:2011 – Guidance for the research, development and Innovation (R&D&I) management system	Brazil	(Mir, Casadesús, and Petnji, 2016, p. 27; de Casanove, Morel, and Negny, 2017, p. 5)
NTC 5801:2008 – R&D&I Management: Requirements of the R&D&I management system	Colombia	(Mir, Casadesús, and Petnji, 2016, p. 27)

About the structure of the ISO 50500 series, de Casanove, Morel, and Negny (2017) indicated the following parts:

ISO 50500 Innovation Management – Fundamentals and Vocabulary

This document will contain a standard vocabulary and will address the innovation management principles, such as: (a) realization of value, (b) future-focused leaders, (c) purposeful direction, (d) innovation culture, (e) exploitable insights, (f) mastering uncertainty, (g) adaptability, and (h) transformation of the organization. (p. 6)

ISO 50501 Innovation Management – Innovation Management System – Guidance

This document will contain the following mandatory chapters: (a) introduction, (b) scope, (c) normative references, (d) terms and definitions, (e) context of the organization, (f) leadership, (g) planning, (h) support, (i) operation, (j) performance evaluation, and (k) improvement. (p. 7)

ISO 50502 Innovation Management – Assessment – Guidance

ISO 50502 is based on the following innovation management principles: (a) add value to the organization, (b) challenge the organization's objectives and strategy, (c) motivate and mobilize for organizational development, (d) be timely and encourage a focus on the future, (e) allow for context and promote the adoption of best practice, (f) be flexible and holistic, and (g) be an effective and reliable process (p. 7). ISO 50502 will include: (a) existence (to check if a system is present and what is its level of maturity), (b) efficiency (does it produce results in a timely and cost-effective manner?), and (c) effectiveness (does it help the organization learn and achieve more/better results?) (p. 8). ISO 50502 will point out the different lacks or gaps in their organizations, policies, and process (p. 8). Once the gaps or lacks have been identified, organizations can set up an action plan (p. 8).

ISO 50503 Innovation Management – Tools and Methods for Innovation Partnership

ISO 50503 will provide guidance on methods and tools that the collaborating partners can use to achieve a successful interaction and outcome. Indeed, partnership is becoming increasingly widespread in innovation. Organizations can achieve much more as a result of partnership than acting alone. However, failure to manage it correctly can result in a waste of time and resources. To improve the governance of the partnership, all stakeholders should be aware of the

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parameters that must be addressed to increase the chances of success and reduce the waste resulting from failure. Innovation partnerships are developed to create value for each partner working together towards an innovative outcome. (p. 8)

ISO 50504 Strategic Intelligence Management

This standard will provide guidelines to facilitate the scanning and analyzing process of the organization environment in order to support decision making at all levels within the organization, fostering the implementation of stable strategic intelligence management practices. (p. 8)

ISO 50505 Intellectual Property Management

An efficient management of intellectual property creates an interesting backbone to protect and increase the competitiveness of an innovation project. This standard will propose guidelines for supporting the intellectual property within innovation management. It aims at addressing the following topics of IP management at strategic and operational levels. (p. 8)

UNE 166002 R&D&I Management

Gil, Varela, and González (2008) indicated that the UNE 166000 had the following components:

- UNE 166000:2006 Management of R&D&I: Terms and definitions of the activities of R&D&I
- UNE 166000:2006 Management of R&D&I: Requirements of a R&D&I project (certifiable)
- UNE 166000:2006 Management of R&D&I: Requirements of the R&D&I Management System (certifiable)
- UNE 166000:2006 Ex Management of R&D&I: System of Technological Surveillance
- UNE 166000:2006 Ex Management of R&D&I: Competences and evaluation of auditors of R&D&I Management System

The term R&D&I means research and development and innovation. AENOR (2014) detailed the parts of the UNE 166002:2014- R&D&I Management: Requirements of the R&D&I Management System as follows:

1 Context of the organization. It included:

- Knowledge of the organization and its context. The organization must determine the internal and external aspects which are pertinent to its purpose and that affects to its capacity for obtaining the expected results of the management system of the R&D&I. (p. 7)
- Comprehension of the needs and expectations of the stakeholders. The organization must determine which interested parts are relevant in relation with the system and to identify its needs, expectations and requirements. (p. 7)
- Management system of the R&D&I. The organization must establish, document, implement and maintain a management system of the R&D&I and improve continuously its effectiveness according to the requirements of this norm. The organization also must determine the limits and the applicability of the system for establishing and for documenting its scope. (p. 8)

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2 Leadership

- Vision and strategy of the R&D&I. The vision of the R&D&I begins commonly of the organizational vision, which is a declaration about the organizational purposes, concretely in terms of R&D&I for the purposes of this norm. (p. 8)
- R&D&I Policy. The policy of R&D&I must be documented and communicated into the organization and to be available for the interested parts which were defined by the Direction. (p. 9)
- Leadership and commitment of the management. The Direction must demonstrate its leadership and the commitment in relation to the management system of R&D&I. (p. 9)
- Promotion of an innovation culture. The Direction must promote a culture which supports the innovation. That culture is understood as a mentality and all the members of the organization are responsible for contributing to its growth. (p. 9)
- Roles, responsibilities, and organizational authorities. The Direction must assure that the responsibilities and authorities for the pertinent roles are assigned and communicated inside the organization. (p. 10)

3 Planning

- Risks and opportunities. To plan the system, the organization must take into account the internal and external analysis, the needs, the expectations, the requirements, and the innovation policy of this norm, and must determine the risks and opportunities for assuring that the system obtains the expected results, for preventing or reducing the undesirable effects, and to get the continuous improvement. (p. 10)
- Purposes of the R&D&I and plan for obtaining them. The organization must establish the R&D&I purposes for the pertinent functions and levels. The organization also must conserve documented information about the purposes of R&D&I. The plan for obtaining the R&D&I purposes must determine the activities, resources, responsibilities, duration times, and indicators for measuring the accomplishment of purposes. (p. 10)

4 Support of the R&D&I

- Organization of the roles and responsibilities. The organization must define the responsibilities of the management unit of R&D&I (for the whole management of the R&D&I) and if applies, the units of R&D&I for specific R&D&I projects. (p. 11)
- Resources. The organization must determine and provide the required tangible and intangible resources for the development, implementation, maintenance and continuous improvement of the system. (p. 12)
- Competencies. The organization must determine the required competencies of people which develop and work in R&D&I activities, to assure that people have or obtain the required competencies, and improve continuously the required capacities for increasing the R&D&I performance, and maintain the records of education, formation, skills and experience. (p. 12)
- Awareness. The personnel of the organization should be conscious and motivated about the importance of the R&D&I for the organization, the R&D&I policy, and the importance of their personal contribution to the effectiveness of the system, including the benefits of a better performance of the R&D&I, and the implications of the lack of accomplishment of the requirements of the system. All these aspects should be obtained through a solid innovation culture. (p. 12)
- Communication. The organization must establish the relevant internal and external communications for the system, taking into account aspects as what communicate,

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when, to who and by part of who, and to provide adequate channels for the communication and the expected feedback. (p. 13)

- Documented information. The system must include the required documented information of this norm and the organization as necessary for the effectiveness of the system and for contributing with evidences about its performance, as is derivate of the application of this norm. This documentation must be created, identified, shared, updated, stored, controlled, and protected in a right manner. (p. 13)
- Intellectual and industrial property, and knowledge management. The organization must define guidelines for the management of intangible assets (including the knowledge and the know-how) and its intellectual and industrial property. (p. 13)
- Collaboration. The organization must define guidelines for the internal and external collaboration which promote to share ideas and knowledge among different people, groups, and units. The organization must assure that the possible outsourcings or acquired products accomplish the specified requirements of the R&D&I management system. (p. 13)
- Technological surveillance and competitive intelligence. The R&D&I management system must include a process of technological surveillance and competitive intelligence. The technological surveillance permits to realize the capture, the analysis, the diffusion and the exploitation of useful information of diverse types: scientific, technical, legislative, normative, economic, market, social, etc., in a systematic manner. The information of the technological surveillance is fundamental for the knowledge of the environment of the organization and for the competitive intelligence. The competitive intelligence includes analysis, interpretation, and communication of the information with strategic value, which is transmitted to the responsible people of the decision making in the organization, including the decisions which are related to the R&D&I management system. (p. 14)

5 Operating Processes of R&D&I

- Generalities. According with its strategy, policy and purposes of R&D&I, the organization must establish the operating processes of R&D&I which include all the relevant activities, since the information acquisition about a problem or opportunity (ideas) until the exploitation of the results of the R&D&I. The common aspects that integrate the R&D&I cycle are the management of ideas, the development of R&D&I projects, the protection and the exploitation of the results. (p. 14)
- Management of ideas. The management of ideas includes generation, collection, evaluation and selection. (p. 15)
- Development of R&D&I projects. The R&D&I projects must be developed with a documented methodology. The main advantage of the use of a methodology is the discipline that it imposes due to [its] established clear project plan, purposes and deliverables which are supervised with the advance of development of the project. (p. 15)
- Protection and exploitation of the results. The protection and exploitation of the results of the R&D&I activities must be realized according to the corresponding guidelines, applying the best option for protecting each step and following the mechanisms and the defined exploitation agreements, such as cession of intangible assets, concession of licenses of intangible assets, and securitization of intangible assets. (p. 16)
- Introduction to the market. For considering the existence of a success of an innovation, it should produce a return to the organization through the introduction of the

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results to the market or through an internal improvement of processes. For introducing a product, process or service to the market, the organization must plan the actions considering: to identify the environment of the intellectual and industrial property in the destination markets, to develop a marketing and sales plan, to assure available funds and resources for introducing it into the market and for the expansion or implantation of the new process, and to establish the production, the supply chain, the client attention, the mechanisms for knowing its acceptance level and the formation of the involved agents, according to the needs. (p. 16)

- Results of the operating processes of the R&D&I. These results vary in function to the developed activities and the associated processes. The monitoring of the operating processes of the R&D&I is realized over the basis of the established indicators. The evaluation of the results in respect to these indicators should provide information about the success or the failure of the R&D&I and the learning for the improvement of the operating processes of the R&D&I. (p. 17)

6 Performance Evaluation of the R&D&I Management System

- Monitoring, measuring, analysis and evaluation. The organization must determine the methods for monitoring, measuring, analyzing and evaluating the performance and the effectiveness of the R&D&I Management System considering the following processes: R&D&I strategic processes, R&D&I operating processes, and R&D&I support processes. The results of this evaluation must permit to obtain information about the contribution of the R&D&I Management System such as: growth rate of benefits, growth rate of sales, growth rate of the operating margin, market share, scientific impact of the research results, generated intangible assets (number of registers of intellectual or industrial property, knowledge, recognition indexes, brand reputation, relationships, etc.), and the impact in social and environmental sustainability (reduction of emissions, reduction of energy consumption, material efficiency, improvement of the environment and work conditions, etc.). (p. 17)
- Internal Audit. The organization must realize documented procedures for internal audits periodically for determining the conformity of the effectiveness of the R&D&I management system with the requirements of this norm and the organization; also, for informing about the results and the corresponding records. (p. 17)
- Evaluation by the Direction. The Direction must review the R&D&I management system periodically for assuring its continuous convenience, adequation, and effectiveness. The evaluation of the Direction must include considerations about: the state of the actions of previous evaluations, the changes of internal and external conditions which can affect to the R&D&I management system, the information about the performance of the R&D&I management system (including nonconformities and corrective actions, monitoring and results of the measurements, and the results of the audits), and the opportunities of continuous improvement. (p. 18)

7 Improvement of the R&D&I Management System

The organization must improve continuously the suitability and the effectiveness of the system through the R&D&I strategy and policy, the leadership, the purposes, the planning, the R&D&I support processes and the performance evaluation. The organization must identify the deviations and nonconformities and to establish adequate corrective actions for eliminating the causes or to establish actions for improving the effectiveness and the results of the R&D&I Management System. (p. 18)

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Mir and Casadesús (2011a) described the case of a Spanish manufacturing firm that implemented UNE 166002:2006 standard, which was "the first in the world to offer a certifiable standardized management system for innovation" (p. 171). Mir and Casadesús (2011a) also pointed out: "It is apparent from this case study that the standard encourages innovation and improvement in procedures for internal transfer and assimilation of technology, as well as facilitating improved results in terms of innovative products and services" (p. 184) and indicated the benefits after the implementation of the standard as follows: "the case company now has the capacity to detect emerging technologies (or existing technologies not yet applied in its sector), and to assimilate and develop these technologies to strengthen its future innovation activities and enhance its competitiveness". (p. 184)

Regarding the problems with implementing the UNE 166002:2006 standard, Mir and Casadesús (2011a) explained: "In particular, the quantity of documentation required for implementation was sometimes onerous, and some personnel (especially those with a low level of 'innovation culture') experienced difficulties in adapting to the new management system" (p. 184) and stated "[i]f the company in this case had not had prior experience with other management system standards (ISO 9001:2000, ISO 14001:2004, ISO -TS 16949:2002, and EMAS), these difficulties would certainly have been more significant". (p. 184) This adaptation could be more difficult for innovative people in particular.

CEN/TS 16555 Innovation Management

Caetano (2017) stated that "[t]he main objective of the CEN 'Family' of Technical Specifications (TS) is to guide European organizations to be aware and to develop innovation as a driver for competitiveness and value creation" (p. 10). Caetano (2017) also summarized the parts of the CEN/TS 16555 standard as follows:

- CEN/TS 16555–1:2013, Innovation Management System: This Technical Specification aims to present a framework, integrating activities crucial to generate innovations as a "routine" process and to target specific innovation determinants that include Organization Context, Leadership, Planning, Innovation Enablers, Innovation Process and Results, Innovation Management Techniques and Innovation, Performance assessment. (p. 10)
- CEN/TS 16555–2:2014, Strategic intelligence management: As innovation management depends on organizational capabilities to translate strategic signals and emerging trends into valuable inputs to innovation strategy and projects, this TS can be used to ensure intelligence and foresight can support innovation management. (p. 11)
- CEN/TS 16555–3:2014, Innovation Thinking: Based on a structured approach, that can be complemented by other methods and tools to promote innovation, Innovation Thinking aims to capture information, insights and experiences to maximize opportunities and problem solving in order to accelerate time to market and to create value-added innovations. (p. 11)
- CEN/TS 16555–4:2014, Intellectual Property Management (IP) Organizations must consider IPR as a strategic asset that can be linked to competitiveness, especially when considering value creation. Innovation management must consider IP as an enhancer and a tool to increase temporary market advantages and to use it as a knowledge management method that can capture information about competitors scientific and technological competences and assets. (p. 11)
- CEN/TS 16555–5:2014, Collaboration Management: Innovation management has been evolving towards an open and collaborative model. This TS targets collaboration as a new

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domain that needs strategic guidance and management processes capable to enable organizations with internal tools to address issues that include "Why", "When", "How" and "With whom". (p. 12)

- CEN/TS 16555–6:2014, Creativity Management: Ideas are at the heart of the innovation process. By that reason, it was considered crucial to identify conditions necessary to nurture and develop ideas generation, collection, selection and implementation. (p. 12)
- CEN/TS 16555–7:2015, Innovation Management Assessment: Evaluation and assessment of innovation contribution to firms performance, competitiveness and sustainability are powerful instruments. Among other reasons, learning and improvement can illustrate why innovation assessment is gaining relevance at micro and macro levels. Through this TS, organizations can identify which tools can be used, from simple check lists to more complex models as the maturity or benchmarking instruments, and which results can be obtained. (p. 12)

ISO/TC 279 Innovation Management

De Casanove, Morel, and Negny (2017) explained that "[t]he charter of this group (ISO/TC279 business plan, 2014) has been defined at the creation the committee in 2013" (p. 6) and "aims at defining 'Standards on innovation management will allow organizations to share their best practices in innovation management. This will facilitate collaboration and also develop the capability to innovate and to bring innovations successfully to market.'" (p. 6) de Casanove (2014) also stated:

> That's what we do in ISO/TC 279 on innovation management. This is a new technical committee and the goal is to develop tools and methods that support the development of this innovation culture. We are quite young. The committee was created last year. For the moment, we have agreed on the work structure, that's a good achievement. We have four working groups. One will work on an innovation management system; the second on terminology, to ensure that we share the same definition of innovation and that we differentiate between innovation and innovation process.
>
> *(p. 98)*

The scope of this standard is consistency in the terminology tools, methods, and interactions among the relevant parties to enable innovation in the organizations (ISO, 2013). This standard has the following structure: (a) ISO/TC 2791/WG 1Innovation Management System, (b) ISO/TC 2791/WG 2 Terminology, terms and definitions, (c) ISO/TC 2791/WG 3 Tools and methods, and (d) ISO/TC 2791/WG 4 Innovation Management Assessment (ISO, 2013).

BS 7000 Design Management Systems

The British Standards Institution (2008) indicated that BS 7000 Design Management Systems includes the following components:

- Part 1: Guide to managing innovation (this part);
- Part 2: Guide to managing the design of manufactured products;
- Part 3: Guide to managing service design;
- Part 4: Guide to managing design in construction;

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- Part 6: Guide to managing inclusive design;
- Part 10:Vocabulary of terms used in design management.

Other parts might be added. (p. v)

The British Standards Institution (2008) also indicated the following phases and stages of the Guide to Management Innovation:

Phase 1: Explore the Potential/Set the Context

Stage 1: Review the current innovation practices to determine the potential for improvement

It is necessary to review: current situation (quantified wherever possible) of the diverse aspects of the innovation in the organization, market information, projections of financial performance, intellectual property to be exploited, strengths, weaknesses, opportunities and threats, and comparisons with competitors and the best organizations of the industry (p. 32). All the information will be integrated in a business case with the assistance of experts and lead users of products (p. 32).

Stage 2: Create future vision

The creation of a future innovation vision should be clear and should guide and motivate to the improvement of capabilities for the innovation and the development of long term products (p. 33).

Stage 3: Draw up mission statement related to innovation

The organization's innovation mission should articulate organization's general stance, or philosophy, towards innovation, the prime reasons for promoting innovation, and its contribution to overall performance. The innovation mission of the organization joined to the objectives and strategies are determinants for investing in innovative activities. (p. 33)

Stage 4: Distill innovation objectives and strategies from the organization's objectives and strategies

The innovation objectives and strategies must be formulated from the organization's objectives and strategies, coordinating all the disciplines and elaborating documented key plans. (p. 33)

Phase 2: Establish foundation

Stage 5: Determine the innovation highway

The innovation highway sets the direction an organization takes to develop its next three product generations. It should illustrate how market demand, specific customer needs, technological advances, etc. can be brought together in the range of products offered by the organization. (p. 33)

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Stage 6: Plan introduction of organization's new approach to innovation

The introduction of a new approach to innovation should encompass: (a) setting the context, (b) establishing mechanisms, (c) knowing what has been done, and (d) refining for the future. (p. 34)

Stage 7: Communicate essence of innovation mission, objectives and strategies

The innovation highway must include the rules, terrain and plans for improving innovation management issues, including the stakeholders outside the organization, using the appropriate language and terms to the targeted audiences, including informal communication alongside formal channels, and reducing the burden of bureaucratic paperwork. (p. 35)

Stage 8: Promote innovation nurturing culture

The leaders should evolve the organizational identity and the organizational culture to an innovative culture characterized by: (a) the foundations, (b) acknowledgement and leading from the top, (c) involvement of staff, (d) enlightened systems and rigorous application, and (e) making to most of experience. (p. 37)

Stage 9: Reinforce infrastructure and expertise to manage innovation

It includes: (a) need for rigorous innovation management system, and (b) augment internal competencies with external expertise. (p. 37)

Phase 3: Implement changes

Stage 10: Draw up master innovation programme

All innovative activities (long- and short-term) should be co-ordinated within a master innovation programme that details work on each potential product, technology or process broken down into stages (with deliverables, budgets, schedules and reviews). (p. 38)

Stage 11: Implement programme and support new approach to innovation

An innovation highway must be focused considering the projects in the master innovation programme to develop thinking, get closer to target audiences, gain greater insights into requirements and conceive options; also, innovation leaders should maintain the energy of the teams and remain properly informed of the progress of innovation projects. (p. 39)

Stage 12: Evaluate progress and contribution of master innovation programme

Principals are responsible for overseeing and evaluating the innovative work undertaken by, or on behalf of, their organizations. Regular reviews should be scheduled into the master innovation programme. Investments in innovation should be evaluated by

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means of a formal procedure that is documented, transparent and familiar to a wide range of personnel within the organization. (p. 41)

Phase 4: Build on expertise and enhanced reputation

Stage 13: Build distinctive competencies and competitive advantage through innovation

Organizations that develop distinctive competencies in innovation are likely to be at a competitive advantage where sustained performance in constantly changing circumstances is at a premium. (p. 42)

Stage 14: Document, share, publicize and celebrate achievements through innovation

It is essential to capture the essence of innovative work through documentation and rigorous analysis due to that such references help to make contributions to corporate performance more tangible in the short and medium terms. (p. 43)

Stage 15: Enhance organization's reputation through innovation

The value of innovation could be enhanced further by building it into a core component of an organization's reputation; a key driver and highly visible deliverer of corporate performance. Showing that innovation makes a valuable contribution to sustainability and the communities where facilities are located also helps. (p. 43)

Stage 16: Review and refine overall approach to innovation.

Principals should also reinforce the regime of continually improving their organizations' approaches and innovation management systems with more substantial longer-term reviews that reflect increased confidence and credibility as a result of mounting quantified achievements. (p. 44)

NP Series of R&D&I Management

Mir and Casadesús (2011b) detailed the documents of the NP Series of R&D&I Management as follows:

- NP 4457:2007 *Requisitos do sistema de gestão de IDI* (Requirements of the R&D&I Management System)
- NP 4456:2007 *Terminologia e definições das actividades de IDI* (Terms and definitions of the R&D&I activities)
- NP 4458:2007 *Requisitos de um projecto de IDI* (Requirements of a R&D&I Project)
- NP 4461:2007 *Competência e avaliação dos auditores de sistemas de gestão da IDI e dos auditores de proyectos de IDI* (Competences and availability of the auditors of R&D&I Management System and of the auditors of R&D&I Projects)

Models and methodologies for innovation management

Many authors have developed diverse models and methodologies for managing innovation in organizations. In this section, some of the models and methodologies which were found in the literature review are presented.

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Innovation management models

Some of the innovation management models that were found in the literature review are in Table 24.3 with their respective authors.

iSIM: Integrated Service Innovation Method

Chew (2016) proposed the model of iSIM (Integrated Service Innovation Method) with the following components: (a) strategy, (b) service architecture, (c) monetization, (d) customer value proposition, (e) service concept, (f) service system, and (g) customer experience (p. 463). Chew (2016) also described the iSIM end-to-end design processes as follows:

- **Service business strategy design**

  Strategy (step 1) is designed (by C-level leadership team) to fulfill the firm's vision and mission. To that end, it defines the firm's business logic, its platform choice, and corresponding m-sided market model. Service strategy defines the overarching directional guide for all design process elements in iSIM. (p. 465)

- **Customer type and value proposition design**

  Step 2 customer-type and value proposition (CVP) design and step 7 monetization design are co-dependent factors of business model design. They are analyzed and chosen by using competitive game theory and contingency theory. These steps are typically marketing-led in collaboration with IT and finance executives. Customer type and value proposition (CVP) design process element defines the external fitness requirements for all other design process elements. (p. 465)

- **Service concept design**

  A marketing-led practice (supported by IT and operations executives), step 3 service concept design process element designs the service logic (e.g. Dell's Build-to-order^ logic [McGrath, 2010]) in line with the business logic and strategic intent defined in step 1 in order to fulfill the high-level customer value proposition designed in step 2. (p. 465)

- **Service system design**

  Service system design (step 4) at service delivery level is an IT/operations-led cross-disciplinary endeavor. It starts with the customer/user and defines how the service will be performed using human-centered and user-participatory methods to model the service performance (Patricio et al., 2011; Holmlid and Evenson, 2008). Service

Table 24.3 Identified models for innovation management

Name	*Authors who commented on the standard*
iSIM: Integrated Service Innovation Method	(Chew, 2016)
Open Innovation Maturity Model for the Government	(Ham, Lee, Kim, and Choi, 2015)
Innovation Capability Maturity Model (ICMM v2) of Essmann	(Knoke, 2013)
I2MM: Integrated Innovation Maturity Model	(Müller-Prothmann and Stein, 2011)
Model for Measuring the Business Model Innovativeness	(Spieth and Schneider, 2016)
The Open Business Model	(Khumalo and Van der Lingen, 2017)

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innovation, and thus the step 4 service system design process element, could be exploratory requiring comprehensive service system radical redesign. (p. 466)

- **Customer experience design**

  Service design excellence strives to achieve superior customer experience (step 5), which is defined by the usability and pleasurability of the service interactions (Stickdorn and Schneider, 2010, p. 84). Service organizations are increasingly managing customer experiences to promote differentiation and customer loyalty. Due to its strategic significance as a competitive differentiator, this specialist practice of service encounter design, whilst an integral part of service system design, is factored out as a crucial step deserving special attention in the overall integrated design method. Customer experience is the outcome of the co-created customer value fulfilled by the service (delivery) system design in line with the CVP of the customer type in question. The desired customer experience envisioned by the CVP for each service type is analyzed as the (outside-in) objectives of service encounter blueprinting design (Bitner et al., 2008; Patricio et al., 2008, 2011). (p. 467)

- **Service architecture design**

  Service architecture is designed to systematize service design and innovation by providing a common language across different views on service design and a systematic way to operationalize and measure the degree of service architecture modularity (Voss and Hsuan, 2009). It is designed in accordance with the principle of modularity (Baldwin and Clark, 1997) comprising five dimensions: components, the interfaces, degree of coupling, and commonality sharing between components, and platform as the overarching configuration of components and interfaces that make up the service architecture (Fixson, 2005; Tiwana et al., 2010;Yoo et al., 2010; Gawer and Cusumano, 2014). (p. 467)

- **Monetization design**

  Step 7 monetization design is interlinked with customer type design choice in Step 1. Customer types can be chosen (Eisenmann et al., 2006) by the business model as: (a) one-sided – where the end-user customers pay to use the service offered; (b) two-sided – where the end-user customers use the service offered free, which is actually subsidized by the advertiser customers who pay the focal firm to target-advertise to the firm's huge captive audience of end-user customers according to their service usage behaviors – an end-user co-created value offered to the advertisers as a value proposition; or (c) multi-sided – often found in B2B business model context, where different roles played by different actors: service usage by end-users, authorization of service contract by senior executive, and payment for service used by finance officer. Monetization service experience (influenced by monetization intensity) can be further refined and customized by deciding when, what and how money is raised. (p. 468)

Open Innovation Maturity Model for the Government

Ham, Lee, Kim, and Choi (2015) described the components of the Open System Framework for Open Innovation in the Government and the fundamental structure of the Open Innovation Maturity Model for the Government. Ham, Lee, Kim, and Choi (2015) indicated the components of the Open System Framework for Open Innovation in the Government as follows:

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- **Input**
  - Legal needs: open data–related law
  - Political needs: open data use for political activities
  - Social needs: transparent government
  - Economical needs: open data–related business
  - Institutional needs: open data–related institution
  - Operational needs: efficiency of data and information
  - Technical needs: open linked data
- **Transformation**
  - Management subsystem: exploitation/exploration
  - Supportive subsystem: exploitation/exploration
  - Production subsystem: exploitation/exploration
  - Maintenance subsystem: exploitation/exploration
  - Distribution subsystem: exploitation/exploration
  - Adaptive subsystem: exploitation/exploration
  - Value generating mechanism:
    i. Transparency
    ii. Participation
    iii. Efficiency
    iv. Innovation
- **Outputs**
  - Social value (Impacts)
    i. OECD: BLI (Better Life Index)
    www.oecdbetterlifeindex.org
      - Housing, Income, Job, Community
      - Education, Environment
      - Civic Engagement
      - Health, Life Satisfaction, Safety
      - Work-Life Balance

    ii. NEF: HPI (Happy Planet Index)
  - Economic Value (Impacts)
    i. GNP (Gross National Product)
    ii. GDP (Gross Domestic Product)
    iii. GNI (Gross National Income)
    iv. GDI (Gross Domestic Income)
  - Competitive Value (Impacts)
    i. WEF: GCI (Global Competitiveness Index)
      - Basic Requirements
      - Efficiency Enhancers
      - Innovation and Sophistication

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- **External Environment**
  - Environmental condition: Legal, political, social, economical, institutional, operational, and technical environment

Ham, Lee, Kim, and Choi (2015) considered that the model proposed in their study is "the best means not only to assess the current maturity level of the open innovation of a government but also to provide the government with appropriate future directions and guidelines to increase the maturity level" (p. 5). Ham, Lee, Kim, and Choi (2015) also stated that the procedures of the development processes of the Open Innovation Maturity Model for the Government as follows: (a) problem identification, (b) comparison of existing maturity models and determination of a development strategy, and (c) iterative maturity model development (p. 5). Ham, Lee, Kim, and Choi (2015) also explained the fundamental structure of the Open Innovation Maturity Model for the Government as follows: (a) the generic and specific processes of each system are extracted from the literature review on open data, open innovation and maturity model research, (b) the definitions of the measurements are extracted from the literature review on open data, open innovation and maturity model research, (c) the capability scores are extracted from the calculation based on the evaluated points of each measurement, (d) the capability types of each subsystem are extracted from the results of capability scores, and (e) the capability level of each subsystem is extracted from the mapping results of capability types (p. 6).

Innovation Capability Maturity Model (ICMM v2) of Essmann

Knoke (2013) explained the five maturity levels of the Innovation Capability Maturity Model ICMM v2 of Essmann, as follows:

- Ad-hoc innovation: consumed with day-to-day operations; outputs are inconsistent and unpredictable
- Defined innovation: need to innovate identified and defined; outputs are inconsistent but traceable
- Supported innovation: practices, procedures and tools implemented; consistent outputs maintain market share
- Aligned innovation: integrated and aligned activities and resources; outputs are a source of consistent differentiation
- Synergized innovation: synchronization of activities and resources; outputs provide sustained competitive advantage. (p. 8)

Integrated Innovation Maturity Model (I2MM)

Müller-Prothmann and Stein (2011) described the I2MM process areas and the I2MM capability levels. Mûller-Prothmann and Stein (2011) detailed the I2MM process areas as follows: (a) Ideation and Product Development, which "concentrates on activities with regard to seeking, analysing, and evaluating ideas" (p. 6); (b) Innovation Management, which "covers among other aspects the innovation strategy, its documentation, and transparency to employees as well as the degree of its realisation" (p. 6); (c) Requirements Engineering, which "deals with development, definition, documentation, planning, and improvement of requirements" (p. 6); and (d) Quality Management, which "is characterised by the necessity for quality processes and products. Therefore, both processes and products need to be continuously improved to reduce bugs, problems,

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costs, and risks" (p. 6). Müller-Prothmann and Stein (2011, p. 6) also described the I2MM Capacity Levels as follows:

- **Capability Level 1:** Chaotic. Chaotic organization, ad-hoc managed, structure processes with unpredictable outcomes, disorganized, unregulated, unknown and undocumented requirements for products and processes, projects frequently exceed schedule and budget, without integration with stakeholders, conservative, firefighter behavior without the idea of the complexity and interconnectedness of problems, strongly conservative towards improvements, innovations and external knowledge and experts, nonintegrated and limited communication, and not documented innovation-related knowledge, which is not seen as relevant for quality and risk management.
- **Capability Level 2:** Organized. Documented processes and subprocesses, although not harmonized in every single division, rudimentary quality management results in quality guidelines, some claims of management processes and customer feedback, some feedback loops are converted into lessons learned, upper management communicates innovation objectives, innovative ideas and solutions are rejected as unworkable, identification of stakeholders, and the transfer of knowledge or cooperation with other areas is not considered as important.
- **Capability Level 3:** Standardized. Documented and harmonized processes in all divisions of the organization, standardized company-wide innovation process with embedded requirements engineering and permanent feedback to relevant staff members, minimized risks in checked projects, knowledge is shared and broadcasted, learning culture is constant, knowledge management tools are available to management and individual staff members only, cooperation with stakeholders has been improved but remains an exception, the stakeholders and their ideas and expectations are identified systematically, the ideas are evaluated and rewarded with incentives, quality management is implemented and harmonized in all divisions to evaluate processes and to achieve customer satisfaction, and benchmarking of markets is developed and is used to optimize processes and products.
- **Capability Level 4:** Predictable. Stakeholders are integrated into ideation and product development with continuous feedback, creativity workshops, cross-organizational cooperation inside and outside of networks, innovation process and its documentation are permanently assessed and adjusted if required, continuous usage of termination criteria throughout the process ("kill early, kill cheap" mentality), lessons learned are registered and reviewed, planned and evaluated processes through indicators and expected results, the tools and techniques are accessible to each employee, the knowledge management stimulates the process improvement and is deeply integrated in corporate processes, and continuous examination of consumer satisfaction, time to market, adherence to schedules, costs, product, and process quality.
- **Capability Level 5:** Innovation "Black Belt". Defined to respond to changing project conditions, processes and products are improved continuously, permanent benchmarking of markets for determining the best practices, organizational culture can be easily adjusted to changing requirements, organization realizes strategic foresight with knowledge networks inside and outside the organization, innovation methods are suggested by stakeholders, innovations are planned and generated systematically, open innovation methods inspire new products, processes and technologies, requirements are classified according to the phases of the product lifecycle, employee creativity is fostered, and financial incentives and time to help to employees for realizing the ideas.

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Statistical Model for Measuring the Business Model Innovativeness

Spieth and Schneider (2016, p. 686) evaluated a Statistical Model for Measuring the Business Model Innovativeness with the following dimensions, elements, and indicators:

1 Value Offering Innovation: The value proposition towards the customer has changed

- Target customers: Target customers have changed
- Positioning: The product and service offering has changed
- Product and service offering: The firm's positioning in the market has changed

2 Value Architecture Innovation: The value creation architecture has changed

- Core competencies and resources: The firm's core competences and resources have changed
- Internal value creation: Internal value creation activities have changed
- Partners in value creation (external value creation): The role and involvement of partners into the value creation process has changed
- Distribution: Distribution has changed

3 Revenue Model Innovation: The logic how revenues are generated has changed

- Revenue mechanisms: Revenue mechanisms have changed
- Cost mechanisms: Cost mechanisms have changed

The Open Business Model

Khumalo and Van der Lingen (2017) stated that the concept of Open Business Model originated from the intersection of open innovation and the business model (p. 149). Khumalo and Van der Lingen (2017) also stated that open innovation is best understood as "a paradigm that assumes that organisations can and should use external and internal ideas, as well as internal and external paths to market, as they look to advance their technology" (p. 149) and detailed the open innovation practices as follows:

- Inbound: alliances, purchase of scientific services, in-licensing, institutional collaboration, venture capital, acquisition, customer involvement, and external networking – including conferences, fairs, knowledge clusters, and crowdsourcing (p. 150).
- Outbound: spinoff, supply of scientific services, out-licensing, external technology commercialization, knowledge exploitation, venturing out, industry groups, and institutional collaboration/partnerships (p. 150).

Khumalo and Van der Lingen (2017) explained that the Business Model Canvas includes (a) key partners, (b) key activities, (c) value proposition, (d) customer relationships, (e) customer segments, (f) key resources, (g) channels, (h) cost structure, and (i) revenue streams (p. 151). Khumalo and Van der Lingen (2017) also explained that "[m]ultiple studies tend to recommend openness" (p. 156) and that "there is no explicit directive about what managers have to deal with or how they should overcome the challenges brought about by openness" (p. 156). Additionally, Khumalo and Van der Lingen (2017) pointed out: "A strategic and operating management model, or rather a toolkit, is necessary" (p. 156). Khumalo and Van der Lingen (2017) also stated:

> In more progressive organisations, business model change is not necessarily motivated by poor organisational performance, but can even occur while the organisation is

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> thriving [97]. Such proactiveness could anticipate a decline in performance, or offer foresight into better returns with a new configuration. The development of new organisational routines, such as evaluation procedures and metrics of performance [74], could be considered to be the foundation of business model archetypes. Furthermore, the literature generally agrees that enterprises, when operating under uncertainty, should experiment with a range of business models [98]. Through experimentation, the initial value proposition evolves into a viable business model by using a series of trial-and-error changes that are pursued along various dimensions [99].
>
> *(p. 156)*

Khumalo and Van der Lingen (2017) pointed out: "An open business model archetype does not need to digress from existing knowledge. Only a new configuration of existing elements is necessary" (p. 156) and proposed the features of the Open Business Model as follows: (a) Iteration (consists of decision gates and feedback loops), (b) Value calculation mechanism, (c) Strategic agility/flexibility, (d) Managerial assumptions (effort on proximity to fact), (e) Organizational dynamic capability, and (f) Boundary-spanning concept (p. 156).

Innovation management methodologies

After the literature review, diverse methodologies for innovation management were found. A short list of these innovation management methodologies is in Table 24.4.

MIM3

Alfaro (2017b) developed "MIM3: Methodology of Innovation Management for Obtaining the Level 3 of I2MM", which is a holistic methodology for the obtaining level 3 of the Integrated Innovation Maturity Model. Alfaro (2017b) stated that MIM3 is "an integrated methodological approach which includes the good management practices of

Table 24.4 Identified methodologies for innovation management

Methodology	*Authors who commented on the methodology*
MIM3: Methodology of Innovation Management for Obtaining the Level 3 of I2MM	(Alfaro, 2017b)
MEVGIT: Methodology for Evaluating the Value Generation of Information Technology	(Alfaro, 2017a)
Lean Product Innovation Management	(Wang, Ming, You, Kong, and Li, 2011)
Lean Startup	(Ciobanu and Nastase, 2015).
Very Lean Startup	(Gupte, 2015)
Design Thinking	(Coleman, 2016; Liedtka, 2015; Joyce, Ching, Wong, and Huang-Yao, 2015; Brown, 2008)
Living Lab Methodology	(Schuurman, de Marez, and Ballon, 2016)
Goodyear's Business Model Innovation Process	(Euchner and Ganguly, 2014)
FastWorks Framework	(Merfeld, 2014)
Lean Innovation Model	(Frederic, Lam, and Martin, 2014)
Seeking Solutions Approach	(Deutsch, 2013)
3-Stage Roadmap	(Belkhir, 2015).

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the following management areas: (a) strategic management, (b) project management, (c) innovation models and innovation methods, (d) standards for innovation management, (e) knowledge management, and (f) financial management" (p. 31). Alfaro (2017b) also explained that

> The proposed MIM3 methodology integrates the generation of ideas of innovative projects in an aligned manner with the strategic planning of the organizations through the concordance with the organizational purposes and goals of the organizations and the areas or processes of the organizations joined to the manner in which the innovative project idea will contribute to the goals searching the quantification of the impact. MIM3 also includes the knowledge areas (integration management, scope management, time management, cost management, quality management, human resources management, communications management, risk management, acquisitions management and stakeholders management) of the project management according to Project Management Body of Knowledge (Project Management Institute, 2013) in a summarized manner and the use of the Critical Chain (Goldratt, 1997), with the processes of some of the main innovation models and innovation methods which were found in the literature review, considering the good practices of the standards of innovation management. MIM3 also includes some knowledge management good practices, such as the yellow pages and the evaluation of the value generation of the innovative projects with a procedure based on the MEVGIT methodology (Alfaro, 2017a), which is also based on free cash flow, total cost of ownership and the direct costing.
>
> *(p. 32)*

Additionally, Alfaro (2017b) indicated the policies of the MIM3 as follows:

The general policies which are necessary for the application of the methodological proposal are the following:

- This methodological proposal is applicable to all the innovative projects which the personnel want to present in each one of the processes or areas of the organization.
- The innovation area will maintain a service vocation for all the personnel of the processes or areas, all the time. In this way, the innovation area will support with the corresponding technical knowledge to the diverse proposals of innovation projects.
- The innovation area will consider "Idea of an Innovative Project" to an idea of project which would generate value and would have a creative or new component for the reality of the process of the organization.
- The innovation area must receive and evaluate all the ideas of innovative projects which each worker of the organization or its stakeholders consider innovative project. (p. 56)

Alfaro (2017b, p. 57) described the processes of the MIM3 as follows:

1. To generate and to evaluate the "Idea of Innovative Project".
2. To prepare the "Innovative Project Charter" and "Plan for the Management of Innovative Project".
3. To determine the technical feasibility of the innovative project.
4. To determine the financial feasibility of the innovative project.

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Is feasible technical and financially?
Then
5 To plan, implement and evaluate the "Proof of Concept".
Was the "Proof of Concept" a success?
Then
6 To plan, implement, and evaluate the pilot project.
Was the "Pilot Project" a success?
Then
7 To implement the innovative project.
8 To record "Learned Lessons", to update "Yellow Pages", and to realize the "Closure of the Project"
9 To select the successful and culminated innovative projects and apply for national and international awards or competitions.
10 To register copyright or inventions, as determined by the Chief Executive Officer or the Board of Directors.
Go to process 1.
Otherwise
Go to process 8.
Otherwise
Go to process 8.
Otherwise
Go to process 8.
Go to process 1.

Each one of the processes of MIM3 with its respective forms are detailed (Alfaro, 2017b). The forms of MIM3 are the following: (a) FR-MIM3–001–001 Idea of Innovative Project, (b) FR-MIM3–002–001 Innovative Project Charter, (c) FR-MIM3–003–001 Template of the Project Management Plan – Table of Contents, (d) FR-MIM3–004–001 Technical Evaluation of the Project, (e) FR-MIM3–005–001 Risks Management of the Innovative Project, (f) FR-MIM3–006–001 Financial Evaluation of the Project, (g) FR-MIM3–007–001 Registration of Innovative Project's Learned Lessons, (h) FR-MIM3–008–001 Form of Project Closure, (i) FR-MIM3–009–001 Budget of Outflows of the Innovative Project, (j) FR-MIM3–010–001 Schedule of the Project, (k) FR-MIM3–011–001 Control of Changes of the Innovative Project, (l) FR-MIM3–012–001 Communications Management of the Innovative Project, and (m) FR-MIM3–013–001 Yellow Pages of the Project (Alfaro, 2017b).

MEVGIT

Alfaro (2017a, p. 170) described MEVGIT (Methodology for Evaluating the Value Generation of Information Technology) as a methodology for evaluating the financial value generation of investments in information technology innovation and outlined its steps as follows:

1 To calculate the additional inflow which will be collected by the product or result of the project.
   - To calculate the additional contribution margin (in the case of firms) or the additional gross domestic product (in the case of nonprofit governmental entities) due to the product or result of the project

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For firms:

- To calculate the additional contribution margin due to the increase of sales to the current clients.
- To calculate the additional contribution margin due to the increase of sales to new clients.
- To calculate the additional contribution margin due to the organization would avoid the loss of sales.
- To calculate the additional contribution margin due to the reduction of the variable cost of sales.

For nonprofit governmental organizations:

- To analyze how to convert the nonfinancial benefits with the goods or services of the nonprofit governmental entities, to amounts of gross domestic product.
- To calculate the amount of gross domestic product which will be increased through the product or result of the project.

- To calculate the savings due to the product or result of the project
- To calculate the savings due to the reduction of investments.
- To calculate the savings due to the reduction of expenses.

2 To calculate the additional outflows which will be collected by the product or result of the project.
   - To calculate the additional investments: hardware acquisition, software acquisition, installation, infrastructure, furniture and equipment, and others.
   - To calculate the additional expenses: personnel, advertising, training, support, maintenance, inactivated time, space and energy, and others.

3 To calculate the net flow. The calculation of the net flow is the difference of the additional inflows and the additional outflows.

4 To estimate the discount rate.

   The discount rate must consider the following criteria: (a) to be higher than the risk free rate, (b) to be higher than the average return on investment of the firms of the economic sector of the country or region, (c) to be higher than weighted average cost of capital, and (d) to be equal or greater than a minimum discount rate that the board of directors determined.

5 To calculate the net present value.

   For calculating the net present value, the discount rate and the net flow must be considered. Each one of the net flow at the end of each period must be discounted dividing (1 + discount rate)i, where "i" is each one of the periods. The sum of the discounted net flows of each period will be the net present value.

Lean Product Innovation Management

Wang et al. (2011, p. 2076) explained the five steps of an approach toward Lean Product Innovation Management as follows:

- Adopt lean. Adopt a lean paradigm: prepare in advance
- Specify value. Rapid response to market and customer demands; customers define value by new product and form of service

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- Identify current value stream. Data collection: record current value stream status of product innovation; show the product and information
- Create future value stream. Analyze the current-state value stream based in the definition; eliminate nonvalue-added activities and get a new value stream
- Implement flow. Actualized innovation process; continuous; control and standardize the process of innovation

Wang et al. (2011) also explained the roadmap to transition to Lean Product Innovation Management as follows:

1 Pre-innovation plan.

The company's senior leadership committed to product innovation lean organization and implementation of the reform process. Prevent the blind development of new products in mobile phone development process examining options to be sure to prepare adequately and to handset development teams focus on the project from the beginning.

2 The definition of value.

Collect and analyze data from the fact of consumer, at the same time market researcher studies the competitor's product as comprehensive as possible to accurate understanding of consumer needs.

3 Value stream.

According to company the prior product development process, the numbers of development team proposed development process milestone, the actual delivery time, and the number and impact of project changes. Through this accurate data collection and rigorous data analysis, the waste in project is definite.

4 The future value stream.

In order to reduce the occurrence of changes and rework the final detailed schedule and work plan, the tools which can identify and eliminate waste such as mass matrix, causal analysis, brainstorming and other methods to be used, and then implementation of resources is allocated in a new mobile phone development process.

5 Implementation Process.

To become learning-oriented enterprises, Staff training Lean thinking and suppliers attend new product development. (p. 207)

Lean Startup

The concept of Lean Startup was introduced by the entrepreneur Eric Ries in 2011 in his book: *The Lean Startup, How Today's Entrepreneurs Use Continuous Innovation to Create Radically Successful Businesses*" (Ciobanu and Nastase, 2015, p. 81). Ciobanu and Nastase (2015) stated that the Lean Startup method "is based on a different kind of thinking and asks from the entrepreneurs to see productivity differently" (p. 83) and "builds sustainable and effective companies because it allows businesses into the startup phase to test and recognize when it is time to change strategy, without consuming resources irresponsible relying on predefined and pre-accepted strategies"

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(p. 83). Additionally, Ciobanu and Nastase (2015, p. 83) explained their interpretation of the five principles of the Lean Startup method as follows:

- Entrepreneurs can be found everywhere and can be anyone from novices to intrapreneurs.
- Entrepreneurship means new management adjusted to an environment of maximum uncertainty.
- Validating learning by empirical research of their own entrepreneurial vision.
- Transforming ideas into products through the loop Construct–Evaluate–Learn.
- Measuring results and entrepreneurial progress through accounting for innovation.

Finally, Ciobanu and Nastase (2015, p. 84) described the following characteristics of the Lean Startup:

- Empirical research of the market by creating a minimum viable product (MVP);
- Low initial production, avoiding wasting resources on a product that is likely to be unsaleable;
- Reduced time of execution of the first versions of the product/service that come on the market;
- Use continuous innovation for improving the quality of the product as a function of early customer feedback;
- The failure of the product/service can be determined earlier through testing, when production is reduced in quantity. In this way the risk of bankruptcy is also reduced;
- The focus is on the quality and value offered to the customer according to his needs by involving him in the design process to the final product.

The Very Lean Startup Method

Gupte (2015) stated that "[t]he Very Lean Startup Method© or perhaps the Really Lean Startup Method© is but a natural extension of the Lean Startup Method." (p. 52) and that "[t]he Very Lean Startup Method focuses on identifying customers before an entrepreneur builds or perhaps even defines a product" (p. 52). Gupte (2015) also proposed the processes of the Very Lean Startup Method as follows:

- Conduct brainstorming and informal "research".
- Identify possible customer demographics.
- Make the collateral.
- Send out the collateral.
- Send out variations with different pricing or offers.
- Find out why the nonresponses didn't respond.
- Ask the responding customers to pay.
- Do the math on the cost of customer acquisition and pricing.
- Adjust the cost of feature development in the business model.
- Modify the offering – product/price/placement/target customer.
- Repeat until you have a viable business model.

Design Thinking

Joyce, Ching, Wong, and Huang-Yao (2015) described design thinking as follows: "Design thinking is implicit in intentional acts that lead to the creation or improvement of products, services, and experiences" (p. 537). Design thinking is "a discipline that uses the designer's sensibility and

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methods to match people's needs with what is technologically feasible and what a viable business strategy can convert into customer value and market opportunity" (Brown, 2008, p. 96). Coleman (2016) explained that Tim Brown, president and CEO of IDEO, describes design thinking as "a methodology that imbues the full spectrum of innovation activities with a human-centered design ethos" (p. 63). Coleman (2016) also stated:

> By this I mean that innovation is powered by a thorough understanding, through direct observation, of what people want and need in their lives and what they like or dislike about the way particular products are made, packaged, marketed, sold and supported (Brown, 2008, p. 86).
>
> *(p. 63)*

Regarding the design thinking process, Coleman (2016) explained that "[t]he Institute of Design at Stanford University (a.k.a., the d School) lists five steps in the design thinking process" (p. 64) as follows:

> Step one is to understand or empathize. In this step the design team focuses on observing and interviewing their subjects and learning as much as possible about their audience. The team will be looking to answer questions such as "Who is the user?" and "What matters to this person?"
> Step two is to define the issue and the needs of the user. What is the audience's point of view and what are the needs of the end user?
> Step three is the ideate stage. The team brainstorms as many creative solutions as possible. "Crazy ideas" are encouraged!
> Step four is the prototype stage. This stage involves creating or building a rough representation of one or more ideas to show to the end user.
> Step five is to test the product, sharing ideas and prototypes with end users and a larger audience to garner feedback. (p. 64)

Liedtka (2015, p. 928) described the common design thinking tools as follows: (a) visualization: use of imaginary, either visual or narrative; (b) ethnography techniques: participant observation, interviewing, journey mapping, and job-to-be-done analysis; (c) structured collaborative sense-making techniques: mind mapping, collaborative ideation techniques (brainstorming and concept development techniques); (d) assumption surfacing; (e) prototyping techniques; (f) cocreation; and (g) field experiments. As can be appreciated, the design thinking tools are very diverse and promote the collaborative work. Liedtka (2015, p. 928) also described the models of design thinking in practice from IDEO, Continuum, Stanford Design School, Rotman Business School, and Darden Business School, as follows:

- **IDEO**
  - Stage I – Data gathering about user needs: Discovery and interpretation
  - Stage II – Idea generation: Ideation
  - Stage III – Testing: Experimentation and evolution
- **Continuum**
  - Stage I – Data gathering about user needs: Discover deep insights
  - Stage II – Idea generation: Create
  - Stage III – Testing: Make it real: prototype, test and deploy

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- **Stanford Design School**
  - Stage I – Data gathering about user needs: Empathize and define
  - Stage II – Idea generation: Ideation
  - Stage III – Testing: Prototype and test
- **Rotman Business School**
  - Stage I – Data gathering about user needs: Empathy
  - Stage II – Idea generation: Ideation
  - Stage III – Testing: Prototyping and experimentation
- **Darden Business School**
  - Stage I – Data gathering about user needs: What is?
  - Stage II – Idea generation: What if?
  - Stage III – Testing: What wows? and What works?

Living Lab Methodology

Schuurman, de Marez, and Ballon (2016) explained the Living Lab Methodology as an alternative to quasi-experimental design. Schuurman, de Marez, and Ballon (2016) explained that quasi-experimental design includes the following processes: (a) Pre-Test, (b) Intervention, and (c) Post-Test. Schuurman, de Marez, and Ballon (2016) also explained the processes of the living lab methodology inside each one of the processes of the quasi-experimental design as follows: (a) in Pre-Test: contextualization, selection, and concretization; (b) in Intervention: implementation; and (c) in Post-Test: feedback (p. 9). Additionally, Schuurman, de Marez, and Ballon (2016) indicated the three types of living lab projects with the six stages of new product development: (a) exploration: idea and concept; (b) experimentation: prototype; and (c) evaluation: pre-launch, launch, and post-launch (p. 10). Finally, after the application to 27 innovation projects from Flemish startups and small and medium-sized enterprises (SMEs) carried out within the iMinds Living Labs constellation, Schuurman, de Marez, and Ballon (2016) concluded:

> We summarize and translate our findings in three propositions. First, the discussed living lab projects are aimed at opening up the company boundaries towards user contributions, thus facilitating outside-in open innovation. Moreover, in terms of the collaboration typology of Pisano and Verganti (2008), the projects can be labelled as hierarchical and shifting between open and closed participation. The user contributions were successful for almost two-thirds of the projects, leading to modifications of the innovation during or after the project based on user contributions. Moreover, for two-thirds of projects, this innovation resulted in a market introduction or in further development. These findings show that living lab projects are a means to successfully facilitate open innovation in startups and SMEs.
>
> *(p. 13)*

InnoCamp model

Kaski, Alamäki, and Moisio (2014) presented the InnoCamp model, which is really a method that "comprises the typical participatory open innovation approach with the concept of rapid innovation and coaching" (p. 163). Kaski, Alamäki, and Moisio (2014) stated that "[t]his way it compresses the key phases of the innovation process into two working days" (p. 163). It was

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tested at the Vierumäki Sport Institute for two days with sport firms. Kaski, Alamäki, and Moisio (2014) explained the InnoCamp processes as follows: (a) Pre-Assignments: Pre-understanding); (b) First Day: company task sharing, idea creation – several methods-, and evaluations; and (c) Second Day: selection, improvement, concept creation, selling, and pitch (p. 167).

As was mentioned, the standards, models, and methodologies for managing the innovation could accelerate the value generation of the innovations and avoid various types of failures, and not only financial failures. The learning and the application of the standards, models, and methodologies for innovation management, with previous adaptations to the realities of the organization, should be necessary to obtain the expected results of the investments in innovation.

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