Towards a Maturity Model for Assessment of Organization Readiness in Implementing and Deploying an Open Innovation Platform

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ABSTRACT

Open innovation platforms emerged as software solutions to facilitate collaboration among diverse participants in an open innovation initiative. Implementing an open innovation platform is a challenging endeavor mainly due to the disruptive nature of the paradigm itself and to technological aspects that, if left overlooked, may have a big impact later. During our experience in implementing an open innovation platform in a Chilean university, we soon discovered the need for guidance in the implementation, and we argue that this guidance is compatible with the gap-covering structure of capability maturity models, a well-known approach to ICT process improvement. Based on this insight, we propose an initial version of a focus-area maturity model to assess an organization's readiness to implement and deploy open innovation software platforms. As befits emerging work, we also discuss and share some future lines of work.

CCS CONCEPTS

• **Software and its engineering**; • **Information systems → Information systems applications**;

KEYWORDS

Maturity model, Open innovation, Innovation platform

1 INTRODUCTION

Open innovation platforms appear in the context of open innovation as online software tools for helping open innovation adopters in managing innovation endeavors. Two potential users of open innovation platforms are organizations (including companies) pursuing

opening their innovation process and open innovation intermediaries.

As with any software system implementation and deployment, open innovation platforms are no exception in terms of the challenges that open innovation adopters will face when working towards implementing and deploying one of these platforms. Challenges are even more interesting in this context as many of the platforms provide functional characteristics that are new to many organizations as they respond to the open innovation paradigm.

We were involved in the implementation of an open innovation platform for a well-known research and engineering Chilean university. We would have appreciated having some reference before, in, and after the open innovation software platform development and implementation for guiding us and the organization in achieving the platform deployment and use. Guidance for assessing current situation and future improvements for facilitating the platform implementation and deployment is appreciated.

In this paper we propose a "focus-area"-based maturity model for assessment and guidance in improvement of the organization's readiness for implementing and deploying an open innovation platform. We provide two focus areas: platform implementation and platform deployment. For this paper, we refer by platform implementation to the expected development and integration tasks. On the other hand, we refer by platform deployment to the expected organizational efforts for understanding, embracing and purposely using the platform.

The remainder of the paper is structured as follows. Section 2 briefly discuss current related work regarding open innovation and maturity models design. Section 3 describes the research and maturity model methodology we follow. Section 4 presents the proposed maturity model with a description of the focus areas and capabilities. Finally, section 5 summarizes and concludes with some thoughts on directions to extend this emerging work.

2 RELATED WORK

In 2003, Henry Chesbrough coined the term "Open Innovation" in his book "Open Innovation: The New Imperative for Creating and Profiting From Technology" defining it as paradigm in which *"valuable ideas can come from inside or outside the company and can go to market from inside or outside the company"* [4]. Chesbrough contrasted this paradigm with the Closed Innovation one, inwardly focused by its very nature, which is characterized by a vertical integration model where internal innovation activities end up in

internally developed products or services that are distributed by the company [5].

Open innovation platforms appear as software tools, most of the time online software tools, aiming in general at helping organizations to open their innovation processes by engaging with the crowd [3] and helping innovation intermediaries in managing their open innovation services [7].

There are two broad types of maturity models: fixed-level and focus area maturity models [15]. In fixed-level maturity models, there is a fixed number of generic maturity levels with each one having a set of associated processes to be implemented [15]. The widely known CMMI (Capability Maturity Model Integration) is an example of fixed-level maturity models. On the other hand, focus area maturity models are designed around a number of focus areas that must be worked to achieve maturity in an aspect of a functional domain [15]. The same CMMI, but in its *continuous* representation, can be regarded as a focus-area maturity model style.

3 RESEARCH AND MATURITY MODEL DEVELOPMENT METHODOLOGY

We have recent experience implementing an open innovation platform at a STEM-oriented Chilean university. However, to avoid biases motivated by our particular experience, we conducted this research and explored maturity model development along two axis:

- First, we researched development strategies for, and types of, maturity models.
- Second, we reviewed existing literature about open innovation platforms (including [1][3][7][9][10][14]) to maintain our mindsets open enough to avoid biases derived from our particular experience. In addition, as recommended by Mettler [12], we also use the SEMAT Kernel [11], CMMI [13], and elements of Enterprise Software Architectures [6][8] as references for comparison and motivation.

In terms of the development strategy, we used the approach proposed by Becker et al. [2] (also commented in [12]):

(1) Identify need or new opportunity: implementing and deploying an open innovation platform is challenging due to the typical challenges observed in any software system implementation and deployment and also due to that many of the functional characteristics are motivated by a paradigm that itself is disrupting for many organizations.

(2) Define scope: we focus our proposed maturity model on the specific domain of open innovation platforms implementation and deployment aiming at providing guidance to practitioners in assessment and improvement of the organization readiness for the platform implementation and deployment. For our purposes, practitioners could be working in companies, government, or academy.

(3) Design model: at this early stage, we propose structuring the maturity model around two focus areas. This decision is made considering that the maturity model should be actionable enough so practitioners do not feel as using this model as a heavyweight assessment method.

(4) Evaluate design: as of this writing, we rely on discussion about internal and external validity regarding the defined scope.

Table 1: Summary of focus areas and capabilities

FA1 Platform implementation	FA1.A, FA1.B, FA1.C, FA1.D, FA1.E, FA1.F
FA2 Platform deployment	FA2.A, FA2.B, FA2.C, FA2.D, FA2.E

(5) Reflect evolution: we regard two aspects as critical for evolution. The first one is defining more concrete guidance for assessment (for example, we are working towards the definition of a set of indicators being part of an assessment method). The second one is working towards transferring to industry, government, or academy this model so we can get practical feedback for future model improvements.

4 THE MATURITY MODEL

As explained in Sections 2 and 3, the proposed maturity model is based on a focus-area approach. In this approach, we identify two focus areas: platform implementation (FA1), and platform deployment (FA2); and to each of these we associate a set of capabilities (see Table 1).

The capabilities associated with the focus area "Platform implementation" are:

- FA1.A: The organization understands and agrees open innovation platform functionality.
- FA1.B: The organization understand and agrees platform's architectural decisions and technology to be used.
- FA1.C: The organization chooses between in-house development, outsourced development, or acquisition of a platform as a product.
- FA1.D: The open innovation platform is in use with some degree of integration to other systems
- FA1.R: The platform provides or consumes services, increasing the degree of integration.
- FA1.F: The platform is systematically providing or consuming services in the context of development of external interfaces, reports, and other integrated uses.

And the capabilities associated with the focus area "Platform deployment" are:

- FA2.A: Open innovation processes recognized, modeled, and an open innovation platform appears as a tool supporting some parts of the process.
- FA2.B: The open innovation platform is used to support some open innovation initiatives.
- FA2.C: The open innovation platform is systematically used in the context of open innovation initiatives.
- FA2.D: The open innovation platform provides useable metrics to open innovation management.
- FA2.E: Use of the open innovation platform is being optimized.

One key aspect of focus-area maturity models is that its focus areas must be mutually disjoint functional aspects, which eventually compose a complete functional domain [15]. This feature has practical implications: we must be careful when designing the

model to not mix capabilities from one focus area into another. For example, in our model, if we had considered capability FA1.C to be part of the "platform deployment" focus area, we would have ended up with a maturity model that when applied would have stopped improvement in the "platform implementation" focus area. Nevertheless, we need to remark that some capabilities would benefit from implementation of other areas' capabilities, and we highlight this in the model by referencing them as we explain in the following paragraph.

In the following subsections, we describe each capability with a format based on the example in [15], with four attributes:

(1) Goal: which purpose the capability serves to. It also outlines the benefit of implementing the capability.
(2) Action: outlines what must be done to meet the capability.
(3) Prerequisites: indicate, if applies, which capabilities must be implemented before the present capability. Prerequisites indicate cross referencing capabilities in different focus areas, i.e. do not describe some kind of logical maturity progression.
(4) References: indicate where the reader could see more information about the capability.

4.1 Focus area capabilities: platform implementation

This section presents "platform implementation" focus area capabilities characteristics.

FA1.A: The organization understands and agrees open innovation platform functionality.

- Goal: Focus efforts in the implementation of an appropriate (for the organization) open innovation platform.
- Action: Requirements engineers should research and discuss open innovation platforms requirements and agreed with management staff what functionality is expected for the organization's platform.
- Prerequisite: FA2.A.
- References: [1][3][7][9][10][11][14].

FA1.B: The organization understand and agrees platform's architectural decisions and technology to be used.

- Goal: Provide critical information to support functionality with quality requirements as expected by the organization.
- Action: Requirements engineers and software architects should discuss and agree architectural decisions and define the architecture for the platform.
- Prerequisite: -
- References: [1][3][7][9][10][11][14].

FA1.C: The organization chooses between in-house development, outsourced development, or acquisition of a platform as a product.

- Goal: Decide if the organization is going to buy a software product, a software service, or develop in an in-house or outsourced way the platform.
- Action: Management staff and IT operations and software engineer discuss the tradeoffs between choosing in-house or outsourced development or acquisition (with potential tailoring) of a platform.
- Prerequisite: -

- References: [11]

FA1.D: The open innovation platform is in use with some degree of integration to other systems.

- Goal: Put open innovation platform in production environment and make use of it. Integration to other systems is expected, but only at the platform level (i.e., it is expected that the platform makes use of third-party components for its execution).
- Action: Management staff instruct IT operations to deploy the platform and begin the use to support open innovation initiatives or projects.
- Prerequisite: FA2.A.
- References: [11][13]

FA1.E: The platform provides or consumes services, increasing the degree of integration.

- Goal: Take advantage of the reuse of platform's components as originally designed.
- Action: Integrate the open innovation platform with other systems (e.g., Single-Sign-On) not depending on big maintenance to the current design, i.e, integration is achieved by using current interfaces as they were designed.
- Prerequisite: -
- References: [11][13][6][8]

FA1.F: The platform is systematically providing or consuming services in the context of development of external interfaces, reports, and other integrated uses.

- Goal: Take advantage of systematic software components reuse.
- Action: Software architects improve architecture providing information regarding interfaces and components for the development team so they can refactor current architecture and provide services as described in the improved architecture. Take advantage of the provided services for integration with eventually new applications.
- Prerequisite: -
- References: [11][13][6][8]

4.2 Focus area capabilities: platform deployment

This section presents "platform deployment" focus area capabilities characteristics.

FA2.A: Open innovation processes recognized, modeled, and an open innovation platform appears as a tool supporting some parts of the process.

- Goal: The organization is aware of the benefits and potential uses of an open innovation platform in the context of an open innovation initiative or project.
- Action: Management staff, and IT and software engineers should discuss functionality, costs of implementation, diverse mechanisms for implementation and examples of uses. Discussion must end with alignment of the open innovation platform in the context of current open innovation organization's processes.

- Prerequisite: FA1.B.
- References: [1][3][7][9][10][11][14].

FA2.B: The open innovation platform is used to support some open innovation initiatives.

- Goal: The platform is running in production environment. By some initiatives we mean that the organization is motivating platform use, but still it is not pervasively and systematically used in open innovation initiatives.
- Action: Instruct open innovation practitioners to use the open innovation platform according to functionality and requirements defined. Collect any feedback from the use. Feed IT operations and software engineers with feedback so they can discuss with management and prioritize potential improvements.
- Prerequisite: FA1.C.
- References: [1][3][7][9][10][11][14].

FA2.C: The open innovation platform is systematically used in the context of open innovation initiatives.

- Goal: Promote and control the use of the platform in most or all of the open innovation initiatives or projects.
- Action: Make use of the collected feedback from the initial use of the platform. Implement feedback-driven improvements in the platform.
- Prerequisite: -
- References: [1][3][7][9][10][11][14].

FA2.D: The open innovation platform provides useable metrics to open innovation management.

- Goal: Define metrics and provide measurements to open innovation initiatives and projects management.
- Action: Define metrics, take measurements for the metrics, and report them open innovation management.
- Prerequisite: FA1.C.
- References: [1][3][7][9][10][11][13][14].

FA2.E: Use of the open innovation platform is being optimized.

- Goal: Make use of concrete feedback to optimize the use of the platform in open innovation initiatives or projects.
- Action: Define metrics, take measurements for the defined metrics, and use them for optimization purposes.
- Prerequisite: FA1.C (perhaps also FA1.E and FA1.F).
- References: [1][3][7][9][10][11][13][14].

5 CONCLUSIONS AND FUTURE WORK

Given the disruptive nature of the open innovation paradigm, we argue organizations would benefit from guidance in the assessment and improvement of the *readiness* for implementing and deploying an open innovation platform.

In this paper, we proposed a focus-area maturity model with two focus areas and a total of eleven capabilities. An actionable and lightweight maturity model would allow running quick assessment, and getting guidance for improvement, by practitioners in charge of implementing and deploying an open innovation platform.

Our proposal is in an "emerging state", meaning we are still working the model. We regard, at least, three research lines to continue this work. First, we need to develop a method for helping

and guiding the assessment. This approach will also require us we define a set of indicators to aid in the maturity assessment. This method should also provide concrete definitions for marking a capability as achieved or not (e.g., companion checklists). Second, we are interested in the model transfer to the industry, government or, in general, to any organization pursuing opening its innovation process and implementing and deploying an open innovation platform. Finally, we would like to build a library of practices for each one of the capabilities so users of the model would also benefit from more concrete guidance.

At this stage we have evaluated the model in terms of internal and external validity. We have used our previous experience in implementing an open innovation platform in a Chilean University to apply this model in a retrospective way. This evaluation allowed us to improve the model which is, we insist, still subject to many improvements. We expect getting valuable feedback from future applications to support all three future aforementioned research lines.

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REFERENCES

[1] Sabrina Adamczyk, Angelika C. Bullinger, and Kathrin M. Moeslein. 2011. Commenting for new ideas: insights from an open innovation platform. *International Journal of Technology Intelligence and Planning* 7, 3 (Jan. 2011), 232–249.
[2] Jörg Becker, Ralf Knackstedt, and Jens Pöppelbuß. 2009. Developing Maturity Models for IT Management. *Business & Information Systems Engineering* 1, 3 (June 2009), 213–222.
[3] Kevin J. Boudreau and Karim R. Lakhani. 2013. Using the Crowd as an Innovation Partner. *Harvard Business Review* April 2013 (April 2013). https://hbr.org/2013/04/using-the-crowd-as-an-innovation-partner
[4] Henry Chesbrough. 2003. *Open Innovation: The New Imperative for Creating and Profiting From Technology.* Harvard Business School Press.
[5] Henry Chesbrough. 2012. Open Innovation: Where We've Been and Where We're Going. *Research-Technology Management* 55, 4 (2012), 20–27.
[6] T. Erl. 2004. *Service-oriented Architecture: A Field Guide to Integrating XML and Web Services.* Prentice Hall PTR.
[7] Karsten Frey, Christian Lüthje, and Simon Haag. 2011. Whom Should Firms Attract to Open Innovation Platforms? The Role of Knowledge Diversity and Motivation. *Long Range Planning* 44, 5 (2011), 397 – 420. Social Software: Strategy, Technology, and Community.
[8] G. Hohpe, B. Woolf, K. Brown, and M. Fowler. 2004. *Enterprise Integration Patterns: Designing, Building, and Deploying Messaging Solutions.* Addison-Wesley.
[9] Mokter Hossain and K. M. Zahidul Islam. 2015. Ideation through Online Open Innovation Platform: Dell IdeaStorm. *Journal of the Knowledge Economy* 6, 3 (Sept. 2015), 611–624.
[10] Jeremy Howells. 2006. Intermediation and the role of intermediaries in innovation. *Research Policy* 35, 5 (2006), 715 – 728.
[11] Ivar Jacobson, Pan-Wei Ng, Paul McMahon, Ian Spence, and Svante Lidman. 2012. The Essence of Software Engineering: The SEMAT Kernel. *Queue* 10, 10 (Oct. 2012), 40–51.
[12] Tobias Mettler. 2010. Thinking in terms of design decisions when developing maturity models. *International Journal of Strategic Decision Sciences* 1, 4 (January 2010), 76–87.
[13] CMMI Product Team. 2010. *CMMI for Development, Version 1.3.* Technical Report CMU/SEI-2010-TR-033. Software Engineering Institute, Carnegie Mellon University, Pittsburgh, PA. http://resources.sei.cmu.edu/library/asset-view.cfm?AssetID=9661
[14] Chrysanthos Dellarocas Thomas W. Malone, Robert Laubacher. 2010. The Collective Intelligence Genome. *MIT Sloan Management Review* (2010). https://sloanreview.mit.edu/article/the-collective-intelligence-genome/
[15] Marlies van Steenbergen, Rik Bos, Sjaak Brinkkemper, Inge van de Weerd, and Willem Bekkers. 2010. The Design of Focus Area Maturity Models. In *Global Perspectives on Design Science Research*, Robert Winter, J. Leon Zhao, and Stephan Aier (Eds.). Springer Berlin Heidelberg, Berlin, Heidelberg, 317–332.