

A Process Reference Model and a Process Assessment Model to Foster R&D&I Management in Organizations: MGPDI

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Abstract. A strategy to foster innovation in organizations consists of the adoption of a Research, Development and Innovation (R&D&I) management model. This paper describes the MGPDI model focused on Process Improvement & Assessment that is applicable to any organization independently of size, type and activity. This new model is based on: i) requirements based on innovation best practices and Brazilian and Spanish Standards; ii) the ISO/IEC 330xx family of standards for Process Assessment; iii) lessons learned with the Brazilian model (MPS) for software process improvement. The MGPDI model has three components: a Process Reference Model (MR-MGPDI), a Process Assessment Model (MA-MGPDI), and a Business Model (MN-MGPDI). This paper also describes the validation of this model and its pilot implementation and assessment in three Brazilian companies. In addition to its relevance in Brazil, it has a high potential for replication in other countries.

Keywords: Innovation Management. MGPDI Model. Process Improvement & Assessment. R&D&I Management.

1 Introduction

Increasing innovation is essential for organizations to survive and thrive. Essentially innovation can arise in two ways:

- Closed Innovation in which all R&D is done internally seeking to improve the competitiveness of the organization in its current market;
- Open Innovation in which the pursuit of knowledge (not just technology) in R&D is done both externally and internally in the organization seeking to increase their competitiveness either in the current market or in new innovative businesses. In a firm, Open Innovation also can be described as combining internal and external ideas as well as internal and external paths to market to advance the development of new products and services, as shown in Figure 1 [1].

The Closed Innovation model is still used, but now prevails Open Innovation models such as:

- linear innovation without feedback as the Innovation Value Chain model [2];
- innovation based on local productive clusters and regional clusters as the ORIS - Open Regional Innovation System [3];
- innovation systems based on the Triple Helix [4];
- initiatives seeking to increase innovation through commitment of corporations with startups as the Corporate Venture model [5];

- actions taken to foster the R&D&I Management based on Process Improvement & Assessment models as the MGPDI¹ [6, 7].

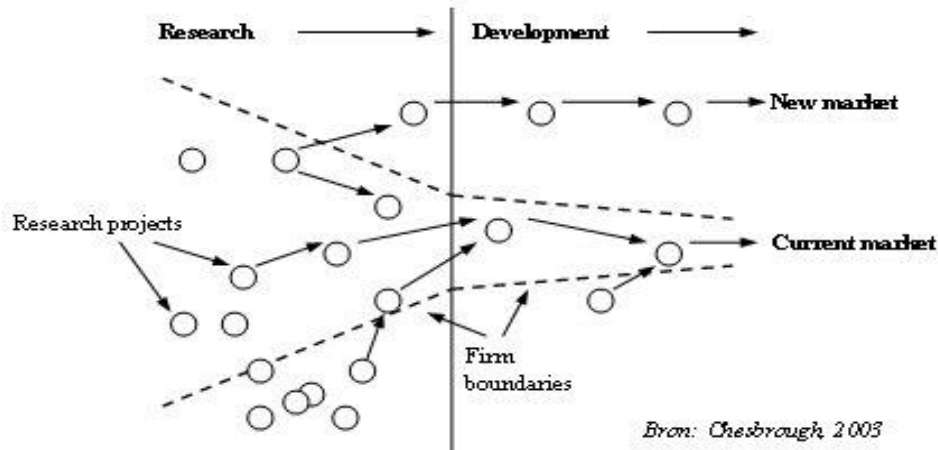


Fig. 1. Open Innovation [1]

This paper describes the creation and validation of the MGPDI, including three pilot practical experiences, which is a new model aiming at Process Improvement & Assessment of the Research, Development and Innovation (R&D&I) management in organizations.

Similar work exists but with a different purpose, e.g. innoSPICE™ is a standard based model for innovation, knowledge- and technology transfer. It is an evaluation procedure that can help knowledge-intensive institutions generate more innovation while helping investors and research institutions optimize public funds to achieve economic added value [8].

SOFTEX – a software industry association < www.softex.br/mpsbr/ > – since December 2003 has been performing successfully the MPS.BR Program aiming at creating and commercializing in Brazil and abroad a successful Software Process Improvement model named MPS (*Melhoria do Processo de Software*, in Portuguese) [9, 10].

In 2015, based on lessons learned in the MPS.BR Program and with the MPS Model for software process improvement, SOFTSUL² – a SOFTEX Agent – decided to transform its already existing MGPDI Methodology into the new MGPDI Model - a process model to foster the R&D&I Management in organizations.

In 2015-2016 this new MGPDI Project had two goals:

- a technical goal aiming at the definition of both a PRM – Process Reference Model and a PAM – Process Assessment Model;
- a market goal aiming at performing MGPDI pilot implementation and assessment in organizations.

Thus actual research work on the MGPDI model comprehended the creation of the PRM MR-MGPDI and the PAM MA-MGPDI, which were documented in a General Guide and an Assessment Guide respectively, including the validation of the new model in three pilot implementations and assessments in Brazilian organizations.

Next, section 2 describes Process Improvement & Assessment and the MGPDI model, highlighting its PRM and PAM. Section 3 presents the main achieved results in pilot MGPDI implementations and assessments in three Brazilian companies. Section 4 brings our final considerations.

¹ MGPDI™ (*Modelo de Gestão da Pesquisa, Desenvolvimento e Inovação*, in Portuguese) is a trademark registered at INPI < <http://www.inpi.gov.br/english> >, owned by SOFTSUL.

² SOFTSUL < www.softsul.org.br > is a Brazilian private, non-profit organization created in 1994 aiming at the socio-economic development and the increase of the competitiveness of organizations ICT-intensive, not only ICT companies. SOFTSUL has a Technology Development Center (CTEC) and has large experience in project coordination in the country and abroad, including Inter-American Development Bank (IDB) projects and the CONECTA 2020 project of the EU HORIZON 2020 Program.

2 Process Improvement & Assessment and the MGPDI Model

This section presents the basics of Process Improvement & Assessment based on the ISO/IEC 330xx family of standards [11], but it mainly describes the MGPDI Model highlighting its PRM and PAM, including the validation of this new process model. The section also describes succinctly two software tools to support MGPDI implementation and assessment in organizations, and the MGPDI Business Model.

2.1 Process Improvement & Assessment

ISO/IEC 33001 [12] defines:

- Process Improvement as actions taken to improve the quality of the organization's processes aligned with the business needs and needs of other concerned parties;
- Process Assessment as a disciplined evaluation of an organizational unit's processes against a process assessment model;
- Process Profile as a set of process attribute ratings for an assessed process.

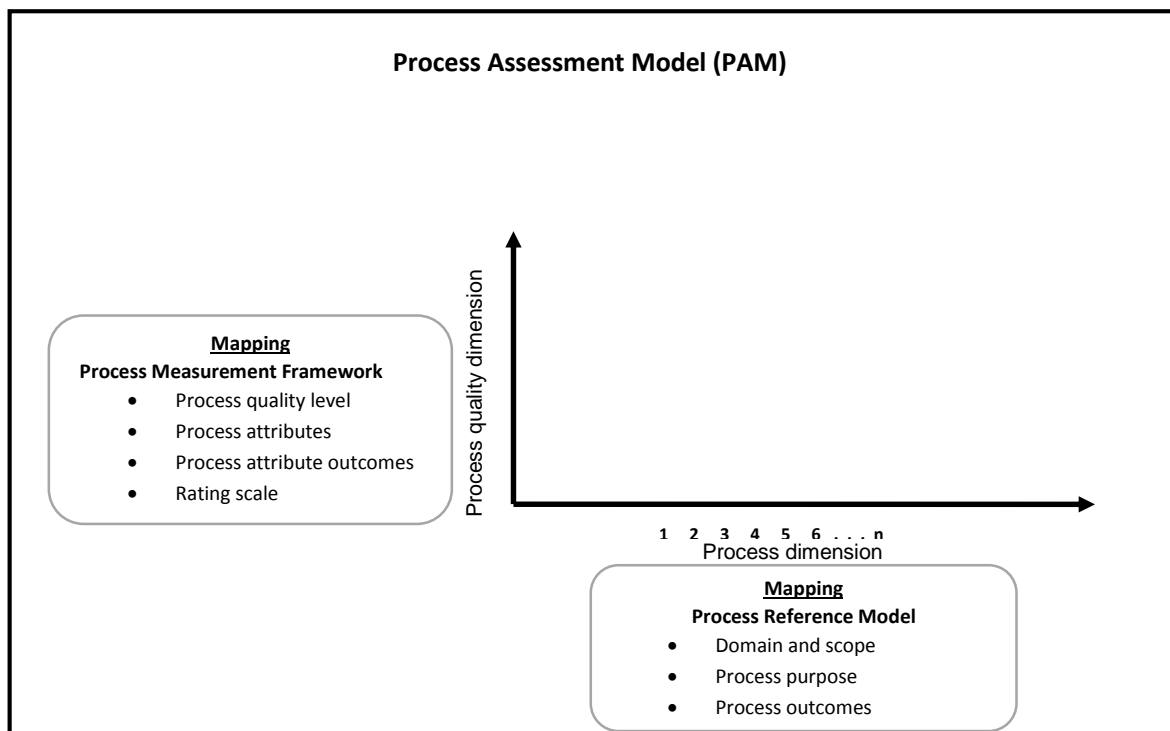


Fig. 2. Process Assessment Model relationships (ISO/IEC 33001:2015. p.12) [12]

Figure 2 depicts that the two-dimensional PAM – Process Assessment Model consists of a set of processes defined regarding their purpose and process outcomes (mapping a PRM – Process Reference Model), and a Process Measurement Framework which contains a set of process attributes related to the process quality characteristic of interest.

In the process quality dimension, the process capability is determined by a set of process attribute (PA) outcomes. PAs are measurable properties of a process quality characteristic. They are accumulative and required for all processes. They may be grouped into process quality levels that may be used to characterize the process.

The assessment output includes a set of process profiles and optionally a process quality level rating for each process assessed. To maximize the repeatability, reliability, and consistency of assessments, documented evidences justifying the ratings must be recorded and retained. These evidences are in the form of assessment indicators, which typically take the form of objectively demonstrated characteristics of work products, practices and resources associated with the processes assessed. A process assessment model contains details of the assessment indicators to be used.

2.2 MGPDI™: From an Existing Methodology to a New Process Model

In 2008 SOFTSUL launched MGPDI as a methodology based on innovation best practices such as Frascati Manual – OECD [15], Oslo Manual – OECD [16], Open Innovation [1], GoInnovate [17], TRIZ – the Russian acronym for the “Theory of Inventive Problem Solving” [18], Risk Management, and Knowledge Management.

The MGPDI methodology development was supported by FINEP (*Financiadora de Estudos e Projetos*, in Portuguese, or Funding Authority for Studies and Projects) <www.finep.gov.br/>.

In 2011-2012, SOFTSUL gave courses on the MGPDI Methodology in several Brazilian cities. This has been supported by CNPq (*Conselho Nacional de Desenvolvimento Científico e Tecnológico*, in Portuguese, or National Council for Scientific and Technological Development) <www.cnpq.br/>.

In 2014 the MGPDI Methodology activities were reactivated in the framework of a Cooperation Agreement SOFTSUL-UNOCHAPECÓ < www.unochapeco.edu.br >.

In 2015, under the MGPDI Project, the existing MGPDI Methodology (*Metodologia de Gestão da Pesquisa, Desenvolvimento e Inovação*, in Portuguese) was the basis to develop the new MGPDI Model (*Modelo de Gestão da Pesquisa, Desenvolvimento e Inovação*, in Portuguese) to foster the R&D&I Management in organizations. Lessons learned from the successful Brazilian MPS Model for Software Process Improvement were very useful [9, 10].

The strategic and executive management of the MGPDI Project is based on:

- innovative ideas on the management of services [19, 20];
- the Logical Framework Approach (LFA) [21].

The MGPDI Project organizational structure comprises:

- a Project General Coordination (*CGP – Coordenação Geral do Projeto*, in Portuguese) integrated by the MGPDI stakeholders which meet half-yearly by Skype;
- a Project Performing Unit (*UEP – Unidade de Execução do Projeto*, in Portuguese) with five members, including the SOFTSUL CEO, which meet monthly by Skype;
- an Executive Project Coordination (*CEP – Coordenação Executiva do Projeto*, in Portuguese) with a senior consultant in charge;
- a Model Technical Team (*ETM – Equipe Técnica do Modelo*, in Portuguese) integrated by experts on Process Improvement & Assessment and R&D&I Management, invited by SOFTSUL, which is responsible to develop and maintain the model, and to prepare and execute people training;
- a Front Stage Collaborators network (*rede CLF – Colaboradores na Linha de Frente*, in Portuguese), which is composed by MGPDI implementation consultants, assessors, auditors and instructors [19, 20].

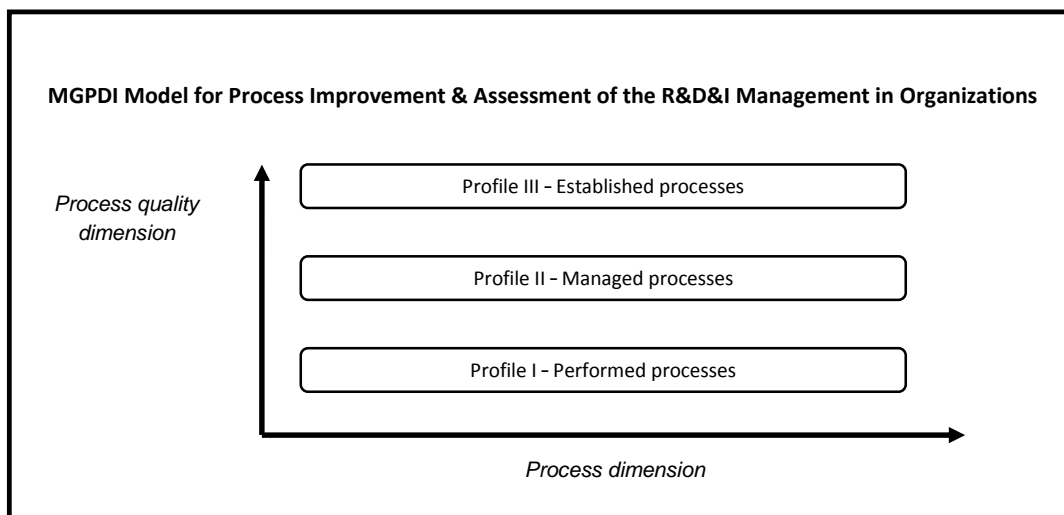


Fig. 3. MGPDI process profiles

As depicted in Figure 3, the MGPDI Model is based on the concepts of Process Improvement & Assessment. The model has two dimensions: process dimension and process quality dimension. It comprehends three process profiles (profile I – Performed processes, profile II – Managed processes, and

profile III – Established processes). This new process model was designed so that the capability in the profile I progressively provides the basis for improving the process quality level in the profiles II and III, idem from the profile II to the profile III.

In the MGPDI model the basic rule is "no one can assess the processes in the same organization where he/she had been an implementation consultant and vice versa".

Figure 4 shows that the MGPDI Model has three components:

- the MGPDI Process Reference Model (MR-MGPDI) is a PRM based on requirements related to the innovation best practices of the existing MGPDI Methodology, and on requirements of Standards such as the Brazilian ABNT NBR 16501 [22] and the Spanish AENOR UNE 166001-166002 [23, 24] for the management of R&D&I in organizations. The PRM MR-MGPDI is described in the General Guide [25], a publicly available document at the softsul/mgpdi Website <http://softsul.org.br/mgpdi/wp-content/uploads/2015/10/GUIA-GERAL-MGPDI.pdf>;
- the MGPDI Process Assessment Model (MA-MGPDI) is a PAM based on the family of standards ISO/IEC 330xx [12] for process assessment. It is described in the MGPDI Assessment Guide [26], a publicly available document at the softsul/mgpdi Website <http://softsul.org.br/mgpdi/wp-content/uploads/2015/10/GUIA-DE-AVALIAÇÃO-MGPDI.pdf>;
- the MGPDI Business Model (MN-MGPDI) with the business rules to commercialize MGPDI courses/exams, implementations and assessments, which is described in a restricted document published at the softsul/mgpdi Website but only available to whom that has an username and a password to access it.

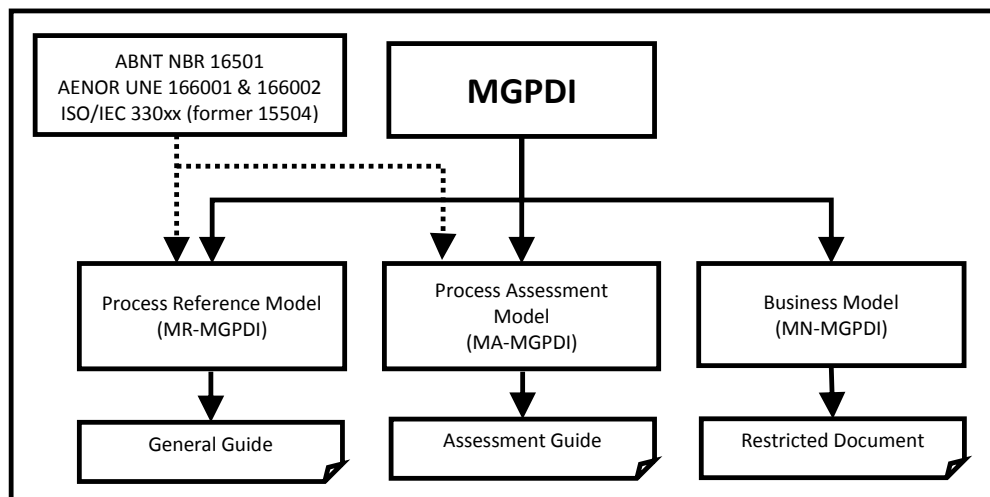


Fig. 4. MGPDI components

2.3 PRM – Process Reference Model (MR-MGPDI – *Modelo de Referência de Processos do MGPDI, in Portuguese*)

The purpose of a PRM – Process Reference Model is to define a set of processes that can collectively support the primary aims of a community of interest. According to ISO/IEC 33004 [13], a PRM must contain:

- a declaration of the domain of the PRM;
- a description of the relationship between the PRM and its intended context of use;
- descriptions of the processes within the scope of the PRM;
- a description of the relationship between the processes defined within the PRM.

The domain of the MGPDI Process Reference Model (MR-MGPDI) is the management of Research, Development and Innovation (R&D&I). Its community of interest comprehends both practitioners, instructors, implementers and assessors of the MGPDI model, and students, professors and researchers interested in the theme of Process Improvement & Assessment in the Academia.

The MGPDI General Guide provides a general description of the MGPDI model and details both the Process Reference Model (MR-MGPDI), and the common definitions that are necessary to its understanding and application [25].

Table 1 shows that the MGPDI Process Reference Model (MR-MGPDI) comprehends three areas, 13 processes and their respective purposes. For each process this PRM also defines the process outcomes (not presented here due to limitation of space).

Table 1. MR-MGPDI areas, processes and purposes.

Area	Process	Purpose (To establish and maintain...)
Innovation	1. GIO – Innovation Management	...the context and the qualification of innovative ideas.
	2. GPE – Research Management	...new knowledge from research in innovation.
	3. EIN – Innovation Strategy	...a strategic innovation plan and to define a set of significant techniques and tools to support the management of innovative business.
	4. GCI – Innovation Cycle Management	...the processes related to the management of the innovation cycle.
	5. GPP – Intellectual Property Management	...activities regarding patents, transfers and records on innovation.
Management	6. GPI – Innovation Project Management	...each innovation project.
	7. GRI – Risk Management	...the uncertainties and risks that may occur during the project.
	8. GPO – Portfolio Management	...innovations and projects that are necessary, sufficient and sustainable in order to meet the strategic objectives of the organization.
Support	9. GOV – Governance	...governance initiatives creating a favorable environment for innovation in organizations.
	10. GIN – Indicator Management	...the indicators that can measure and assess innovation management in organizations.
	11. GCO – Configuration Management	...the integrity of versions of items related to the process work products.
	12. GQU – Quality Management	...a set of definitions and factors related to the quality of process work products.
	13. GMU – Change Management	...activities and responsibilities to ensure the integrity of the model allowing that suggestions for improvements and exception treatments can be implemented.

As you can see in Table 1, there is no a process neither a purpose (nor an outcome) explicitly related to Open Innovation. But there are several Open Innovation best practices related to these areas, processes, purposes and outcomes that can be used by the organizations.

Some of these best practices are used as assessment indicators. For instance, those related to the Idea Generation through collaboration. A report identified 11 Open Innovation best practices based on research into how leading companies are tapping external sources of expertise. These best practices are categorized into four principle areas: strategies, roles, processes, and measurement/improvement [27].

The top three best practices highlighted by the report are:

- establishing a central and dedicated group to drive Open Innovation (75% of the surveyed best practice companies have staff members specifically dedicated to pursuing and deploying Open Innovation strategies);
- partnering broadly across a variety of external and internal organizations;
- inviting participation in Open Innovation via experiences.

Among the other best practices revealed by the report are:

- position your organization to build and manage key relationships;
- embrace broad and specific scouting for new ideas;
- use change management to drive commitment to Open Innovation.

2.4 PAM – Process Assessment Model (MA-MGPDI – *Modelo de Avaliação de Processos do MGPDI, in Portuguese*)

According to ISO/IEC 33001 [12], a PAM – Process Assessment Model is a model suitable for the purpose of assessing a specified process quality characteristic, based on one or more process reference model. According to ISO/IEC 33020 [14], a PAM is based in a set of assessment indicators that:

- explicitly address the purpose and process outcomes of a PRM;
- demonstrate the achievement of the process attributes within the scope of the PAM;
- demonstrate the achievement (where relevant) of the process quality levels within the scope of the PAM.

The community of interest of the PAM MA-MGPDI is the same as the PRM MR-MGPDI, but it mainly includes those interested in process assessment based on the ISO/IEC 330xx family of standards [11].

The MGPDI Assessment Guide describes this assessment process detailing its activities, tasks, tools, artifacts, assessment participants, process quality levels and rating scale [26].

Table 2 summarizes the PAM MA-MGPDI profiles, processes and process attributes. The new processes and process attributes in Profile II and II are bolded.

Table 2. PAM MA-MGPDI profiles, processes and process attributes

Profile	Process	Process Attributes (PA)
I - Performed processes	GIO – Innovation Management GPI – Innovation Project Management GIN – Indicator Management GOV – Governance GPE – Research Management	PA 1.1: Process is performed
II – Managed processes	GIO – Innovation Management GPI – Innovation Project Management GIN – Indicator Management GOV – Governance GPE – Research Management GRI – Risk Management EIN – Innovation Strategy GCI – Innovation Cycle Management GMU – Change Management GCO – Configuration Management GQU – Quality Management GPO – Portfolio Management	PA 1.1: Process is performed PA 2.1-2.2: Process performance and work products are managed
III – Established processes	GIO – Innovation Management GPI – Innovation Project Management GIN – Indicator Management GOV – Governance GPE – Research Management GRI – Risk Management EIN – Innovation Strategy GCI – Innovation Cycle Management GMU – Change Management GCO – Configuration Management GQU – Quality Management GPO – Portfolio Management GPP – Intellectual Property Management	PA 1.1: Process is performed PA 2.1-2.2: Process performance and work products are managed PA 3.1-3.2: Process is defined and deployed

Remark. Based on the ISO/IEC 33020 [14], the capability of the MGPDI model could still be expanded with the addition of the following process attributes: "PA 4.1-4.2: Quantitative analysis and quantitative control of processes" creating the profile IV – Predictable process; "PA 5.1-5.2: The innovation processes are being optimized" creating the profile V – Optimizing innovation process. Although we have good knowledge of these two higher profiles from the lessons learned with the Brazilian MPS model [9,10], we decided not include them now due to the adoption of a 'divide to conquer' strategy.

As shown in Figure 5, the MGPDI Process Assessment Model (MA-MGPDI) also defines a MGPDI Assessment process which comprehends four steps: 1 – Enable assessment, 2 – Remote pre-assessment, 3 – Visit the organizational unit, and 4 – Conclude assessment, that make up a set of activities to be performed during the assessment in each organization as well as the key outputs that should be generated and informed. The MGPDI Assessment process begins with the notice of an assessment and ends when the organizational unit returns the feedbacks about the implementation and assessment processes, so the assessment results can be published at softsul/mgpdi Website (http://softsul.org.br/mgpdi/?page_id=56&lang=pb).

Each MGPDI assessment has a validity period of three years. During this term there are two annual follow-ups, respectively at the end of first and second years.

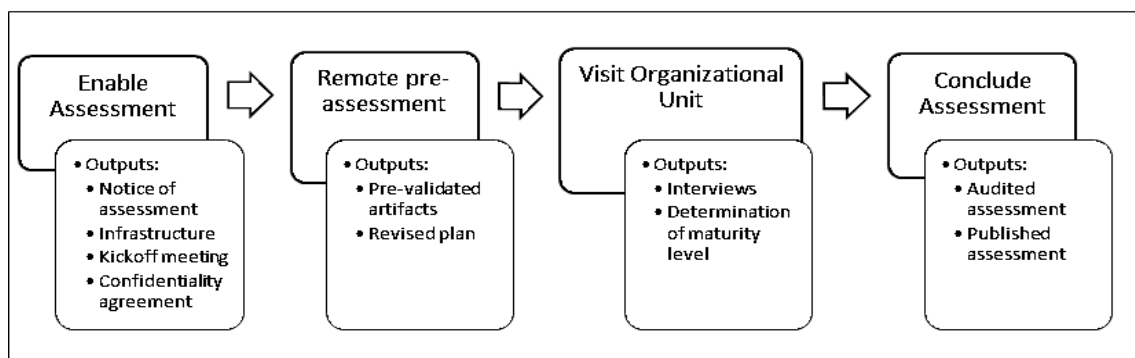


Fig. 5. Steps of the MGPDI Assessment process

2.5 MGPDI Support Tools

There are two online software tools to support respectively the MGPDI implementation and assessment in organizations.

- **SGPDI Implementation Tool**

In the MGPDI there is a software tool named SGPDI (*Sistema de Gestão da Pesquisa, Desenvolvimento e Inovação*, in Portuguese) to provide a work environment integrated with the innovation process and to support its implementation. It is available at (http://www.softsul.org.br/mgpdi_base/).

This software includes the steps of identification, design, and validation of an innovative idea and assists in the development and implementation of innovation projects, including risk monitoring. It also provides user's authentication and secure access control. All activities implemented in organizations that use the MR-MGPDI have their data stored safely in the SGPDI system.

- **Appraisal Assistant - AA**

The software tool 'Appraisal Assistant - AA' was configured to support the Assessment Team in MGPDI assessments, aiming at measuring the process outcomes and the process attribute outcomes in organizations. This tool has an approach based on the validation of pieces of evidences, visualization of processes by profile, and generation of assessment reports. It is available at (<https://www.sqi.griffith.edu.au/AppraisalAssistant/about.html>).

Thus it is possible to make reviews based on the MGPDI model requirements and to identify weaknesses in the implemented innovation processes, providing assessment feedbacks that point to improvement opportunities in each assessed organization. The assessment feedbacks of all assessed organizations also contributes to improve the assessment process and the MGPDI Model.

2.6 Validation of the new MGPDI Model

The PRM MR-MGPDI was conceived by the ETM-MGPDI (Model Technical Team) and a draft version of the MGPDI General Guide was available in October 2015 to support the three pilot implementations of the MGPDI Profile I – Performed processes from November 2015 and June 2016.

The PAM MA-MGPDI was created by the ETM-MGPDI and a draft version of the MGPDI Assessment Guide was available in September 2016 to support the three pilot assessments of the MGPDI Profile I – Performed processes from October and December 2016.

The main conclusion of this two-years work is that the MGPDI model was validated as adequate to its purpose, which is to contribute effectively to foster the R&D&I management in organizations.

In December 2016 there were published at the softsul/mgpdi Website the first version of the MGPDI General Guide [25] and MGPDI Assessment Guide [26].

Some lessons learned were raised by the team of MGPDI implementation consultants and assessors:

- some improvements should be made in the MGPDI General Guide to clarify some process outcomes and overlapping;
- the SGPDI Implementation tool needs to be interface improved to increase the usability;
- a map between the Process & Process Attribute outcomes and the SGPDI Implementation tool can be done to facilitate the implementation and assessment;
- training in the use of the AA tool should be carried out and several descriptive fields need to be standardized to generate standards reports;
- the remote pre-assessment has promoted interaction between the assessors and the organizational unit team. This mechanism proved to be efficient and economical without lose the quality of the assessment.

2.7 Business Model (MN-MGPDI – *Modelo de Negócio do MGPDI*, in Portuguese)

The Business Model MN-MGPDI is the component of the MGPDI model related to its trade practices and culture. It only concerns to the purpose of commercialization (*Go2Market*) of the MGPDI model, including marketing, value proposition, target customers, business process, suggested prices (reference values), offerings, strategies, infrastructure, organizational structures, operational processes and policies.

Business rules are described in the MGPDI Business Model (MN-MGPDI) both to support the commercialization of MGPDI implementations/assessments/annual follow-ups, and the offering of MGPDI courses/exams.

The MN-MGPDI comprises:

- a cooperated Business Model (MNC-MGPDI) suitable for groups of small and medium enterprises (SMEs) that want to share costs and part of the efforts;
- a specific Business Model (MNE-MGPDI) suitable for private and public organizations that prefer exclusive attendance.

3 Implementing and Assessing the MGPDI Model in Organizations

This section reports three pilot practical experiences of MGPDI implementations and assessments in organizations in the Southern Region of Brazil.

3.1 Companies that Adopted the MGPDI Model in 2015-2016 (Pilot A – MGPDI Profile I)

In 2015-2016 the new MGPDI model was created and it was documented in beta versions of the MGPDI General Guide and the MGPDI Assessment Guide.

In this period, under SOFTSUL coordination, the first people were trained to act as implementation consultants and assessors in organizations that want to adopt the MGPDI model. In 2016, a beta version of the course C3 – MGPDI Assessment was created to begin the training of new assessors.

The implementation of the MGPDI model, profile I, in these three companies has taken from November 2015 and June 2016.

Table 3 summarizes some demographic characteristics of the organizations that adopted the MGPDI Model in the three MGPDI implementation and pilot projects.

Table 3. Organizations that adopted the MGPD I Model in 2015-2016 (Pilot A – MGPD I Profile I)

Company	A	B	C
Location	Porto Alegre-RS, Brazil	Porto Alegre-RS, Brazil	Chapecó-SC, Brazil
Industry	Software	ICT	Software
Public or private	Private	Private	Private
Small, medium or large enterprises *	Medium	Small	Small
Approx. company annual revenue * (USD 1 = R\$ 3)	Greater than USD 1,2 million and less than or equal USD 100 million	Greater than USD 120 thousand and less or equal to USD 1,2 million	Greater than USD 120 thousand and less or equal to USD 1,2 million
Approx. number of staff	38	31	23
Product portfolio	<p>DRS-Audience - Tool for recording audio, video and text of court hearings</p> <p>DRS-Plenary - Plenary session recording tool, audio and video distribution with shorthand management</p> <p>DRS-Inquiry - Tool for audiovisual recording of testimony and expertise in police investigations</p>	<p>Self-Service Terminals - Product with modern design that adapts to various types of environments</p> <p>Thin Client - Compact CPUs with integrated network processing</p> <p>Mini PC - Solution for applications that need a better balance between CPU performance and multimedia</p> <p>POS Fusion Touch - Screen with Touch SAW technology that provides usability in harsh environments (kitchens, dusty environments, etc.) where other Touch technology is inefficient</p> <p>Digital Signage (DS) - Products for total visual communication with the public of commercial companies</p>	<p>Slim ERP - Solution with a focus on solving all problems in a single system</p> <p>Middle ERP - Solution that works by creating control parameters for: taxes, processes and use</p> <p>High End ERP - Full ERP based on simplicity and customer focus with features beyond what a system presents</p>

* Remark. BNDES criteria (<http://www.bndes.gov.br/wps/portal/site/home/financiamento/guia/quem-pode-ser-cliente>).

Table 4 summarizes the results of the process assessments in these organizational units. All the organizations achieved the Profile I – Performed processes.

Table 4. Assessment Results of the Organizational Units

Process	Process Purpose (rating)			Process Attribute AP 1.1 (rating)			Final Result		
	Company			Company			Company		
	A	B	C	A	B	C	A	B	C
GIO – Innovation Management	F	F	F	F	F	F	SATISFIED Profile I	SATISFIED Profile I	SATISFIED Profile I
GPI – Innovation Project Management	F	F	F	F	F	F			
GIN – Indicator Management	F	F	F	F	F	F			
GOV – Governance	F	F	F	F	F	F			
GPE – Research Management	F	F	F	F	F	F			

Remark. Rating used: F: Fully Achieved, L: Largely Achieved, P: Partially Achieved, N: Not Achieved

Table 5 highlights the outcomes of two indicators related to the GIN – Indicator Management process assessed in the three companies. These innovation indicators did not exist in these companies before the adoption of the MGPDI model.

Table 5. MGPDI Assessed Indicators

Assessed indicator	Company A	Company B	Company C
Number of new Ideas	-	19	60
Index of Ideas that become projects	14%	31,5%	51,6%
Index of Innovation Projects completed in time	80%	-	-

3.1.1 Company A

In this company the MGPDI assessment comprised a remote pre-assessment on Nov 22, 2016, and a visit to the Organizational Unit on Dec 9, 2016.

Company A is a well-structured company in the area of Quality, with certifications such as ISO 9000, CMMI and MPS.BR. Thus, the profile I of the MGPDI model was incorporated into the existing Quality Management system, which deals with Process Improvement & Assessment and already defined innovation processes, named differently and with other approaches.

The company IT Director was the assessment sponsor and he sent the following testimony as a feedback: “Our company always valued and guaranteed the quality of its products and services based on the main Market Certifications. Thus, starting from this premise, the MGPDI model emerged both to continue the improvement of our processes and now to assess and certify our technological differential, which are the R&D and Innovation projects. We consider this new model to be very complete and productive, from implementation to assessment, and now we are motivated and focused on its adoption aiming at continuous improvement, which will bring relevant results to our company.”

3.1.2 Company B

In this company the MGPDI assessment comprised a remote pre-assessment on Aug 5, 2016, and a visit to the Organizational Unit on Nov 9, 2016.

In Company B. two employees were selected to be the Innovation Leaders, under the supervision of the Quality Director. The fact of having two Innovation Leaders favored the Governance process (GOV) and brought a particular aspect about the distribution of roles and responsibilities to the implementation and assessment.

The company CEO was the assessment sponsor and he sent the following testimony as a feedback: “Our organization was born from the development of a bank check printer. At that time this was an innovation. Since then, throughout its 26 years, the company has been evolving by the development of new products and it has in its DNA a very strong bias for innovation. However, there was a lack of a methodology or model that could organize the innovation management and control all stages of the innovation processes, from the idea to its implementation and assessment, including measurements through indicators. For a long time, we have looked for management models that could meet our need. Knowing the MGPDI, I realized that this model had everything we were needed. The best was to realize that, even in the course of its implementation and assessment in our company, this model not only answered us positively but it exceeded all our expectations.”

3.1.3 Company C

In this company the MGPDI assessment comprised a remote pre-assessment on Oct 10, 2016 and a visit to the Organizational Unit on Oct 31, 2016 - so this was the first organization to achieve the MGPDI “certification”.

Company C had already dealt with innovation processes, but these were not organized and were not managed, and had not been able to measure the innovation improvements.

A company Director was the assessment sponsor and she sent the following testimony as a feedback: “For 17 years, since the founding of our company, one of our values has been innovation. However the challenge of promoting innovation within companies is to create a culture and practice it with employees. So we saw in the MGPDI model a way of organizing innovation management. We adopted this new model

and we already perceived great differences because we started to measure employees' activity in a more efficient way, bringing new ideas that were latent within the company. Also, we saw the possibility of interacting with the market, involving customers so that they live with us this new way of managing companies. The adoption of the MGPDI model (profile I) is being very effective, but we know that there is a road to be covered from the profile I to higher ones.”

4 Final Considerations

This paper described the MGPDI Model that was created in Brazil in 2015-2016 to conduct Process Improvement & Assessment aiming to foster the management of the R&D&I in organizations, independently of their size, type and activity – not only ICT companies, highlighting:

- its PRM – Process Reference Model (MR-MGPDI) and PAM – Process Assessment Model (MA-MGPDI), including the validation of the MGPDI Model;
- three pilot implementations and assessments in Brazilian companies of the software & ICT industries.

Thus this research work (creation and validation of the MGPDI model aiming at fostering the R&D&I management in organizations), including its pilot practical experience (implementations and assessments of the new model in three Brazilian organizations), has contributed to the body of knowledge in Process Improvement & Assessment.

In addition to its relevance to Brazilian organizations, this new model has a high potential for replication in other countries - firstly in Portuguese and Spanish speaking countries, and later in English-speaking countries as the model is re-written in English.

The new MGPDI model was conceived and developed as a whole but a limitation is that only was detailed the Profile I – Performed processes. The Profile II – Managed processes and the Profile III – Established processes will be detailed in 2017 based on lessons learned until now.

As next steps, the 2017 MGPDI Annual Plan foresees:

- a complete revision of the MGPDI General Guide to detail both Profile II and Profile III;
- the consequent fixes in the MGPDI Assessment Guide;
- the development of a beta version of the MGPDI Implementation Guide aiming at providing non-prescriptive guidelines for the Implementation Consultants;
- the training of 12 (twelve) people - with good experience in Process Improvement & Assessment both on the Brazilian MPS model and the CMMI - aiming to qualify them as new MGPDI Instructors and Implementation Consultants.

But the main challenge in 2017 is to begin an initial offer (*Go2Market*) of:

- the MGPDI model (Profile I – Performed processes) in the marketplace, both in Portuguese in the five Brazilian regions and in Spanish in Latin America and the Caribbean (LAC) countries, seeking totalize over 12 (twelve) MGPDI implementations and assessments in organizations;
- course and exam C1/P1 – MGPDI Introduction both face-to-face and online distance learning.

Last but not least we hope that this paper can contribute to a better understanding of R&D&I management in organizations, either by practitioners, instructors, implementers and assessors of this new [process model, or at the Academia by students, professors and researchers interested in Process Improvement & Assessment, and also to foster the diffusion of the SPICE-based process assessments.

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