

# Benefits and Limitations of Using the MPS.BR Model with Agile Methodologies

## A Survey Based on a Systematic Literature Review

Robson Amorim de Souza

Department of Computer Science  
Mato Grosso State University, UNEMAT  
Barra do Bugres, Brazil  
robson.unemat@gmail.com

Fernando Selleri Silva

Dept. of Computer Science, Mato Grosso State University  
Center of Informatics, Federal University of Pernambuco  
Barra do Bugres, Recife, Brazil  
fss4@cin.ufpe.br

Felipe Santana Furtado Soares and Silvio Romero de Lemos Meira

Center of Informatics, Federal University of Pernambuco, UFPE  
Recife Center of Advanced Studies and Systems, C.E.S.A.R  
Recife, Brazil  
fsfs@cin.ufpe.br, srlm@cin.ufpe.br

**Abstract**— This paper investigates the benefits and limitations of using the Reference Model for the Improvement of the Brazilian Software Process (MPS.BR) with agile methodologies. A survey of the Brazilian and international literature was performed, which used the concepts of a systematic literature review. Altogether 21 studies were included on the subject, viz., 12 articles, 1 Master’s dissertation, 3 dissertation from post-graduate courses, 4 end-of-course undergraduate monographs, and 1 report arising from an undergraduate traineeship. Based on the results presented in the studies, agile methodologies and their practices were found to be feasible used in serving the initial levels of MPS.BR, but for the highest levels of the model, additional practices must be used.

**Keywords**-MPS.BR; Brazilian SPI Model; Agile Methodologies; Suitability.

### I. INTRODUCTION

Ensuring that their products or services are of good quality is essential if organizations have to survival on the market. Generally, this quality is related to the production processes of the product/service. In the context of Information Technology, all software must be of good quality, both in the development process and the product itself. In order to establish Software Process Improvement (SPI), various software development organizations are looking for quality reference models available on the market, such as: ISO/IEC 90003 - Guidelines for the application of ISO 9001:2000 to computer software [1], ISO/IEC 12207 - Software Life Cycle Processes [2], CMMI - Capability Maturity Model Integration [3], and MPS.BR - Brazilian Software Process Improvement [4]. However, quality models, generally, establish firstly “what” needs to be done in order to engage on demanding processes and secondly, methodologies for developing software that indicate “how” to do so.

Agile methodologies for use in software development became widely known from 2001, when a group of professionals, from the software area, assembled and published the Manifesto for Agile Software Development, also known as the Agile Manifesto [5]. These methodologies aim to develop software with high quality, iteratively and incrementally, thereby stimulating team interaction, with less documentation, and aim at meeting deadlines, costs and quality standards. Among various agile methodologies, the most used are Scrum and Extreme Programming (XP) [6].

In this context, this paper sets out to discuss by means of a survey of the literature that uses the concepts of a Systematic Literature Review, the Reference Model (RM) for Improving the Brazilian Software Process (MPS.BR) together with agile methodologies for software development. The following research question was considered: *What is known about the benefits and limitations of adopting the MPS.BR reference model using agile methodologies?* Further, the paper seeks to characterize academic production on the Brazilian model of quality assurance, together with agile methodologies.

The paper is organized in five sections. Section 2 gives a brief theoretical description of the MPS.BR model and agile methodologies. Section 3 describes the methodology used. Section 4 reports the results, and comments on benefits and limitations. Conclusions are drawn and recommendations for future work are made in Section 5.

### II. THEORETICAL BACKGROUND

Initially, the MPS.BR model will be briefly described; then, the main concepts regarding agile methodologies are presented.

#### A. MPS.BR

MPS.BR is a Brazilian Software Process Improvement Program that was created in December 2003, by the

Association for Promoting Excellence in Brazilian Software (SOFTEX), with the support of several public and private organizations in Brazil, including: the Ministry of Science and Technology (MCT), an Agency that Funds Studies and Projects (FINEP), and the Inter-American Development Bank (IDB) [4]. MPS.BR aims to assist organizations, particularly small and medium-sized Brazilian companies, to achieve good quality in software development, in a smoother and less expensive way.

The MPS.BR program proposes the SPI Reference Model for Software (MR-MPS-SW), which defines seven maturity levels for the software process of an organization [4]: In descending order, these are A (In Optimization), B (Quantitatively Managed), C (Defined), D (Largely Defined), E (Partially Defined), F (Managed), and G (Partially Managed). For each maturity level, a profile of processes is assigned that suggests where the organization must make efforts to improve, as described below (for which the acronym is given in Portuguese, in brackets): In ascending order of maturity level, these are:

- Level G: Project Management (GPR) and Requirements Management (GRE).
- Level F: Acquisition (AQU), Configuration Management (GCO), Quality Assurance (GQA), Project Portfolio Management (GPP), and Measurement (MED).
- Level E: Evaluating and Improving the Organizational Process (AMP), Defining the Organizational Process (DFP), Human Resources Management (GRH), and Reuse Management (GRU).
- Level D: Requirements Development (DRE), Product Integration (ITP), Product Design and Construction (PCP), Validation (VAL), and Verification (VER).
- Level C: Development for Reuse (DRU), Management Decisions (GDE), and Risk Management (GRI).
- Level B: Project Management (GPR – evolution).
- Level A: (process optimization).

**B. Agile Methodologies**

Agile methodologies refer to approaches of software development used by organizations that focus on flexible collaboration, as they deal with projects in which requirements change constantly. Their core values were defined in the Agile Manifesto [5], as: individuals and interactions over processes and tools, working software over comprehensive documentation, customer collaboration over contract negotiation, and responding to change over following a plan.

Among the main agile methodologies, especially in Brazil, Scrum and Extreme Programming (XP) are foremost [7], the focus on each is as follows:

- Scrum: its focus is on managing software development, through an iterative and incremental process. It aims to deliver software in the shortest time, to meet deadlines and to reduce costs [8].

- Extreme Programming (XP) focuses on the development of a specific piece of software, by providing a set of practices that addresses the different phases of the life cycle, in an incremental and iterative format [9].

**III. REVIEW METHOD**

A survey of the literature on the MPS.BR model and agile methodologies cited in Brazilian and international sources was conducted, using the concepts of a Systematic Literature Review, described in Kitchenham and Charters [10]. This is a way to identify, evaluate and interpret the relevant papers available on a research question in particular, a topic area or phenomenon of interest. The systematic review process generally consists of identifying a research study by using a protocol (described in this section), study selection, quality assessment, data extraction and synthesis.

In this article, we used the stage of study selection, which includes (automatic and manual) search and the application of inclusion/exclusion criteria, as described below. Due to the limit on the available resources, the stage of quality assessment was suppressed. Data extraction and synthesis stages were performed, the findings of which revealed benefits and limitations.

We chose to search, in addition to articles published in journals and conferences, academic studies (works from undergraduate and post-graduate courses, Master’s dissertations and PhD thesis). Although in the systematic review process, inclusions such as these are not common, mainly due to the review process being less formal, academic studies were considered because this enabled ongoing research in the area to be mapped.

**A. Search for studies**

The first activity for the search was to formulate a string, which makes an automatic search feasible. This string was set taking into account the research question addressed in Section 1, from which were derived the key terms, their synonyms or related words, as shown in Table 1.

TABLE I. TERMS USED IN SEARCHES

Term	Synonyms or related words
“MPS.BR”	“MPSBR”, “MPS BR”, “MPS-BR”, and “Brazilian software process improvement”
“process”	“method” and “methodology”
“agile”	“agility”, “light”, “scrum”, “extreme programming”, “XP”, “dynamic system development”, “DSDM”, “crystal”, “kanban”, “feature driven development”, “FDD”, “lean”, “adaptive software development”, “ASD”, “test driven development”, and “TDD”

The terms and their synonyms or related words were organized in a standard search string, in which each key term was grouped with the logical operator “AND” and its synonyms or related words with the operator “OR”, as follows:

*(“MPS.BR” OR “MPSBR” OR “MPS BR” OR “MPS-BR” OR “Brazilian software process improvement”) AND (“process” OR “method” OR “methodology”) AND (“agile” OR “agility” OR “light” OR “scrum” OR “extreme*

*programming" OR "XP" OR "dynamic system development" OR "DSDM" OR "crystal" OR "kanban" OR "feature driven development" OR "FDD" OR "lean" OR "adaptive software development" OR "ASD" OR "test driven development" OR "TDD")*

The next step was to define in which electronic databases to conduct searches and to include digital libraries of organizations that have an interest in the subject, search engines that index academic studies in Brazil and international mechanisms for indexing scientific studies. Some terms of the string were translated as per the language of the database language (Portuguese or English) in order to get better results. In some bases (national and international), the default string had to be adapted. However, the original essence of the string, without restricting the results, was preserved. The following databases were considered:

- Organizations: Association for Promoting Excellence in Brazilian Software (SOFTEX), Ministry of Science and Technology (MCT), and Brazilian Computer Society (SBC).
- National mechanisms: Dedalus – USP, Public Domain, Google Web Brazil, Google Scholar Brazil, and Scientific Electronic Library Online (SciELO).
- International mechanisms: ACM, Compendex, IEEE, ISI, Science Direct, Scopus, Springer, and Wiley.

The inclusion of the Google search engine is not common in most systematic reviews. However, it was included with the intention of facilitating the identification of academic studies originating from a wide variety of Higher Education institutions. The search in Google Web returned 980,000 results, of which only the first 200 results were considered, because from that point on, the results proved to be irrelevant and/or repetitive. In the other electronic databases, including Google Scholar, all returned results were considered.

The automatic search was conducted from April 28 to May 21, 2012, and included studies made available up to (and including) December 31, 2011. A summary of the results obtained is listed in Table 2, grouped by electronic database, and amounted to 836 in total.

TABLE II. AUTOMATIC SEARCH RESULTS

Electronic Database	Result
MCT (www.mct.gov.br)	2
BDBCComp – SBC (www.lbd.dcc.ufmg.br/bdbcomp/)	56
SOFTEX (www.softex.br)	58
Dedalus - USP (www.dedalus.usp.br)	177
Public Domain (www.dominiopublico.gov.br)	27
Google Web (www.google.com)	200
Google Scholar (scholar.google.com)	172
SciELO (www.scielo.org)	55
ACM (portal.acm.org/dl.cfm)	6
Compendex (www.engineeringvillage2.org)	11
IEEE (ieeexplore.ieee.org)	18
ISI (apps.isiknowledge.com)	3
Science Direct (www.sciencedirect.com)	4
Scopus (www.scopus.com/home.url)	17
Springer (www.springerlink.com)	29
Wiley (onlinelibrary.wiley.com)	1
<b>Total</b>	<b>836</b>

The survey also included a manual search, which was undertaken immediately after the automatic search, in the proceedings of the Brazilian Symposium on Software Quality (SBQS) and the Brazilian Symposium on Software Engineering (SBES). The manual search identified one potentially relevant study, published in SBQS 2009. Altogether 837 results were considered for being selected for study.

*B. Study Selection*

First of all, the titles and abstracts of the studies were analyzed in order to identify potentially relevant studies. After eliminating redundancies (studies returned by more than one database engine) and studies clearly irrelevant to this research, 56 studies were considered potentially relevant. The rationale for this reduction (837 results to 56 potentially relevant studies) was due to the redundancy of results arising from using two or more database engines and due to the extensive coverage of the string, which returned studies with the terms, e.g., “MPS.BR”, “process” and “agile”, applied in a different context to that of the objective of this research.

The next stage of the review was to read the complete texts of potentially relevant studies, applying inclusion/exclusion criteria. To facilitate the application of the criteria for inclusion and exclusion in the studies, a Microsoft Excel™ spreadsheet was used.

The following inclusion criteria were used:

- 1) Studies from academia or industry;
- 2) Studies with practical scientific (empirical) or bibliographic data or experience reports;
- 3) Studies that addresses MPS.BR and agile methodology;
- 4) Studies in Portuguese or English.

As exclusion criteria were adopted:

- 1) Studies merely based on expert opinion, without being supported by a practical or bibliographic study or a report of an experience;
- 2) Studies in the format of an editorial, foreword, abstract, interview, news, poster and so forth.

At the end of this stage, 21 studies were included that address the MPS.BR model together with agile methodologies. The absence of inclusion criterion number 3 and the occurrence of exclusion criterion number 2 were the most frequently instances for excluding studies. When this stage was completed, we moved on to extracting data as described below.

*C. Data Extraction*

Data from 21 studies were extracted and analyzed, including: title, publication year, author, type (article, undergraduate monograph, post-graduate dissertation or Master’s dissertation), publication source, where the research was conducted, research method (case study, experience report, survey, experiment, action research, ethnography, and literature), research goal, agile method addressed, MPS.BR levels involved, and the benefits and limitations of using MPS.BR and agile methodologies. Data from each study were copied to an Excel spreadsheet, to aid referencing during the stage of synthesizing the result.

IV. RESULTS AND SYNTHESIS

The studies included 12 articles, 1 Master’s dissertation, 3 post-graduate dissertations, 4 undergraduate monographs, and 1 undergraduate traineeship report. Fig. 1 shows the corresponding percentages. The articles were written at the following levels: 1 by post-graduate students, 1 by an undergraduate student, 4 by students of various levels, 2 by industry professionals, and 4 by students and professionals.

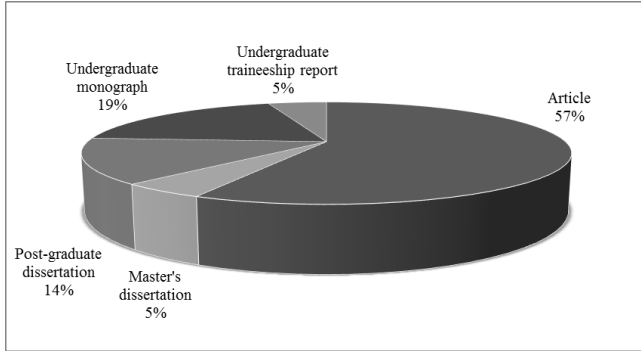


Figure 1. Type of studies.

The sources where the studies were published or produced are shown in Table 3. Note that articles published in 7 conferences, 1 magazine, and academic studies produced in 7 institutions of higher education were included.

TABLE III. SOURCE OF STUDIES

Type	Source	Study	No.
Article	Brazilian Symposium on Software Quality (SBQS)	[11][12][13][14]	4
	Annual Workshop on SPI (WAMPS)	[15][16]	2
	Informatics Students Meeting of Tocantins (ENCOINFO)	[17]	1
	Innovations Week in Information Systems (SIS²INFO)	[18]	1
	Regional Seminar on Informatics (SRI)	[19]	1
	Scientia Plena Magazine	[20]	1
	Symposium on Computational Mechanics (SIMMEC)	[21]	1
	Workshop on Companies (W6-MPS.BR)	[22]	1
Master’s dissertation	Pernambuco University (UPE)	[23]	1
Post-graduate dissertations	Federal University of Sergipe (UFS)	[24]	1
	Pontifical Catholic University of Paraná (PUCRS)	[25]	1
	State University of Londrina (UEL)	[26]	1
Undergraduate monographs	Passo Fundo University (UPF)	[27][28]	2
	Santa Cruz do Sul University (UNISC)	[29]	1
	UniSEB University Center	[30]	1
Undergraduate traineeship report	State University of Londrina (UEL)	[31]	1
<b>Total</b>			<b>21</b>

Fig. 2 shows the percentage of studies with respect to the research method. Note that 9 of the 21 studies used Bibliographic Research. The 6 empirical studies used the following methods: 4 Case Studies, 1 Action Research, and 1 Survey. Six Experience Reports were also included.

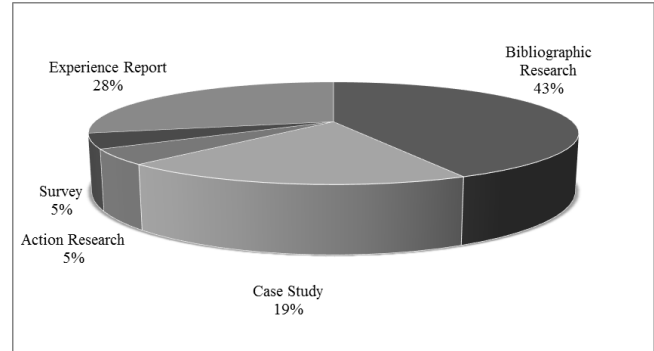


Figure 2. Research methods of studies.

As reported to the year, it was noted that 2010 was the year in which most studies were produced on the subject, as illustrated in Fig. 3. The number of studies has been growing every year since 2008, but in 2011 there was a small reduction. The geographical distribution of studies by State was as follows: 4 from Paraná, 4 from Rio Grande do Sul, 3 from Pernambuco, 3 from Rio de Janeiro, 2 from Minas Gerais, 2 from Sergipe, 2 from São Paulo, and 1 from Santa Catarina.

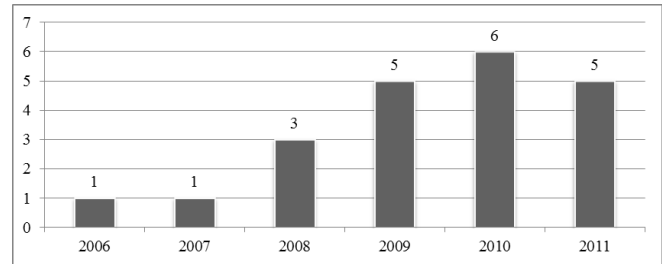


Figure 3. Year of studies.

In Fig. 4, the agile methodologies found in the studies are shown. Note that the Scrum methodology was the most used, being addressed in 17 studies (81%). In some studies, Scrum was used in combination with another methodology. The agile practices most addressed were Daily Meetings and Development in Sprints (in 13 studies), followed by Product Backlog Elaboration (in 11 studies), Sprint Review Meeting (in 9 studies), Sprint Planning Meeting and Retrospective (in 8 studies).

Fig. 5 shows the number of studies related to the levels of the MPS.BR model. The studies focus most on the initial levels (G and F). Although smaller, the number of studies that cites the other levels (A to E) was similar. The most addressed processes were Requirements Management (in 19 studies), Project Management (18), Quality Assurance (10), Measurement (9), Configuration Management (8), and Acquisition (6). The processes of Project Portfolio Management, Reuse Management, and Development for

Reuse were the least discussed (2 studies). The remaining processes were discussed in 3-5 studies.

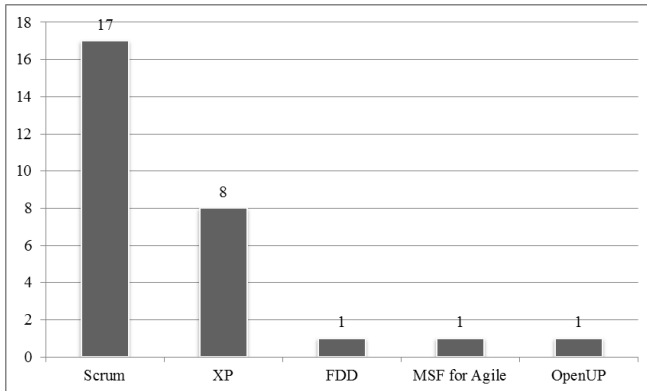


Figure 4. Agile methodologies addressed.

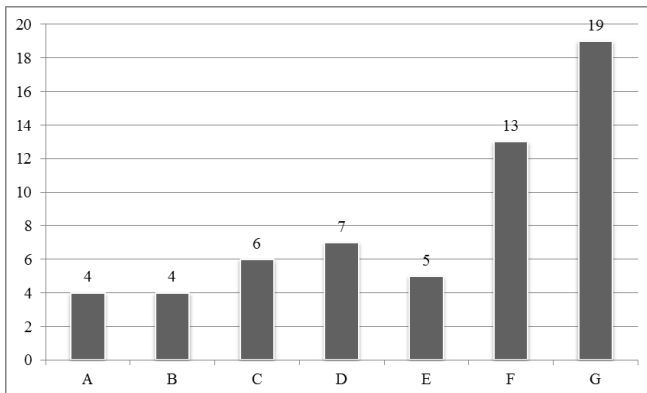


Figure 5. Number of studies by MPS.BR Levels.

Next, the benefits and limitations of MPS.BR together with agile methodologies are discussed.

**A. Benefits of using MPS.BR and Agile Methodologies**

At this stage of the review, the benefits were analyzed, as per how they were cited by the authors in the studies. Oliveira [29] found that the use of Scrum practices, such as maintaining the product backlog, satisfies many of the expected results from the processes of Requirements Management and Requirements Development, which correspond to levels G and D, respectively.

The study of Oliveira, Guimarães, and Fonseca [22] reports the experience in a company while the MPS.BR model together with Scrum and XP methodologies was being implemented, and notes the following benefits:

- Significant improvements with regard to team performance and the quality of final product.
- Indicators defined for the processes of Project Management and Requirements Management, such as productivity indicators, percentage of rework and percentage of deviation from predicted vs. actual, provided important feedback to the team and created goals to be achieved.
- Indicators also support decision making and create an atmosphere of continuous improvement.

- Indicators of Configuration Management ensured that certain practices were followed, providing greater control of the versions generated and continuous integration.
- Practices of Quality Management, such as audits, ensured the institutionalization of the development process and the quality of work products.

The study also considers that, when problems are identified, those responsible for Quality Management must submit proposals for solutions and improvements, and monitor the deliberations until completion.

According to Santesso [26], the combination of Scrum and MPS.BR proved to be satisfactory and feasible. Silva and Denardi [18] observed that the use of Scrum practices might bring quick results and with quality in the processes, in order to achieve the maturity levels of MPS.BR model. For Mancine [30], agile methods, in particular Scrum, were able to streamline the development processes.

Begnini [27] claims that the use of MPS.BR model can also be combined with XP agile methodology, bringing benefits to the company that aim to produce software with quality and greater agility.

In the study of Osawa [31], Scrum compatibility with the expected results of MPS.BR processes at level G was highlighted.

Considering the benefits mentioned by the studies, the use of agile methodologies with MPS.BR model succeeded in bringing improvements to organizations, which aim to produce software with agility and quality. However, the authors also pointed out limitations and challenges, which are discussed below.

**B. Limitations of using MPS.BR and Agile Methodologies**

Teixeira [28] concludes that Scrum practices alone is not able to meet all the requirements of MPS.BR, thus requiring the use of additional practices, as metaphor, planning game, pair programming, study documents, develop the model, and other, from other agile methodologies, such as XP and FDD. Several studies, such as [11][23][28], reported that one agile approach alone is not sufficient to achieve the maturity levels, and thus require some adjustments. In Silva, Magela, Santos, Schots, and Rocha [16], a combination with Unified Process and Scrum was proposed, showing that organizations can combine different approaches (agile and traditional) in order to comply with MPS.BR.

According to Stanga [19], to use agile practices of XP with the MPS.BR model some adjustments should be made to the project team, especially to aid Requirements Management. The study notes that a formal way of recording and monitoring requirement is necessary, but it does not offer a solution. The use of a tool for agile project management could help in this task. Some teams record manually the requirements in a spreadsheet or other document.

Begnini [27] notes that XP does not aid some processes of the MPS.BR model, because it does not prioritize the documentation of software developed nor the development and management of reusable components. Documentation and the production of an objective insight are challenges to

which MPS.BR and agile methodologies are open. Agile teams should to define a minimum of essential documentation, in other hand, MPS.BR evaluators should understand agile values and be open to other forms of documentary representation.

When Salgado et al. [13] report the experience of implementing new processes adherent to MPS.BR level C, using Scrum practices, the main difficulties were presented:

- Discussions about process improvement can divert the focus of agile practices, such as retrospective meetings, e.g., making these meetings very long;
- All team members, including the Product Owner, must participate in the meetings, to provide communication and visibility of the Sprint status;
- Difficulty in estimating the size and time required to perform a certain activity, causing project delays;
- Team members should have a heterogeneous profile, thus avoiding a high turnover of team members.

Given the limitations observed in the studies, although it is possible the use of MPS.BR together with agile methodologies, there is the need to use additional practices, especially with respect to documentation and the metrics of storage.

## V. CONCLUSION AND FUTURE WORK

This article conducted a study, through a systematic review, on the MPS.BR model with agile methodologies, thereby aiming to contribute to quality improvements in both the development process and in the final software product.

In accordance with the included studies and the benefits pointed therein, the adoption of MPS.BR together with agile methodologies is feasible, mainly for the initial levels (G to D, except processes related to acquisition and reuse). They report that agile practices, which enable rapid improvements and significant quality in the processes and products, are needed to achieve maturity levels. However, the studies also pointed out limitations, such as the fact that agile methodologies could not completely satisfy the highest MPS.BR levels (C to A), thus requiring other practices, such as adjustments in the team, the representation of explicit knowledge and storage. These limitations can make it difficult to apply agile methodologies, and their benefits, in organizations. This demands alternatives that overcome mainly the problem of documental evidence.

Regarding the limitations of this review, the fact of not having performed a quality assessment of the studies does not allow an analysis of the strength of the results found. All studies underwent some review process, but this is not sufficient to provide a high level of quality. Another possible limitation is as to the coverage of the studies. Even though automatic and manual searches on major sources and indexing mechanisms were conducted, it is possible that relevant studies were not included, mainly studies produced in educational institutions, not published in journals or conferences. Studies produced from 2012 onwards were not included. Possible biases introduced throughout the process of study selection and data extraction are also considered as limitations. However, all the stages were performed by two

researchers, and then revised by two other researchers who are knowledgeable about the area. The approach of MPS.BR gave this study a local scope (Brazilian context), but the authors undertook a systematic review on the benefits and limitations of CMMI and agile methodologies, as their scope was more global. The results will be presented in a future article.

The research presented in this paper may contribute to the academic area, since it presents an initial mapping of the studies conducted with respect to the issue addressed, as well as to organizations that focus on improving software development processes and adherence to best practices in order to ensure the quality of the software they develop. As a suggestion for future work, we put forward:

- Analyzing the adoption of agile methodologies with higher levels of MPS.BR model, aiming to find the possibility of smooth adaptation.
- The number of empirical studies found (28,5%), suggests the importance of more practical studies directed to the software industry, in order to meet its needs.

## ACKNOWLEDGMENT

This study has the support of the Foundation for Science and Technology of Pernambuco State (FACEPE), through Process No. IBPG-0136-1.03/11.

## REFERENCES

- [1] ISO/IEC 90003, "Software engineering - Guidelines for the application of ISO 9001:2000 to computer software", 2004.
- [2] ISO/IEC 12207, "Systems and software engineering - Software life cycle processes", 2nd ed., 2008.
- [3] SEI, Software Engineering Institute, "CMMI® for Development", Version 1.3, Technical Report, CMU/SEI-2010-TR-033, November 2010.
- [4] SOFTEX, Association for Promoting Excellence in Brazilian Software, "MPS.BR - Brazilian Software Process Improvement", SPI General Guide for Software, December 2012.
- [5] Agile Manifesto, "Agile Manifesto for Software Development", 2001, <http://www.agilemanifesto.org> [retrieved: August, 2013].
- [6] VersionOne, "State of Agile Development Survey Results", 2011, [http://www.versionone.com/pdf/2011\\_State\\_of\\_Agile\\_Development\\_Survey\\_Results.pdf](http://www.versionone.com/pdf/2011_State_of_Agile_Development_Survey_Results.pdf) [retrieved: August, 2013].
- [7] H. Corbucci, A. Goldman, E. Katayama, F. Kon, C. Melo, and V. Santos, "Genesis and evolution of the agile movement in Brazil - a perspective from the academia and the industry", Proc. 25th Brazilian Symposium on Software Engineering (SBES 11), IEEE Press, Sept. 2011, pp. 98-107, doi:10.1109/SBES.2011.26.
- [8] K. Schwaber and M. Beedle, Agile Software Development with Scrum, Prentice Hall, 2002.
- [9] K. Beck, Extreme Programming explained: embrace change, Addison-Wesley, 2000.
- [10] B. Kitchenham and S. Charters, "Guidelines for performing Systematic Literature Reviews in Software Engineering", Technical Report, School of Computer Science and Mathematics, Keele University, 2007.
- [11] M. M. Arimoto, E. Murakami, V. V. Camargo, and M. I. Cagnin, "Adherence analysis of agile methods according to the MR-MPS Reference Model", Proc. VIII Brazilian

- Symposium on Software Quality (SBQS 09), SBC, Jun. 2009, pp. 249-263.
- [12] E. Catunda et al., "Implementation of MR-MPS level F with Scrum agile practices in a software factory", Proc. X Brazilian Symposium on Software Quality (SBQS 11), SBC, Jun. 2011, pp. 1-8.
- [13] A. Salgado et al., "Applying an agile process for deploying software processes based on Scrum at Chemtech", Proc. IX Brazilian Symposium on Software Quality (SBQS 10), SBC, Jun. 2010, pp. 351-358.
- [14] C. Santana, A. M. L. Vasconcelos, and A. L. Timoteo, "Mapping of the Brazilian Model of Software Process Improvement (MPS.BR) for companies using Extreme Programming as development methodology", Proc. V Brazilian Symposium on Software Quality (SBQS 06), SBC, Jun. 2006, pp. 130-143.
- [15] R. Prikladnicki and A. L. C. C. Magalhães, "Implementation of maturity models with agile methodologies: an experience report", Proc. VI Annual Workshop on SPI (WAMPS 10), SOFTEX, Oct. 2010, pp. 88-98.
- [16] T. Silva, R. Magela, G. Santos, N. C. L. Schots, and A. R. Rocha, "Implementation of MR-MPS level F combining features of the Unified Process with Scrum practices", Proc. VII Annual Workshop on SPI (WAMPS 11), SOFTEX, Oct. 2011, pp. 54-61.
- [17] F. Szimanski, J. Albuquerque, and F. Furtado, "Implementing maturity and agility in a software factory using Scrum and MPS.BR level G", Proc. XI Informatics Students Meeting of Tocantins (ENCOINFO 09), Lutheran University Center of Palmas, Nov. 2009, pp. 161-170.
- [18] A. M. Silva and A. Denardi, "Using Scrum methodology to achieve MPS.BR level F", Proc. XII Innovations Week in Information Systems (SIS<sup>2</sup>INFO 11), UNIPAR, Oct. 2011, pp. 1-13.
- [19] M. Stanga, "Integrating XP agile project with MPS.BR level G", Proc. XX Regional Seminar on Informatics (SRI 11), URI, Sept. 2011, pp. 1-6.
- [20] F. G. Silva, S. C. P. Hoentsch, and L. M. A. Silva, "An analysis of FDD and Scrum agile methodologies under MPS.BR quality model perspective", Scientia Plena, vol. 5, Dec. 2009, pp. 1-13.
- [21] T. M. R. Dias, G. F. Moita, M. P. Silva, B. Ferreira, and A. M. Silva, "Feasibility of software development based on the MPS.BR model with Extreme Programming methodology", Proc. IX Symposium on Computational Mechanics (SIMMEC 10), UFSJ, May. 2010, pp. 1-10.
- [22] A. C. G. Oliveira, F. A. Guimarães, and I. A. Fonseca, "Using agile methodologies to achieve MPS.BR level F in Powerlogic", Proc. II Workshop on Companies (W6-MPS.BR), SOFTEX, Oct. 2008, pp. 1-8.
- [23] C. Santana Júnior, "Evaluation of the Use of Agile Methodologies in the Context of Software Quality Models", Master's Dissertation in Computer Engineering, Pernambuco University (UPE), 2008, unpublished.
- [24] P. Silva Neto, "Case Study of a Software Project Management Process Based on Agile Methods and MPS.BR Model", Post-graduate Dissertation in Project Management of Information Technology, Federal University of Sergipe (UFS), 2010, unpublished.
- [25] D. A. Nunes, M. A. F. Locks, and R. Hayashi, "To Check the Suitability of Using the Scrum Agile Methodology for MPS.BR Level G", Post-graduate Dissertation in Software Project Management, Pontifical Catholic University of Paraná (PUCRS), 2011, unpublished.
- [26] P. H. C. Santesso, "Using Scrum Agile Methods with MPS.BR Level G", Post-graduate Dissertation in Systems Analysis, Design and Management with Emphasis on Business Intelligence, State University of Londrina (UEL), 2009, unpublished.
- [27] M. M. Begnini, "An Analysis of XP From the Perspective of MPSBR Model, Undergraduate Monograph in Computer Science, Passo Fundo University (UPF), 2008, unpublished.
- [28] M. Teixeira, "An Analysis of Scrum From the Perspective of MPSBR", Undergraduate Monograph in Computer Science, Passo Fundo University (UPF), 2007, unpublished.
- [29] J. S. Oliveira, "Scrum Methodology Applied to Requirement Management and Development Process of MPS.BR Model", Undergraduate Monograph in Information System, Santa Cruz do Sul University (UNISC), 2010, unpublished.
- [30] M. H. Mancine, "Analysis of the Use of Scrum Methodologies and MPS.BR in the Real Case Study in Development of Commercial Applications", Undergraduate Monograph in Computer Science, UniSEB University Center, 2011, unpublished.
- [31] G. S. Osawa, "Analysis of the Implementation of Scrum in a Company with MPS.BR Level G", Undergraduate Traineeship Report in Computer Science, State University of Londrina (UEL), 2009, unpublished.