

MPS Model-Based Software Acquisition Process Improvement in Brazil

Kival Chaves Weber¹, Eratóstenes Edson Ramalho de Araújo¹, Danilo Scalet², Edméia Leonor Pereira de Andrade³, Ana Regina Cavalcanti da Rocha⁴, Mariano Angel Montoni⁴

¹*SOFTEX – Associação para Promoção da Excelência do Software Brasileiro*
{kival.weber, eratostenes}@nac.softex.br

²*CELEPAR – Companhia de Informática do Paraná*
danilo@pr.gov.br

³*MAPA – Ministério da Agricultura, Pecuária e Abastecimento*
edmeia@agricultura.gov.br

⁴*COPPE/UFRJ – Universidade Federal do Rio de Janeiro*
{darocha, mmontoni}@cos.ufrj.br

Abstract

This paper describes an initiative to improve software acquisition process in Brazil. This initiative was conducted in the context of the MPS.BR Program, a nationwide effort to develop and disseminate the MPS Model both in large organizations and Small and Medium-size Enterprises (SME). The MPS Model was developed aiming to represent Brazilian software industry needs and is constituted of three main components: the MPS Reference Model; the MPS Assessment Method; and the MPS Business Model. One of the MPS Model processes is the Acquisition process for software and related services. This paper presents the main achievements of the MPS.BR Program but it is focused on the Acquisition Process described in the MPS Acquisition Guide (a stand-alone guide that constitutes one of the base elements of the MPS Model). This work also presents the customization of the MPS Acquisition process for specific purposes in the context of the Brazilian Ministry of Agriculture, Livestock and Food Supply (MAPA), including process instantiation of the customized acquisition process, aiming to improve quality of basic projects in the Information Technology Area and to assure contracting of services and products which satisfy the MAPA needs.

1. Introduction

In December 2003, the Association for Promoting the Brazilian Software Excellence (SOFTEX) began a nationwide program (a.k.a. MPS.BR Program) representing a joined effort of the Brazilian software industry and research institutions aiming to improve software process in organizations all over the country both in large organizations and Small and Medium-size Enterprises (SME) [1, 15]. MPS.BR is the acronym of

the Portuguese expression “Melhoria de Processo do Software Brasileiro” and stands for Brazilian Software Process Improvement. SOFTEX is a private not-for-profit organization aiming at promoting competitiveness of the Brazilian software industry, which holds a network of 26 SOFTEX agents (in 22 cities of 13 estates). There are over 1,200 SOFTEX affiliated firms (70% are small and micro-size companies) [2].

The MPS.BR Program main goal is to develop and disseminate the MPS Model, a software process reference and assessment model better suited to the Brazilian industry/community [3]. The MPS Model has three components:

- i. Reference Model (MR-MPS);
- ii. Assessment Method (MA-MPS);
- iii. Business Model (MN-MPS).

MR-MPS and MA-MPS are tailored conformant with ISO/IEC 12207 [4] and ISO/IEC 15504 [5], compatible with CMMI[®] [6, 7], based on software engineering best practices, and according to the reality of Brazilian firms. The MPS Model has four guides:

- i. MPS General Guide;
- ii. MPS Implementation Guide;
- iii. MPS Assessment Guide;
- iv. MPS Acquisition Guide.

73% of the Brazilian software industry is constituted of SMEs, namely fewer than 50 employees in small-size organizations and between 51 and 100 people in medium-size enterprises [8]. Therefore, the main goal of the MPS Model is to establish a feasible mechanism for organizations to achieve benefits of implementing SPI, especially for SMEs.

[®] CMM and CMMI are registered in the U.S. Patent and Trademark Office by Carnegie Mellon University. MPS.BR, MR-MPS, MA-MPS, and MN-MPS are SOFTEX service marks.

This paper describes an initiative to improve software acquisition process in Brazil conducted in the context of the MPS.BR Program. Section 2 describes the basic structure of the MPS.BR Program and the main components of the MPS Model. Section 3 describes the Acquisition Process described in the MPS Acquisition Guide and discusses the customization of the MPS Acquisition process for specific purposes in the context of the Brazilian Ministry of Agriculture, Livestock and Food Supply (MAPA), including process instantiation of the customized acquisition process. Finally, section 4 concludes this paper highlighting its main points.

2. Software Process Improvement (SPI) in Brazil

This section describes the structure of the MPS.BR Program and the main components of the MPS Model.

2.1. MPS.BR Program

The purpose of the MPS.BR Program is to improve software process in Brazilian organizations at reasonable costs. The program is sponsored by the Brazilian Ministry of Science and Technology (MCT), Brazilian Research and Projects Financing Agency (FINEP) and Inter-American Development Bank (IDB), but it is being increasingly sustained by revenues from MPS services provided.

The MPS.BR Program is managed by:

- i. a Program Team coordinated by SOFTEX;
- ii. a Model Team (“ETM – Equipe Técnica do Modelo”, in Portuguese) which develops the MR-MPS and MA-MPS, and deals with MPS training. This team is coordinated by COPPE/UFRJ, an institution of the Federal University of Rio de Janeiro with vast experience in software process research, implementation and assessment;
- iii. an Accreditation Forum (“FCC – Fórum de Credenciamento e Controle”, in Portuguese) which deals with SOFTEX authorized organizations that provide MPS process implementation service and/or MPS process assessment service.

The MPS.BR Program has two subprocesses:

- i. creation and improvement of the MPS Model;
- ii. dissemination and adoption of the MPS Model.

The first subprocess, related to the technical MPS Model creation and improvement, comprises five outcomes:

- i. Expected Outcome: Development of the MPS Model.
Achieved Outcome (June 2007): The MPS Model was created in 2004 with two technical

components [1, 3, 15]: a Reference Model (MR-MPS) and an Assessment Method (MA-MPS). These components are documented in four guides: MPS General Guide, MPS Implementation Guide, MPS Assessment Guide, and MPS Acquisition Guide. The current versions of these guides are available in the section “Guias” (in Portuguese) of the SOFTEX Web site at www.softex.br/mpsbr [2].

- ii. Expected Outcome: Qualification of MPS practitioners by offering official courses, applying individual examinations and organizing recycling workshops.
Achieved Outcome (June 2007): 30 instructors were trained and authorized to teach MPS courses. 3,000 people have attended MPS courses since 2004 and almost 900 people were approved in individual examinations.
- iii. Expected Outcome: Accreditation of organizations to provide MPS process implementation services, named MPS Implementation Institution (MPS II).
Achieved Outcome (June 2007): 18 organizations were accredited to provide MPS process implementation services.
- iv. Expected Outcome: Accreditation of organizations to provide MPS process assessment services, named MPS Assessment Institution (MPS AI).
Achieved Outcome (June 2007): 4 organizations were accredited to provide MPS process assessment services.
- v. Expected Outcome: Certification of MPS Acquisition Consultants (MPS AC).
Achieved Outcome (June 2007): 2 MPS Acquisition Consultants were certified.

The second subprocess, related to the MPS Model dissemination and adoption in Brazilian organizations, comprises three outcomes:

- i. Expected Outcome: Creation and improvement of the Business Model (MN-MPS) as the third MPS Model component.
Achieved Outcome (June 2007): The Business Model (MN-MPS) was released in April 2004.
- ii. Expected Outcome: Implementation of the MPS Model at least in 80 organizations by December 2006 and in other 160 organizations by December 2008.
Achieved Outcome (June 2007): The MPS Model was implemented in at least 120 organizations. Among these, 93 organizations organized in 15 groups located on 13 cities are implementing the MPS Model (52% small, 33% medium and 15% large-size enterprises).

These organizations are committed to conclude the implementation within 12 months and to be assessed 3 months later.

- iii. **Expected Outcome:** MPS official assessments in at least 50% of the organizations mentioned in preceding outcome.

Achieved Outcome (June 2007): 40 MPS assessments have been conducted in Brazilian organizations since September 2005. The assessment results (7,5% level A, 10% levels D and E, and 82,5% levels F and G) are available on the section “Avaliações” (in Portuguese) of the SOFTEX Web site at www.softex.br/mpsbr [2].

2.2. MPS Model

This subsection describes the three components of the MPS Model: MPS Reference Model (MR-MPS), MPS Assessment Method (MA-MPS) and MPS Business Model (MN-MPS).

2.2.1. MPS Reference Model. The MPS General Guide describes the MPS Reference Model (MR-MPS). This guide provides a definition of the MPS Model and common definitions to all other guides. The MR-MPS is defined through maturity levels in two dimensions: process capability dimension and process dimension.

The MR-MPS process capability dimension is described by Process Attributes (PA) based on the ISO/IEC 15504-2 process attributes used to define capability levels. The MR-MPS defines nine PAs: PA 1.1 (process performance attribute); PA 2.1 (performance management attribute); PA 2.2 (work product management attribute); PA 3.1 (process definition attribute); PA 3.2 (process deployment attribute); PA 4.1 (process measurement attribute); PA 4.2 (process control attribute); PA 5.1 (process innovation attribute); and PA 5.2 (process optimization attribute).

The MR-MPS process dimension is described by seven sequential and accumulative groups of processes that correspond to the MR-MPS maturity levels. The MR-MPS processes are described in terms of their specific purpose and outcomes used to evaluate specific process implementation. The MR-MPS processes are a combination of the ISO/IEC 12207 Amd 1 & Amd 2 processes (purpose and outcomes) and the CMMI process areas. The seven MR-MPS maturity levels are: A (Optimizing), B (Quantitatively Managed), C (Defined), D (Largely Defined), E (Partially Defined), F (Managed) and G (Partially Managed). The level G is the most immature level and level A is the most mature one. The MR-MPS maturity levels are based on the CMMI staged representation maturity levels. The MR-

MPS levels F, C, B and A correspond respectively to CMMI levels 2, 3, 4 and 5. The MR-MPS level G is an intermediary level between CMMI levels 1 and 2, and the MR-MPS levels E and D are two intermediary levels between CMMI levels 2 and 3, respectively.

Table 1 presents the MR-MPS maturity levels, processes and process attributes. This seven levels grading makes possible a more gradual implementation and recognition of the software process improvement with better visibility in a shorter term, making MR-MPS easier to adopt and suitable to adapt in SME.

Table 1. MR-MPS maturity levels (ML), processes and process attributes (PA)

ML	Processes	PA
A	Causal Analysis and Resolution	1.1, 2.1, 2.2, 3.1, 3.2, 4.1*, 4.2*, 5.1*, 5.2*
B	Project Management (evolution)	1.1, 2.1, 2.2, 3.1, 3.2, 4.1*, 4.2*
C	Risk Management Decision Analysis and Resolution Development for Reuse Reuse Management (evolution)	1.1, 2.1, 2.2, 3.1, 3.2
D	Requirement Development Product Design and Construction Product Integration Validation Verification	1.1, 2.1, 2.2, 3.1, 3.2
E	Human Resource Management Process Establishment Process Assessment and Improvement Project Management (evolution) Reuse Management	1.1, 2.1, 2.2, 3.1, 3.2
F	Configuration Management Measurement Quality Assurance Acquisition	1.1, 2.1, 2.2
G	Requirement Management Project Management	1.1, 2.1

** These PAs are applicable only to selected processes. All the other PAs must be applied to all processes.*

The MPS Implementation Guide provides technical guidance for implementing the seven MR-MPS levels. This guide is divided into 7 parts, one per each MR-MPS maturity level. Each part of the MPS Implementation Guide describes theoretic concepts that

fundamentals the processes defined in the MR-MPS maturity levels. Moreover, it contains detailed information on implementing MR-MPS process outcomes.

2.2.2. MPS Assessment Method. The MPS Assessment Guide describes the MPS Assessment Method (MA-MPS) developed based on ISO/IEC 15504-2. The guide also describes the MPS Assessment Process defined to support the application of the method. This process has four subprocesses:

- i. contracting the assessment;
- ii. preparing to perform the assessment;
- iii. performing the assessment;
- iv. recording assessment output.

The MPS Assessment Guide defines the requirements for accreditation of:

- i. organizations that provide MPS assessment services (MPS AI);
- ii. MPS Competent Assessors;
- iii. MPS Provisional Assessors (assessors that support competent assessors during assessments).

The MPS Assessment Guide also describes the roles and responsibilities of assessment team members during assessments. The results of a MPS assessment are valid for a period of three-years.

2.2.3. MPS Business Model. The MPS Business Model (MN-MPS) defines business rules for:

- i. training practitioners through MPS official courses, individual examinations and recycling workshops;
- ii. implementing the MPS Model by organizations that provide MPS implementation services (MPS II);
- iii. executing process assessments by organizations that provide MPS assessment services (MPS AI);
- iv. organizing groups of enterprises to execute MPS implementation and assessment.

The MN-MPS comprises:

- i. a Specific Business Model suitable to large companies which do not want to share MPS services and costs with other companies;
- ii. a Cooperative Business Model for groups of SME interested in implementing and assessing the MPS Model, and sharing MPS services and costs.

The MN-MPS is unique and it is a strong contribution to the dissemination and adoption of the MPS Model in Brazilian organizations, mainly in groups of SME. It is based on the previous experience of many SOFTEX agents on process improvement initiatives such as “Towards ISO 9000” [9].

3. Software Acquisition Process Improvement (SAPI) in Brazil

The Acquisition Process is one of the MR-MPS processes, namely in the level F (Table 1). This process focuses on effective acquisition activities and practices that are implemented and assessed in the project level by organizations that have adopted the MPS Model. But it can also be used by organizations that manage acquisition programs to implement organizational process improvement activities based on MPS Acquisition Process customization and instantiation.

Some related works in this area are: the IEEE Recommended Practice for Software Acquisition (IEEE STD 1062) [10]; the CMMI Acquisition Module (CMMI-AM) which was created by a CMMI team of government, industry and academic experts for the U.S. Department of Defense in 2004 [11]; the Software Engineering Institute (SEI) and General Motors (GM) co-development of an initial acquisition model based on the existing CMMI-AM for use by government and industry organizations which was announced in November 2005 [12]; and the Watts Humphrey’s principles to get quality at reasonable costs and predictable schedules [13].

This section presents software acquisition process improvement (SAPI) in Brazil focused on organizational process improvement activities. The following subsections describe: i) the MPS Acquisition Guide; ii) the Acquisition Process customization, including the MPS Acquisition Guide customization to the Brazilian Ministry of Agriculture, Livestock and Food Supply (MAPA) and process instantiation of the customized acquisition process; iii) the MPS Acquisition Process training and consultancy.

3.1. MPS Acquisition Guide

The MPS Acquisition Guide is a stand-alone guide released in May 2005 that describes the MPS Acquisition Process for software and related services.

The purpose of the MPS Acquisition Process is to obtain the product and/or service that satisfy the need expressed by the customer. There are six outcomes as a result of successful implementation of the acquisition process [4]:

- i. acquisition needs, goals, product and/or service acceptance criteria and acquisition strategies are defined;
- ii. an agreement is developed that clearly expresses the expectation, responsibilities and liabilities of both the customer and the supplier;

- iii. a product and/or service is acquired that satisfies the customer's stated need;
- iv. the acquisition is monitored so that specified constraints such as cost, schedule and quality are met;
- v. supplier deliverables are accepted;
- vi. any identified open items have a satisfactory conclusion as agreed to by the customer and the supplier.

As shown in Fig. 1, this acquisition process contains four subprocesses: acquisition preparation; supplier selection; supplier monitoring; and customer acceptance. Therewith each subprocess is deployed in activities based on Annex F of Amendment 1 that allows organizations own an acquisition process to be assessed for conformance to the ISO/IEC 12207 [4].



Figure 1. MPS Acquisition Process: subprocesses and activities

The MPS Acquisition Guide details each acquisition subprocess considering:

- i. required activities;
- ii. required products;
- iii. deliverable products;
- iv. contract agreements that takes into account the supplier process maturity level, such as in MPS or CMMI models.

An example of the supplier selection subprocess is shown in Fig. 2.

The MPS Acquisition Guide also provides some templates of documents referred on the acquisition

process and describes common problems that occur in the acquisition process, aspects relating to the acquisition of free software/open source and the acquisition of software components, as well as the evolution of the MPS Acquisition Process in the capability dimension.

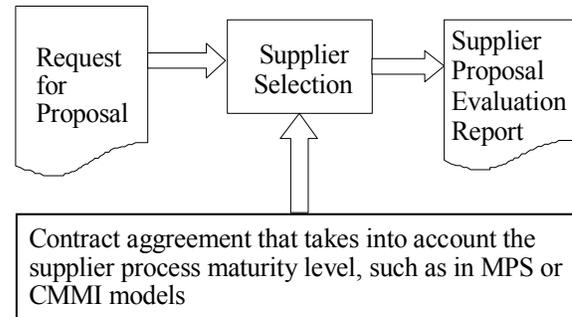


Figure 2. MPS Acquisition Guide: supplier selection as an example

3.2. MPS Acquisition Process Customization

Organizations that need to acquire software and related services may apply the MPS Acquisition Process for a specific project or, as the organization commonly perform this sort of acquisition, the MPS Acquisition Process should be customized in order to adapt it to the organization characteristics and regular types of acquisitions.

3.2.1. Customizing the Acquisition Process. Fig. 3 shows a set of aspects that should be considered when customizing the MPS Acquisition Process to a private or government organization. The core part of the figure represents the standard acquisition process and the management process that shall be taking into account when executing acquisition projects. The upper level part of the figure identifies the support tools that the organization may intend to apply in order to improve the performance of its acquisition projects. The lower level part of the figure addresses some contexts that may affect the conduction of the acquisition projects.

The standard process may be derived from the MPS Acquisition Process (Fig. 1), stating, for each subprocess, the activities that are compatible with the organization context – this means that it is possible to include, delete or modify the MPS Acquisition Process activities. Responsibilities should be established mainly defining organizational areas that are responsible for executing acquisition activities. Standard work products shall also be defined for each activity. These work products may be adapted from the input and output

products listed in the MPS Acquisition Guide but taking into account standards adopted by the organization.

The management process shall establish management procedures to be adopted during the acquisition projects addressing issues that include requirements, communication, problem and change management, schedule and quality. As some organizations have already defined their management processes, they should only adapt their processes to deal with software acquisition projects. Organizations that do not have an established project management process shall evaluate their organizational maturity and consider the opportunity to implement such process considering some approach recognized by the market.

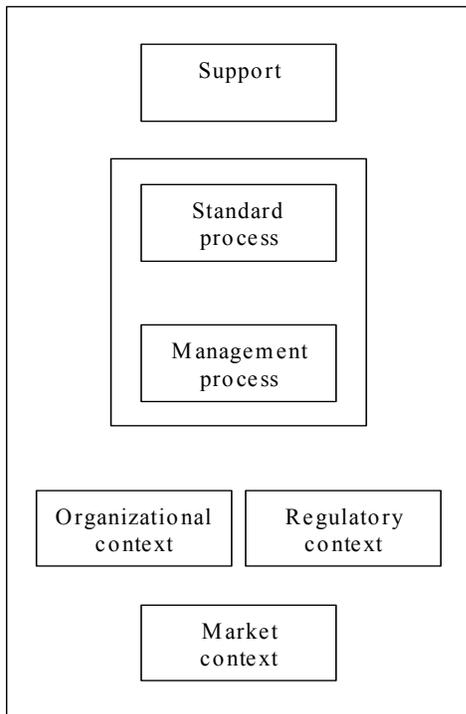


Figure 3. MPS Acquisition Process customization

Support (Fig. 3) aims at improving the effectiveness and productivity of the acquisition projects and it involves the identification, obtaining, implementation, dissemination and evaluation of the use of methods, techniques and tools to the acquisitions projects. The support activities may be organized by an organizational area with this specific purpose or by means of shared structures that provide this kind of support for compatible activities as, for instance, activities related to software acquisition and software development.

In order to customize the acquisition process, the following contexts that may influence this process shall

be examined: organizational, regulatory and market ones.

When analysing the organizational context, it should be considered issues such as:

- o The existing organizational processes: if the organization adopts some process for software acquisition and intends to improve this process it is important to evaluate its activities and respective work products, because it is likely that even after the implementation of the MPS Acquisition Process, some particular aspects or integration with other organizational process need to be kept at least during a transition period, until the organization reaches a maturity level that enables it to search for a more significant evolution.
- o The organizational software and hardware environment: such aspects may be considered as constraints for most organizational acquisition projects. Therefore, it is necessary that its characteristic be clearly understood and represented as part of the organizational context;
- o People: the skills of the people staff that will be involved with the acquisition projects are fundamental part for the definition of the acquisition process. There are some situations where skill constraints may difficult or make not feasible the implementation of the acquisition process, demanding training or even hiring people with more adequate profile.

When addressing the regulatory context, there shall be analysed and organized all the standards, conventions and regulations in law to be enforced for software acquisition projects. When dealing with government organizations this issue is very critical and involves a huge effort in order to identify and organize all these regulatory issues.

At the market context the organization shall consider the typical software product domains related to its acquisitions and the general requirements expected for the potential providers regarding all those domains. This work will contribute to improve the results when executing the “Supplier Selection” subprocess during an acquisition project.

As an organization succeeds in customizing the MPS Acquisition Process it shall analyse each new acquisition project considering the required characteristics for the project and instantiating the general acquisition process for the specific project. Fig. 4 shows a problem to be addressed by an acquisition project. It is necessary to instantiate the customized acquisition process, producing a process that is specific for the project to be developed. This project process defines the management process to be adopted, the support to be provided and organizational, regulatory and market contexts

applicable. This process instantiation aims at reaching the expected results for the project.

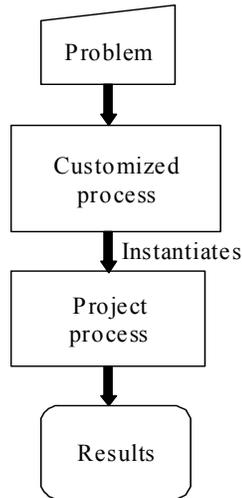


Figure 4. Process instantiation

3.2.2. Customizing the MPS Acquisition Guide to MAPA. The Brazilian Ministry of Agriculture, Livestock and Food Supply (MAPA) has adopted the MPS Acquisition Process (Fig. 1) as a standard model to improve quality of basic projects in the Information Technology Area and to assure contracting of services and products which satisfy the MAPA needs. This Acquisition Process is being customized according to MAPA specific characteristics and following the Brazilian legislation related to the purchase of software, hardware and related services by government institutions [14].

The customization has started with a MAPA basic project focused on contracting Information Systems development and maintenance specialized services.

Following are the main activities, achievements, difficulties and learning from the MPS Acquisition Process customization to MAPA.

The main activities were:

- i. contract of a certified MPS Acquisition Consultant from Feb. to Oct. 2006 for advising the MPS Acquisition Guide customization to MAPA;
- ii. creation of a Virtual Community to facilitate communication and collaborative work development;
- iii. presentations on software quality and MPS Acquisition Process by the MPS Acquisition Consultant for the MAPA team;
- iv. definition of premises for the MAPA basic project, with MAPA team participation, such as: i) service characteristics to be contracted; ii) payment types, contracting

- v. and monitoring; iii) suppliers expected characteristics; iv) role of involved parts;
- v. plan definition for MPS Acquisition Process customization (Fig. 3), including: i) support tools definition; ii) standard acquisition subprocesses and activities derived from the MPS Acquisition Process; iii) management process and responsibility definition; v) definition of the organizational, regulatory and market contexts;
- vi. development of a template based on the acquisition plan structure, including information compatible with those from MAPA project, trying to facilitate the basic project development;
- vii. MPS Acquisition Consultant revision of the MAPA basic project developed by the MAPA team;
- viii. discussion on the use of Function Point Analysis for size estimation in software development or maintenance;
- ix. use of Virtual Communities discussion forums to support MAPA technicians;
- x. development of a MAPA basic project compatible with MAPA needs.

The main outcomes were:

- i. training the MAPA team (6 people) on the MPS Acquisition Guide to disseminate acquisition process concepts. One of them was the candidate who was certified later as a new MPS Acquisition Consultant;
- ii. development of a MAPA basic project for contracting specialized services on Information System development and maintenance. This project was sent to the MAPA Bidding Sector which is in charge of fulfilling all official requirements regarding services contracting;
- iii. use of the template (customized process) to instantiate two software basic projects (project processes) related to animal and vegetal defense (Fig. 4), with involvement of the end users;
- iv. inclusion of the customized acquisition process and its workflow in the MAPA Information Technology Strategic Plan.

The technical and administrative aspects, budget impacts and expected results, made the MAPA basic project very complex and consequently it required knowledge and specific abilities.

The following difficulties were identified:

- i. inexistence of a multidisciplinary team equally proficient in the information technology, bidding and legal affairs areas;

- ii. lacking of adequate government rules regarding software acquisition;
- iii. great number of constraints established by the official control institutions;
- iv. great difficulty in establishing suppliers evaluation and selection criteria which fulfill MAPA requirements and are compatible with legislation;
- v. lack of guidance regarding Service Level Agreement (SLA) definitions, which is of fundamental importance for software product approval.

Considering the outcomes and difficulties experienced in the MAPA case, the main lessons learned were:

- i. the understanding on the main aspects of the MPS Acquisition Guide helped to apply them in the MAPA basic project;
- ii. the use of Virtual Communities, as a knowledge management and communication tool, stimulated and facilitated the team participation in the MAPA basic project;
- iii. the use of a standard template allowed reuse, facilitated and increased the efficiency in the development of similar basic projects;
- iv. the work as a team facilitated the knowledge leveling, stressed the importance of the Acquisition Process as a guidance, allowed greater transparency in the MAPA basic project and improved the bidding process.

The results achieved in the MAPA basic project may indicate that the MPS Acquisition Process (Fig.1) fulfill private and government institutions requirements. However, some modifications in the sequence of activities are necessary to meet specific requirements from the acquisition legislation for government institutions. As an example, in the “Supplier Selection” subprocess, the activity sequence was: i) to prepare a reference contract based on the basic project developed by the technical area; ii) to evaluate supplier capability; iii) to select the supplier.

Therefore, the acquisition process in Fig. 1 was customized and included in the MAPA Information Technology Strategic Plan. It will be improved from the experience gained during the development of the basic project for contracting Information System development (scope of this experience) and from other basic projects already developed such as software package acquisition, consulting services and hardware contracts. The standard template should be instantiated for reuse according to the acquisition objective.

As a future prospect, it is proposed the establishment of a permanent group for acquisition of software, hardware and related services in the Brazilian Ministry

of Agriculture, Livestock and Food Supply (MAPA). This group will be composed by technicians from the information technology, bidding and legal affairs areas. The results from this team work should be stored in a Virtual Community or in a specific database for future reuse. In this way, it will be possible to improve the quality from contracted software products and services.

3.3. MPS Acquisition Process Training and Consultancy

The MPS.BR acquisition process aims at improving the software acquisition process activities in private and government acquirers, as well as stimulating the improvement of supply processes for suppliers which develop and deliver software and related services.

Therefore the MPS Acquisition Process training and the MPS Acquisition Consultant certification is a complementary strategy in order to reach the goals related to the Acquisition area of the MPS.BR Program.

A certified MPS Acquisition Consultant shall support the dissemination of the MPS Acquisition Process as well as working at acquisition projects and defining and implementing acquisition processes that are customized according to the characteristics of each organization. The MPS Acquisition Consultants may also provide more confidence to the organizations involved with software acquisition projects, add value and improve quality of the projects which they work.

3.3.1. MPS Acquisition Process Training. The MPS Acquisition Process is disseminated by means of: published papers; technical reports; technical conferences; MPS Acquisition workshops (W4) where organizations explain their experiences related to software acquisition which are discussed taking into account the MPS Acquisition Process; and by MPS Acquisition Process courses (C4) when, during 16 hours, the MPS Acquisition Process is explained in detail and some practical exercises are executed so that the attendants can perceive and understand some specific aspects that take part of different types of software acquisitions.

The following topics are addressed in the MPS Acquisition Process courses (C4):

- i. The MPS Reference Model;
- ii. Why to use an Acquisition Process;
- iii. The Acquisition Process (General overview; Acquisition preparation; Needs and requirements; Acquisition plan; Test plan; Call for tender; Supplier selection; Proposals from the suppliers; Evaluation criteria; Software process evaluation; Software product evaluation; Supplier and

- customer agreement; Supplier monitoring; Customer acceptance);
- iv. Customizing the Acquisition Process;
- v. Roadmap for evolving the Acquisition Process;
- vi. Additional information addressed by the Acquisition Guide.

The MPS Acquisition Process course (C4) attendants are, in general, professionals with technical and managerial skills in software acquisition or in software development and delivery, such as software engineers, acquisition executives and lawyers. This learning environment enables important interactions among the attendants and with the instructor, resulting in exchange of information, identification of best practices and common problems that need to be coped, and provision of technical input for improving the contents of the course. Some of the most skilled attendants go for the next steps aiming at the MPS Acquisition Consultant certification.

3.3.2. MPS Acquisition Consultant Certification. The MPS Acquisition Consultant certification steps include the MPS Acquisition Process course (C4), the MPS Acquisition Process individual examination (E4), an Academic degree and practical experience applying the acquisition process, as following:

- i. MPS Acquisition Process course (C4);
- ii. MPS Acquisition Process individual examination (E4): the exam consists of a solution of a case, addressing some aspects involved in a software acquisition project. To be approved, the candidate need to achieve, at least, 70% of the total score;
- iii. Work at a software acquisition project: this project shall be a real acquisition project executed by a government or private organization, following the MPS Acquisition Process and advised by a MPS Acquisition Consultant already certified who will be in charge of assuring the project conformance to the MPS Acquisition Process and gathering best practices information which may contribute to the improvement of the MPS Acquisition Process. The candidate proposition is analyzed in order to check whether its characteristics address the certification requirements.
- iv. Technical Report: the results of the Acquisition Project, as well as best practices and learned lessons shall be reported by the candidate and the MPS Acquisition Consultant. This Technical Report may be used to improve the MPS Acquisition

- Process and the related Acquisition Guide;
- v. Conclusion Report: the MPS Acquisition Consultant who advised the candidate shall prepare a report addressing the acquisition project results, the candidate performance and a recommendation regarding certification of the candidate as a new MPS Acquisition Consultant;
- vi. Certification: if the candidate is approved, an MPS Acquisition Consultant certificate is published in the SOFTEX Website. The certificate is valid for two years but it may be cancelled at any time in case that the MPS Acquisition Consultant, for some action or omission, put the MPS.BR credibility in risk.

4. Conclusion

This paper described the MPS.BR Program, i.e. a nationwide effort to develop and disseminate the MPS Model. This process model has been implemented by Brazilian organizations since 2004 and officially assessed since 2005.

Adoption of MPS Model has been accelerating. Until June 2007, 40 Brazilian organizations executed MPS Model-based assessments all over the country. It is expected to achieve 100 MPS Model-based assessments by the end of 2008.

In 2008, it is also expected to present quantitative evidences of performance results from organizations that have adopted the MPS Model, in categories such as cost, schedule, productivity, quality, customer satisfaction, and return on investment (ROI).

We are also planning to amount to 100 certified MPS Acquisition Consultants (MPS AC) by 2010. This is a big challenge and it will be a good contribution to improve more and more the software acquisition process in Brazil.

This paper mainly described: i) the MPS Acquisition Guide; ii) the Acquisition Process customization, including the MPS Acquisition Guide customization to the Brazilian Ministry of Agriculture, Livestock and Food Supply (MAPA) and process instantiation of the customized acquisition process; iii) the MPS Acquisition Process training and consultancy.

We have learned that for improving continuously the MPS.BR Program and MPS Model, including organizational software acquisition process improvement, the main challenges are the following:

- i. it is necessary to commit more qualified people, skillful institutions and interested organizations with the MPS Model, including the MPS Acquisition Guide;

- ii. it is suitable to improve the MPS Model yearly, including the MPS Acquisition Guide;
- iii. it is crucial to strengthen training on the MPS Model through official courses, individual examinations and recycling workshops, including the MPS Acquisition courses (C4), examinations (E4) and workshops (W4);
- iv. it is very important to implement and assess software process in Brazilian organizations based on the MPS Model, including the MPS Acquisition Process;
- v. it is correct to certify MPS Acquisition Consultants to assist the organizations in their acquisition projects;
- vi. it is appropriate to apply the MPS Acquisition Guide to an organization in actual acquisition projects both by customizing it and/or evolving it step by step, such as in the Brazilian Ministry of Agriculture, Livestock and Food Supply (MAPA).

Applying this will lead for continuous:

- i. improvement of both the MPS.BR Program and MPS Model;
- ii. software process improvement (SPI) in the project level of private and government organizations that have adopted the MPS Model;
- iii. software acquisition process improvement (SAPI) in the organizational level of private and government acquirers that have customized the MPS Acquisition Guide.

Last but not the least, the MPS Model has a great potential to be replicated in other countries with similar characteristics related to the software industry.

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