Maturity in Project Management Series¹

Impact of PPPM Maturity on the Success of Software Application Development Projects in Brazil

By Russell Archibald and Darci Prado

The Brazilian Experience with PPPM (Portfolio, Program and Project Management) Maturity is distinguished by longevity of the research (since 2005); by full acceptance by the PPPM community and the broad range of participants; by the large amount of results made available on the web site; and by the consistency of those results. In this article we will show the impact of PPPM Maturity on software application development projects in Brazil.

This PPPM research program was initiated by the authors in 2005 and by 2012 it involved many volunteers and 434 participating organizations, including companies, governmental agencies (both directly managed and indirectly managed), and non-governmental organizations/NGOs. The total of projects involved is 8,680. Four major reports are available for download free on-line (www.maturityresearch.com):

- General Report: includes analysis of all types of organizations, all categories of projects and all business areas;
- I.T. Report: dedicated only to the I.T. category of projects;
- Construction Industry Report: dedicated only to Engineering & Construction categories of projects;
- Organizational Change Report: dedicated only to transformational projects that are related with redesign of processes and the business, reduction of expenses, acquisition and integration of competing companies, etc.

In this article we will continue to show some results in the 2012 survey related to Information Technology, and it is totally devoted to New Applications Development – Software (IT-NAD/SW). In the 2012 research there were 64 participating organizations from this area, with 1,472 projects. Final results showed an average maturity level of 2.64. This can be considered good for the Brazilian organizations, considering the short time in which the Project Management subject became popular in Brazil. But it is certainly a low score considering how much still has to be done.

¹ The Project Management Maturity series of articles by Russell Archibald & Prof Darci Prado is based on their extensive research on this topic in Brazil, the United States and other countries. Russ is one of the pioneers in the project management field and the originator of the Archibald Project Categorization Model. Darci is the developer of the Prado Project Management Maturity Model which has been successfully implemented by many organizations in Brazil. More about this model and related research can be found at http://www.maturityresearch.com/.
New Applications Development is one of the five subcategories of the I.T. category, as we show in the Table 1 with the 2012 maturity research results:

<table>
<thead>
<tr>
<th>Project Subcategory</th>
<th>Participants</th>
<th>Maturity</th>
</tr>
</thead>
<tbody>
<tr>
<td>New Applications Development (IT-NAD/SW)</td>
<td>64</td>
<td>2.64</td>
</tr>
<tr>
<td>Major I. T. System Maintenance</td>
<td>21</td>
<td>2.41</td>
</tr>
<tr>
<td>Implementation of applications for other areas of the organization</td>
<td>5</td>
<td>2.10</td>
</tr>
<tr>
<td>Implementation of applications for external clients</td>
<td>13</td>
<td>2.68</td>
</tr>
<tr>
<td>Implementation of new applications purchased from external suppliers</td>
<td>25</td>
<td>2.44</td>
</tr>
<tr>
<td>Total</td>
<td>130</td>
<td>2.55</td>
</tr>
</tbody>
</table>

Table 1. Project Sub-Categories within the Major I. T. Project Category

In the following sections we will show some IT-NAD/SW results related to leading indicators and some of the groups that the database records. The indicators are:

- Maturity
- Success
- Delay
- Cost Overrun.

Besides these indicators and to better understand this category of projects, we have used some data from the 2010 PM Maturity Research [4] about causes of failure and percent of delivered functionalities.

This article is divided into two main parts:

- Main results for IT-NAD/SW
- Grouped results for organizations and business sector areas.

The groups are the following:

- Organization Types
- Businesses Areas
- Organization Sizes

To fully understand the Prado-PM Maturity Model, it would be better if the reader could read the third article (March 2014) of this series that describes the model in some detail. To facilitate the understanding, we include at the end of this article a summary of the Prado-PMMM and Archibald Categorization Models.
1. Brazilian PM Maturity Research Program: IT NAP-SW Main Results

The survey shows the following average results for 64 participants and 1,472 projects:

Maturity
- PM Maturity: 2.64 (scale 1-5)

Results Indicators
- Project Success:
  - Total Success Rate: 52.4%
  - Partial Success Rate: 34.0%
  - Failure Rate: 13.6%
- Delay: 30.0%
- Cost overrun: 16.0%

Portfolio of Projects Composition by Participant
- Average number of projects: 23.
- Average duration of each project: 8 months.
- Average value of each project: US$ 5,000,000.00

DISTRIBUTION AT LEVELS

Figure 1 indicates how the participants were distributed among the five maturity levels. We can conclude that 50% of organizations are at weak levels (levels 1 and 2) and only 13% of organizations are at excellence levels (levels 4 and 5).

Figure 2 shows the average adherence to the maturity dimensions used within the Prado Maturity Model. This figure shows that I.T. departments are poor in the usage of PM organizations structures (Project Manager, PMO, Sponsor and Committee).
DIMENSIONS ADHERENCE

Figure 2. 2012 Average Adherence by Brazilian Organizations to the Six Maturity Dimensions of the Prado PM Maturity Model Information Technology – NAD/SW [1].

MATURITY LEVELS AND SUCCESS
In Figure 3 we show the relationship between maturity levels and success for IT-NAD-SW projects. It is very clear that the higher the maturity, the higher degree of total success.

The concepts for success are the following:

- **Total success**: the project almost finished on time, scope and budget (minor differences). The user was completely satisfied because the product/service was delivered, is being used, and really has added value to their work.

- **Partial success**: the project was finished and the software is being used. However, there were unsuccessful factors such as significant delay and/or significant cost overrun, and/or user satisfaction was partial because the product/service does not provide all the features needed and expected and/or does not add value to its expected function.

- **Failure**: the project was cancelled or the product/service delivered is not being used for not meeting the expectations of the users, or the delay was such that it resulted in losses to the business. The user/client was deeply dissatisfied.
Figure 3. Maturity Levels and Success. Information Technology – NAD/SW [1].

VALUE AGGREGATION PERCEPTION
In the 2012 research [1], the question on the perception by key stakeholders of value aggregation by project management is:

19. Regarding the practice of project management (PM) in your department, what is the perception by key stakeholders on the importance (or value creation) that project management brings to the success of projects and / or for the business of the department?
   a) PM adds a lot of value
   b) PM adds some value
   c) PM adds little value
   d) PM does not add value
   e) We have no PM

The intersection between key stakeholders’ perception of PM value aggregation and maturity levels is shown in Figure 4.
From Figure 4 we can conclude that there is a direct positive relationship between *Perceived Value Aggregation* and *Project Management Maturity Levels*. The higher the maturity, the greater the perception, by key stakeholders, of added value!

**MATURITY LEVELS AND DELAY**

The relationship between maturity levels and delay is shown in Figure 5.

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**Figure 4. PM Value Aggregation Perception.**

Information Technology – NAD/SW [1].

**Figure 5. Maturity Levels and Delay.**

Information Technology – NAD/SW [1].
MATURITY LEVELS AND COST OVERRUN
The relationship between maturity levels and Cost Overrun is shown in Figure 6.

![Figure 6: Maturity Levels and Cost Overrun](image)

DELIVERED FUNCTIONALITIES
In the 2010 research [4] it was possible to measure the delivering of functionalities. The results showed the following data (Figure 7):

![Figure 7: Delivered Functionalities](image)

The above data has an overall average of 82%. This means that, on average, IT-NAD/SW projects delivers 82% of the initial proposed functionalities.
CAUSES OF FAILURE

In the 2010 research [4] the participants were asked to point the three main causes of their projects failure, according to the following list:

- Incomplete or incorrect Business Case
- Frequent scope change
- Frequent priority changes among the projects portfolio, coming from top management
- Unfeasible deadlines
- Project portfolio size beyond the sector’s capacity to deliver
- Insufficient or inadequate commitment from the user areas involved
- Insufficient or inadequate commitment from top management
- Lack of human, financial and material resources
- Poor methods, tools and techniques for the projects management
- Insufficient managerial capacity of the Project Managers
- Technical I.T. skills of the team insufficient or inadequate to the challenges
- Risks not properly managed

The main causes are the following (Figure 8).

From this figure we can see that Scope Change is the main cause of projects’ failure. Certainly there is no surprise in this information since lots of other researches have arrived at the same conclusion. But it is very interesting to take a look at other main causes, like “Poor PM Methodology”.

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2. Results for Organizational and Business Sector Groups

In this section of this article we show results for the following groups:
   a) Organization Types
   b) Business Areas
   c) Organization Size

a) Organization Types

The research grouped the participants into four organization types:

1. Private companies
2. Government – Direct Administration
3. Government – Indirect Administration
4. NGO - Non Governmental organizations.

Table 2 shows the main numbers for the organization types. Figures 9, 10, 11 and 12 are related with this table. Private companies, as expected, were the main participants. As can be seen, we received no data for the NGO organization type.

<table>
<thead>
<tr>
<th>ORGANIZATION TYPE</th>
<th># of Respondents</th>
<th>Percentual</th>
<th>Maturity</th>
<th>Total Success</th>
<th>Partial Success</th>
<th>Failure</th>
<th>Average Delay</th>
<th>Average Cost Overrun</th>
</tr>
</thead>
<tbody>
<tr>
<td>Private Companies</td>
<td>49</td>
<td>76,6%</td>
<td>2,72</td>
<td>55,4%</td>
<td>32,6%</td>
<td>12,0%</td>
<td>26%</td>
<td>15%</td>
</tr>
<tr>
<td>Government - Direct Administration</td>
<td>9</td>
<td>14,1%</td>
<td>2,14</td>
<td>40,0%</td>
<td>40,7%</td>
<td>19,3%</td>
<td>53%</td>
<td>31%</td>
</tr>
<tr>
<td>Government - Indirect Administration</td>
<td>6</td>
<td>9,4%</td>
<td>2,72</td>
<td>46,7%</td>
<td>35,0%</td>
<td>18,3%</td>
<td>33%</td>
<td>9%</td>
</tr>
<tr>
<td>General Totals</td>
<td>64</td>
<td>100,0%</td>
<td>2,64</td>
<td>52,4%</td>
<td>34,0%</td>
<td>13,6%</td>
<td>30%</td>
<td>16%</td>
</tr>
</tbody>
</table>

Table 2. Results by Organization Type

According to Table 2 and Figures 9, 10, 11 and 12 we may conclude that:

- Private companies have the best indicators;
- Government – Direct Administration has the worst indicators.

There is no surprise in those conclusions.
Figure 9. Average PM Maturity by Organization Type
Information Technology – NAD/SW [1].

Figure 10 - Success by Organization Type
Information Technology – NAD/SW [1].
b) Business Sector Areas

The research grouped the participants into the following businesses areas:

1. Agriculture, Cattle Raising and Forestry
2. Food and beverage
3. Banking, finance and insurance
4. Trading  
5. Construction  
6. Consulting  
7. Defense, Security and Aeronautics  
8. Distribution (Water, gas)  
9. Education  
10. Electronics  
11. Engineering  
12. Electrical Energy (Production and/or Distribution)  
13. Pharmaceutical  
14. Mining  
15. Metallurgy and Steelmaking  
16. Paper and Cellulose  
17. Oil and Gas  
18. Chemical  
19. Refractories, Ceramic and Glass  
20. Health  
21. Information Technology (Hardware & Software)  
22. Telecommunications  
23. Textile  
24. Transportation, Storage & Services, Logistics  
25. Tourism & Sports  
26. Automotive & Automotive Parts  
27. Clothing, Footwear, Fashion and Sports Equipment  
28. Other

Table 3 shows the main numbers for three business areas (we are showing data only for those areas with at least 5 participants). Figures 13, 14, 15 and 16 are related with this table.

<table>
<thead>
<tr>
<th>BUSINESS AREA</th>
<th># of Respondents</th>
<th>Percentual</th>
<th>Maturity</th>
<th>Total Success</th>
<th>Partial Success</th>
<th>Failure</th>
<th>Average Delay</th>
<th>Average Cost Overrun</th>
</tr>
</thead>
<tbody>
<tr>
<td>Banks, Finance</td>
<td>6</td>
<td>9,4%</td>
<td>2,55</td>
<td>31,7%</td>
<td>48,3%</td>
<td>20,0%</td>
<td>48%</td>
<td>29%</td>
</tr>
<tr>
<td>Education</td>
<td>5</td>
<td>7,8%</td>
<td>2,02</td>
<td>56,3%</td>
<td>26,3%</td>
<td>17,5%</td>
<td>55%</td>
<td>34%</td>
</tr>
<tr>
<td>Information Technology</td>
<td>28</td>
<td>43,8%</td>
<td>2,78</td>
<td>57,4%</td>
<td>32,1%</td>
<td>10,5%</td>
<td>27%</td>
<td>14%</td>
</tr>
</tbody>
</table>

Table 3. Maturity Data Related to Three Business Sector Areas

According to Table 3 and Figures 13, 14, 15 and 16 we may conclude that:

- Information Technology has the best indicators;
- Education has the worst indicators.

Again, there is no surprise with these results since the main occupation of Information technology organizations is just to develop and/or install, in addition to operate, software.
Figure 13. PM Maturity by Businesses Areas in Brazil

Information Technology – NAD/SW [1].

Figure 14. Success by Businesses Areas

Information Technology – NAD/SW [1].
Figure 15 - Delay by Businesses Areas
Information Technology – NAD/SW [1].

Figure 16 - Cost Overrun by Businesses Areas
Information Technology – NAD/SW [1].
c) Organization Size (Annual Gross Revenue or Budget)

The research grouped the participants into the following revenue or budget groups:

- Under US$ 250,000
- From US$ 250,000 to US$ 1 million
- From US$ 1 million to US$ 5 million
- From US$ 5 million to US$ 50 million
- From US$ 50 million to US$ 500 million
- Above US$ 500 million

The Table 4 shows the main numbers for the organization sizes based on revenue or budgets. Figures 17, 18, 19 and 20 are related with this table.

<table>
<thead>
<tr>
<th>Annual Gross Revenue or Budget</th>
<th># of Respondents</th>
<th>Percentual</th>
<th>Maturity</th>
<th>Total Success</th>
<th>Partial Success</th>
<th>Failure</th>
<th>Average Delay</th>
<th>Average Cost Overrun</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt; US$ 250,000</td>
<td>3</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>From US$ 250,000 to US$ 1 million</td>
<td>8</td>
<td>12,5%</td>
<td>2,54</td>
<td>50,8%</td>
<td>36,7%</td>
<td>12,5%</td>
<td>31%</td>
<td>16%</td>
</tr>
<tr>
<td>From US$ 1 million to US$ 5 million</td>
<td>12</td>
<td>18,8%</td>
<td>2,40</td>
<td>59,5%</td>
<td>23,6%</td>
<td>16,8%</td>
<td>31%</td>
<td>22%</td>
</tr>
<tr>
<td>From US$ 5 million to US$ 50 million</td>
<td>16</td>
<td>25,0%</td>
<td>2,60</td>
<td>54,5%</td>
<td>33,5%</td>
<td>12,0%</td>
<td>28%</td>
<td>19%</td>
</tr>
<tr>
<td>From US$ 50 million to US$ 500 million</td>
<td>7</td>
<td>10,9%</td>
<td>2,66</td>
<td>25,0%</td>
<td>51,7%</td>
<td>23,3%</td>
<td>35%</td>
<td>10%</td>
</tr>
<tr>
<td>Above US$ 500 million</td>
<td>18</td>
<td>28,1%</td>
<td>2,96</td>
<td>52,1%</td>
<td>36,4%</td>
<td>11,4%</td>
<td>29%</td>
<td>15%</td>
</tr>
<tr>
<td>General Totals</td>
<td>64</td>
<td>100,0%</td>
<td>2,64</td>
<td>52,4%</td>
<td>34,0%</td>
<td>13,6%</td>
<td>30%</td>
<td>16%</td>
</tr>
</tbody>
</table>

Table 4. Maturity Data Related to Organization Size.

According to Table 4 and Figures 17, 18, 19 and 20 we may conclude that there are not any significant differences among organizations of different sizes. The exception is the group “From US$ 50 million to US$ 500 million” that shows results a little bit unexpected, mainly when we look at the success, delay, and cost overrun graphs, Figures 18, 19 and 20.
Figure 17. Global PM Maturity by Organization Size as Indicated by Annual Gross Revenue or Budget Information Technology – NAD/SW [1].

Figure 18. Success by Organization Size as Indicated by Annual Gross Revenue or Budget Information Technology – NAD/SW [1].
Figure 19. Delay by Organization Size as Indicated by Annual Gross Revenue or Budget
Information Technology – NAD/SW [1].

Figure 20. Cost Overrun by Organization Size as Indicated by Annual Gross Revenue or Budget
Information Technology – NAD/SW [1].
3. The Prado PM Maturity Model

The principal criteria used in the design of the model are [2]:

- Use the same levels (1 to 5) of the model SW-CMM developed by Carnegie-Mellon University for software development.
- Have simplicity (questionnaire with only 40 questions) and universality (application to all types of organizations and the entire list of project categories).
- Relate the maturity of the organization to its ability to execute projects successfully.
- Enable direct indications of where PM practices need improvement in order to grow the organization’s PM maturity and project success rate.

The five levels and seven dimensions of PM maturity in the Prado PMM Model are shown in Table 5.

<table>
<thead>
<tr>
<th>LEVELS</th>
<th>DIMENSIONS</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Initial</td>
<td>1. Technical (PM) and Contextual Competence</td>
</tr>
<tr>
<td>2. Known</td>
<td>2. Use of Methodology</td>
</tr>
<tr>
<td>3. Standardized</td>
<td>Computerization</td>
</tr>
<tr>
<td>4. Managed</td>
<td>4. Use of appropriate organizational structure</td>
</tr>
<tr>
<td>5. Optimized</td>
<td>5. Alignment with the organization's business</td>
</tr>
<tr>
<td></td>
<td>6. Behavioral Competence</td>
</tr>
</tbody>
</table>

Table 5. Levels and Dimensions of the Prado PM Maturity Model [2].

The five levels are characterized as follows:

1. Initial
   - Little knowledge of the subject
   - Lack of methodology and/or management models
   - Use of intuition in management of projects.
2. Known – Isolated Initiatives
   - Start creating a new culture to build skills.
3. Standardized
   - Implementation of a standardized platform for project management:
     o Organizational Structure (Governance)
     o Methodology
     o Computerization
     o Strategic Alignment
   - Skills (behavioral competence) development.
4. Managed
   - Improvement of the platform: the standards work
   - Anomalies identified and eliminated
   - Effective human relationships
   - Consolidation of alignment with the organization's business.

5. Optimized
   - Results in high efficiency (optimization of terms, scope, quality and costs)
   - High efficiency of management processes
   - Wisdom
   - Low stress
   - Low noise
   - Something natural.

4. The Archibald Categorization Model

Because there is usually a wide variation within one organization in its PM maturity for different types or categories of projects, the most useful measure of PM maturity relates to each specific project category. To accomplish this PM maturity measurement on a globally consistent basis the Brazilian PM Research Project has adopted the widely accepted project categorization model developed by Archibald [3] with these 10 basic project categories:

1. Aerospace/Defense
2. Business & Organizational Change
3. Communication Systems
4. Events
5. Facilities
6. Information Systems
7. International Development
8. Media & Entertainment
9. Product/Service Development
10. Research & Development.

There are several sub-categories within each of these; for the Brazilian research, for example, within the Facilities category the PM maturity is measured for “engineering design” and “construction and assembly” projects. The benchmarking results at the project category level are averaged for a given organization when one organization has assessed its maturity for more than one project category. More detailed discussion of the purposes and methods of project categorization can be seen in reference 3.
5. Final Consideration

In the site www.maturityresearch.com the reader can find more information about I.T projects and, specifically, New Applications Development- Software.

This is the seventh of a series of articles on PPPM Maturity.
Click on these titles to read the previous six articles:

Feb. 2014: The Importance of Knowing Your Project, Program, and Portfolio Management Maturity: PPPMM
Mar. 2014: Foundations of the Prado-PM Maturity Model
Apr. 2014: PM Maturity for Project Categories
May 2014: Maturity, Success and Competitiveness
June 2014: The Brazilian Experience: General Results

References

About the Authors

Russell D. Archibald

San Miguel de Allende, Mexico

Russell D. Archibald: PhD (Hon) ESC-Lille (Fr), MSc (U of Texas) & BS (U of Missouri) Mechanical Engineering, PMP, Fellow PMI and Honorary Fellow APM/IPMA (member of the Board of IPMA/INTERNET 1974-83), held engineering and executive positions in aerospace, petroleum, telecommunications, and automotive industries in the USA, France, Mexico and Venezuela (1948-1982). Russ also had 9 years of active duty as a pilot officer with the U.S. Army Air Corps (1943-46) and as a Senior Pilot and Project Engineer with the U. S. Air Force (1951-58.) Since 1982 he has consulted to companies, agencies and development banks in 16 countries on 4 continents, and has taught project management principles and practices to thousands of managers and specialists around the world. He is co-author (with Shane Archibald) of Leading and Managing Innovation: What Every Executive Team Must Know About Project, Program, and Portfolio Management (2013); author of Managing High-Technology Programs and Projects (3rd Edition 2003), also published in Russian, Italian, and Chinese; other books (in English, Italian, Japanese, and Hungarian); and many papers on project management. Website: http://russarchibald.com E-mail: russell_archibald@yahoo.com

Darci Prado, PhD

Belo Horizonte (MG) - Brazil

Darci Prado is a consultant and partner of FALCONI (ex-INDG) in Brazil. He is an engineer, with graduate studies in Economical Engineering at UCMG and PhD in Project Management from UNICAMP, Brazil. He has worked for IBM for 25 years and with UFMG Engineering School for 32 years. He holds the IPMA Level B Certification. He was one of the founders of Minas Gerais State and Parana State PMI chapters, and he was member of Board Directors of Minas Gerais State PMI chapter during 1998-2002 and member of the Consulting Board during 2003-2009. He was also the president of IPMA Minas Gerais State chapter during 2006-2008. He is conducting a Project Management maturity research in Brazil, Italy, Spain and Portugal together with Russell Archibald. He is author of nine books on project management and is also author of a methodology, a software application, and a maturity model for project management. Darci can be contacted at darciprado@uol.com.br.