Customization of Project Management techniques for the construction of IT - Information Technology Systems with the Development Methodologies known as Agile Processes

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ABSTRACT

The theory presented by PMBoK© - Project Management Book of Knowledge [1], edited and maintained by PMI - Project Management Institute, which deals with the issues of how to administrate a Project efficiently and planned, is already widely known and recognized by the world professional community as a strong orientation of best practices and effective working tool in this field.

The PMBoK© - Project Management Book of Knowledge directs the Phases and the Disciplines that must be addressed in leading a Project, whether it be, both to meet the construction of projects in Engineering Area or to meet the System Development Projects in the Area of IT - Information Technology.

In the latter Area, namely the area of IT - Information Technology, the theory presented by PMBoK© - Project Management Book of Knowledge is already intensively applied for some decades. However, the System Development Methodologies in IT - Information Technology area are being reviewed by the emergence of new technical resources and new visions of interpretation of the business by the Organizations.

In that way, this study intends to evaluate the current impact of these revisions (in System Development Methodologies in IT - Information Technology area) may result in new versions of the PMBoK© - Project Management Book of Knowledge, which, also implemented revisions and at this moment is in its 5th.Edition.

In conclusion, after some simulations in a practical environment, it is verified the usefulness of this paper (and its "Table of Definition of Specific Features of Project", which try to support the decision about what is the best System Development Methodology in IT - Information Technology area to be applied to a specific Project) as an effective management and planning tool in corporate real world.

Keywords: Project Management; PMBoK©; System Development Methodologies; Methodologies of Traditional Processes; RUP®; Methodologies of Agile Processes; SCRUM; Strategic Planning; Costs; Risks; Evaluation; Project Size; Project Effort.

1. AUTHOR'S EXPERTISE

The perception of the existence of these changes in PMBoK© - Project Management Book of Knowledge theory, according to the moving of way to build systems (from the procedures of Methodologies of Traditional Processes to the procedures of the Group of Methodologies of Agile Processes, that will be more deeply defined in the sequence of this text), is the result of the accumulation of experiences throughout the professional career of more than 40 (forty) years of author of this work in projects of various types, besides their additional Technical Certifications – among others – in the field of Project Management (PMP© - Project Management Professional/PMI© - Project Management Institute) and System Testing (CTFL© - Certified Tester Foundation Level/ISTQB© - International Software Testing Qualifications Board).

Additionally, the author's perception of the existence of these issues in PMBoK© - Project Management Book of Knowledge theory related to new approaches of emergent System Development Methodologies, was consolidated in academic studies and research works (the author is Master in IT - Information Technology and PhD in Production Engineering with emphasis in Production Information Systems). Those works resulted in publications in National Congresses (such as, the ENEGEP - National Meeting in Production Engineering, sponsored by ABEPRO - Brazilian Association of Production Engineering) and International Conferences (such as, IMCIC - International Multi-Conference on Complexity, Informatics and Cybernetics, sponsored by IIIS - International Institute of Informatics and Systemics).

2. OJECTIVES OF THIS ARTICLE

That need for revision and adjustments of the impacts in the theory presented by PMBoK© - Project Management Book of Knowledge – mentioned in the previous paragraphs – is the motivation of this paper, which intends to review the approach of this theory when were used the procedures of the precursor Group of Methodologies of Traditional Processes in comparison with the new procedures of his successor Group of Methodologies of Agile Processes (which will be presented as follow).

In order to substantiate its arguments, this paper – as its first step – describes the Phases and the Disciplines components of the PMBoK© - Project Management Book of Knowledge. In sequence, are interrelated these Phases and Disciplines with common phases and disciplines that exist in almost every Methodologies categorized as members of the Group of Methodologies of Traditional Processes. As sample, will be studied the RUP® - Rational Unified Process® [2][3] that is the UP - Unified Process commercialized by Rational company (an IBM company).

This interrelation is also conducted for the phases and disciplines which are common in almost every Methodologies categorized as members of the Group of Methodologies of Agile Processes. As sample, will be studied the SCRUM [4][5].

Finally, the differences between the 2 (two) interrelations of the 2 (two) Groups of System Development Methodologies in IT - Information Technology area with the Phases and the Disciplines components of the PMBoK© - Project Management Book of Knowledge are highlighted and detailed.

As additional result and contribution, this article also analyses when each of these Methodologies should be better applied based on the classification of the type of System Development Project (considering some characteristics) that we are treating (please, see Topic "5. TABLE OF DEFINITION OF SPECIFIC FEATURES OF PROJECT").

3. PHASES AND DISCIPLINES OF PMBoK©, RUP® and SCRUM

Currently, the System Development Methodologies in IT - Information Technology area are divided in 2 (two) main Groups: Group of Methodologies of Traditional Processes and Group of Methodologies of Agile Processes.

For the first group of System Development Methodologies in IT - Information Technology area, which are categorized as members of the Group of Methodologies of Traditional Processes (precursor of Group of Methodologies of Agile Processes), the theory presented by PMBoK© - Project Management Book of Knowledge is already well adjusted.

However the new reality brought by the emerging Group of Methodologies of Agile Processes, which changes the way we should develop systems according to their procedures, involves a review and adjustments also in the impact of these new procedures in the theory presented by PMBoK© - Project Management Book of Knowledge so that the project can still be conducted under its determinations.

Even the Methodologies of Traditional Processes will be analyze according to impacts that its new approaches may cause in the interpretation of PMBoK© - Project Management Book of Knowledge, since this guide, is now in its 5th.Edition.

Although are being categorized the System Development Methodologies in IT - Information Technology area in 2 (two) Groups, which are, the Group of Methodologies of Traditional Processes (as "precursor" or "old") and the Group of Methodologies of Agile Processes (as "successor" or "new"), both can be applicable to construct of systems.

3.1. PMBoK©

The PMBoK© - Project Management Book of Knowledge (currently in its 5th.Edition), supported and sponsored by PMI - Project Management Institute is a guide to how manage a Project that is recognized as the most used Methodology in this subject.

Its Phases and Disciplines address an accurate manner how to lead a Project in the area of IT - Information Technology as well. Thus, the theory presented by PMBoK© - Project Management Book of Knowledge is already intensively applied for some decades to build applications resultants of a System Development Projects.

Even with, the emergence of new technical resources and new visions of interpretation of the System Development Methodologies in IT - Information Technology, seems that PMBoK© - Project Management Book of Knowledge theory can adapted itself and to keep working as the main fundamental guide in this theme. That is what this paper wants to check.

The execution of a Project under the PMBOK© - Project Management Book of Knowledge specifications follows a sequence of steps called Phases and clusters the activities that must be performed in groups called these as Disciplines.

The PMBoK© Phases are: 1. Initiation; 2. Planning; 3. Execution; 4. Monitoring & Control; 5. Closing. In Table 1, these Phases are shown in this format to better understanding.

Table 1 - The PMBoK© Phases

1. INITIATION
2. PLANNING
3. EXECUTION
4. MONITORING & CONTROL
5. CLOSING

The PMBoK© Disciplines are: 1. Integration; 2. Scope; 3. Time; 4. Cost; 5. Quality; 6. Human Resource; 7. Communications; 8. Risk; 9. Procurement; 10. Stakeholders. In Table 2, these Disciplines are shown in this format to better understanding.

Table 2 - The PMBoK© Disciplines

1. INTEGRATION
2. SCOPE
3. TIME
4. COST
5. QUALITY
6. HUMAN RESOURCE
7. COMMUNICATIONS
8. RISK
9. PROCUREMENT
10. STAKEHOLDERS

3.2. RUP®

The methodologies members of the Group of Methodologies of Traditional Processes are oriented for documentation. These methodologies were created in a very different software development context of the current, based only on a mainframe and non-intelligent terminals.

At the time, the cost to make changes and corrections was very high, since access to computers was limited and there were no modern tools to support the development of software such as debuggers and code analyzers.

So the software was all planned and documented before being implemented. The most respected literature on this topic was written by Pressman [6] and Sommerville [7].

As informed before, in this same text, the example that will be explored is the RUP® and the Figure 1, shown in the Appendix A, presented the work flow of this Methodology.

The execution of a project under the RUP® specifications follows a sequence of steps called Phases and clusters the activities that must be performed in groups called these as Disciplines.

The RUP® Phases are: 1. Inception; 2. Elaboration; 3. Construction; 4. Transition. In Table 3, these Phases are shown in this format to better understanding.

Table 3 - The RUP® Phases

1. INCEPTION
2. ELABORATION
3. CONSTRUCTION
4. TRANSITION

The RUP® Disciplines are: 1. Business Modeling; 2. Project; 3. Requirements; 4. Analysis and Design; 5. Configuration and Change; 6. Implementation; 7. Test; 8. Deployment; 9. Environment. In Table 4, these Disciplines are shown in this format to better understanding.

Table 4 - The RUP® Disciplines

1. BUSINESS MODELING
2. PROJECT
3. REQUIREMENTS
4. ANALYSIS AND DESIGN
5. CONFIGURATION AND CHANGE
6. IMPLEMENTATION
7. TEST
8. DEPLOYMENT
9. ENVIRONMENT

3.3. SCRUM

The methodologies members of the Group of Methodologies of Agile Processes not reject the processes and tools, the documentation, the demands negotiation or the planning, but simply show that these have secondary importance when compared with the individuals and interactions, with the software to be executable, with customer collaboration and rapid responses to changes and modifications.

The focus of these methodologies are self-organizing teams (the division of labor is a result of the project understanding and consensus and there are joint efforts of the team to solve problems) and deliveries of parts of the project continuously and incrementally (Iterations), in order to get quick feedback of the client about the progress of the project.

Another highlight is the daily meetings between the team. The purpose of this is to discuss what will be done at that moment, reviewing the planning in the medium and short term, to reorganize tasks.

These concepts fit better with the way that small and medium sized organizations work and respond to changes. This Methodology has been published and disseminated by the Agile Manifest [8]. Also, these concepts are in Franklin [9].

As informed before, in this same text, the example that will be explored is the SCRUM and the Figure 2, shown in the Appendix A, presented the work flow of this Methodology.

The execution of a project under the SCRUM specifications follows a sequence of steps called Phases and clusters the activities that must be performed in groups called these as Disciplines.

The SCRUM Phases are: 1. View Meeting; 2. Sprint Planning; 3. Daily Scrum Meeting; 4. Sprint Review Meeting; 5. Release. In Table 5, these Phases are shown in this format to better understanding.

Table 5 - The SCRUM Phases

1. VIEW MEETING
2. SPRINT PLANNING
3. DAILY SCRUM MEETING
4. SPRINT REVIEW MEETING
5. RELEASE

The SCRUM Disciplines are: 1. Project; 2. Requirements; 3. Analysis and Design; 4. Implementation; 5. Test; 6. Deployment. In Table 6, these Disciplines are shown in this format to better understanding.

Table 6 - The SCRUM Disciplines

1. PROJECT
2. REQUIREMENTS
3. ANALYSIS AND DESIGN
4. IMPLEMENTATION
5. TEST
6. DEPLOYMENT

4. INTERRELATIONS AMONG PHASES AND DISCIPLINES OF PMBoK©, RUP® and SCRUM

4.1. PMBoK© Phases

4.1.1. PMBoK© Phases and RUP® Phases

In Figure 3, shown in the Appendix A, it is possible to analyze that there are interrelations that can be founded between both these Methodologies.

4.1.2. PMBoK© Phases and SCRUM Phases

In Figure 4, shown in the Appendix A, it is possible to analyze that there are interrelations that can be founded between both these Methodologies.

4.2. PMBoK© Disciplines

4.2.1. PMBoK© Disciplines and RUP® Disciplines

In Figure 5, shown in the Appendix A, it is possible to analyze that there are some interrelations (marked as “No Mapped” in red color) that can be not founded between both these Methodologies.

The interrelations “No Mapped” are:

- From PMBoK© To RUP®)= Cost;
- From PMBoK© To RUP®)= Communications;
- From PMBoK© To RUP®)= Procurement;
- From PMBoK© To RUP®)= Stakeholders.

- From RUP® To PMBoK©)= Business Modeling;
- From RUP® To PMBoK©)= Deployment;
- From RUP® To PMBoK©)= Environment.

Rmk.: “No mapped” means that the missing or existents procedures in the Methodology cannot be considered as an organized Discipline (with Processes well defined) so is not possible to be interrelated to the other.

4.2.2. PMBoK© Disciplines and SCRUM Disciplines

In Figure 6, shown in the Appendix A, it is possible to analyze that there are some interrelations (marked as “No Mapped” in red color) that can be not founded between both these Methodologies.

The interrelations “No Mapped” are:

- From PMBoK© To SCRUM)= Integration;
- From PMBoK© To SCRUM)= Cost;
- From PMBoK© To SCRUM)= Human Resource;
- From PMBoK© To SCRUM)= Risk;
- From PMBoK© To SCRUM)= Procurement.

- From SCRUM To PMBoK©)= Deployment.

Rmk.: “No mapped” means that the missing or existents procedures in the Methodology cannot be considered as an organized Discipline (with Processes well defined) so is not possible to be interrelated to the other.

5. TABLE OF DEFINITION OF SPECIFIC FEATURES OF PROJECT

This paper (as its objective contribution and aggregating the purpose described in its Topic “2. OJECTIVES OF THIS ARTICLE”) presents and proposes (in Appendix B) the “Table of Definition of Specific Features of Project” (composed by 20 Questions to be answered with YES or NO), which enables to support the task of deciding if the System Development Project can be conducted under the procedures of the Group of Methodologies of Traditional Processes or under the procedures of the Group of Methodologies of Agile Processes.

Besides of directing the decision-making, regarding this Project aspect (what means, which Methodology is more adequate), this Table also addresses the way to interpret the PMBoK© - Project Management Book of Knowledge theory which depends on the Methodology that will be applied to the Project as well.

For to put into practice the use of this "Table of Definition of Specific Features of Project”, a MS-Excel® spreadsheet was set up with the objective of assisting the final decision on how the Project should be conducted.

As final consideration about this Table, if the field "TOTAL" founded is not in the range of 5 to 15, the interpretation has not the accuracy expected. Also consider that the field "VALUE" of this Table can be used to implement (according to the importance of the Question) the original number (by multiplying by 2, 3 and etc.) what can change the field "TOTAL" and create a new vision.

6. CONCLUSIONS

By the assessment done by the author of this article, we can conclude that the PMBoK© - Project Management Book of Knowledge still remains as a solid benchmark for Project Management even with the most modern changes in the vision of the work of the System Development Methodologies in IT - Information Technology area.

The PMBoK© - Project Management Book of Knowledge, published and maintained by PMI© - Project Management Institute, offers a descriptive strategy for standardization of best practices in Project Management.

Hence, when we are considering a project as a whole, from its Inception Phase until its Closing Phase, the System Development Methodologies are not complete to perform the Control and Monitoring of the activities required in a software project construction.

Thus, the applicability of PMBoK© - Project Management Book of Knowledge is still effective for both the methodologies, what means, of the Group of Methodologies of Traditional Processes (used as reference the RUP® Methodology) and the methodologies of the Group of Methodologies of Agile Processes (used as a reference the SCRUM Methodology) since its additional Disciplines of the Monitoring and Control Phase cover the perceived shortcomings in each of the 2 (two) Methodologies studied in this article.

The RUP® Methodology has more interrelations with the PMBoK© - Project Management Book of Knowledge. But both (this, as well as the SCRUM Methodology) have not Disciplines directed to managing a project on the Human, Financials and others aspects.

This does not go against what the PMBoK© - Project Management Book of Knowledge determines because is its real intention to provide support, in fact, to any type of project with the technical part being conducted by technical normative and the administrative part of management being administrated by this same guide.

As assessed, is visualized (analyzing the Topic "4. INTERRELATIONS AMONG PHASES AND DISCIPLINES OF PMBoK©, RUP® and SCRUM” in this text) the need for integration of procedures to be performed and artifacts to be delivered, defined by System Development Methodologies, with the controls of Human Resources, of Strategic Planning and Financial-Accounting, besides of a more accurate management of project Risks, which leads to use of the PMBoK© - Project Management Book of Knowledge as a sure guide for structuring and standardization of these processes.

Also, the “Table of Definition of Specific Features of Project” proposed by this paper, was recognized (by some Users that have tested it in real situation) as a tool that really can help them to choose which Methodology can be adopted, with better results, in some kinds of Project, what, drive the adequacy of PMBoK© - Project Management Book of Knowledge for this reality.

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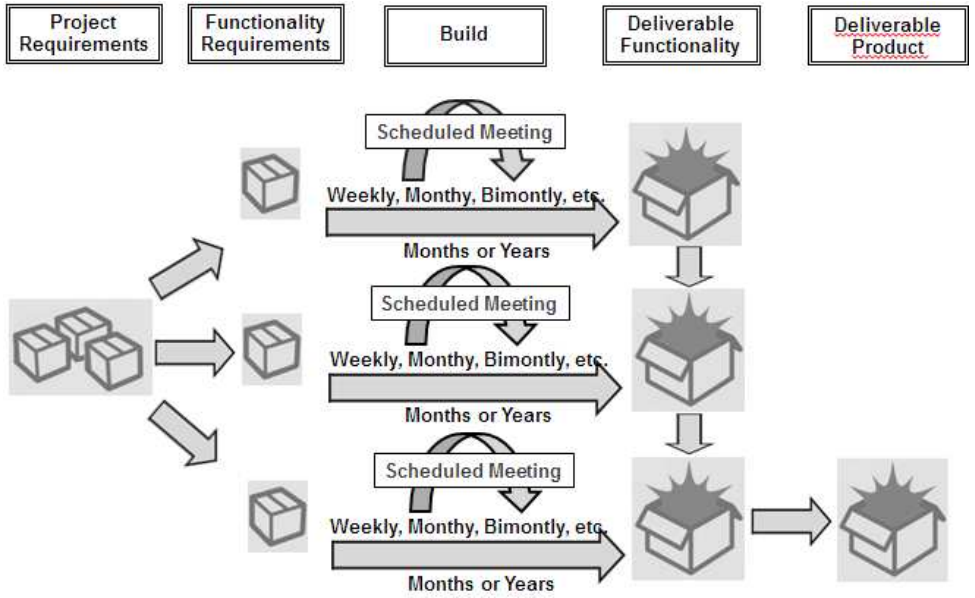

Figure 1 - Methodology of Traditional Process of System Development: RUP(®)

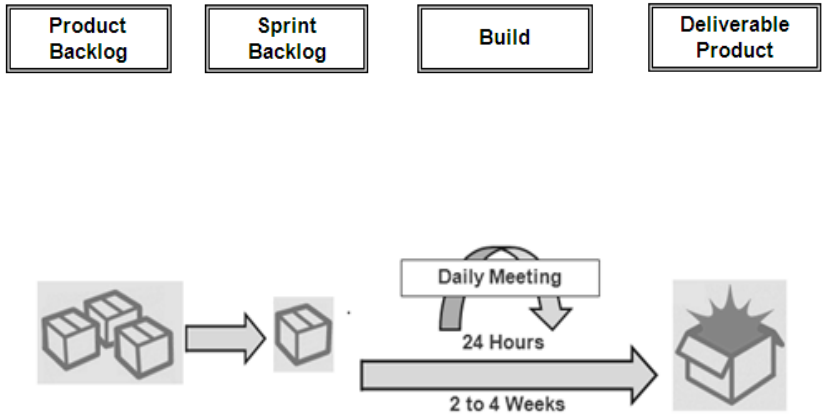

Figure 2 - Methodology of Agile Process of System Development: SCRUM

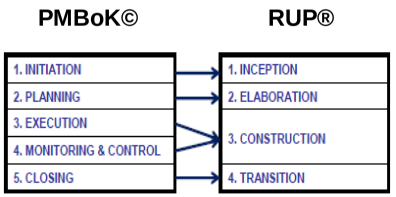

Figure 3 - PMBoK© X RUP® Phases

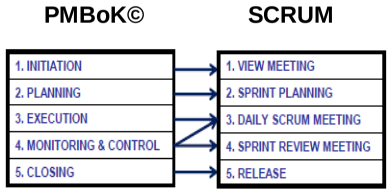

Figure 4 - PMBoK© X SCRUM Phases

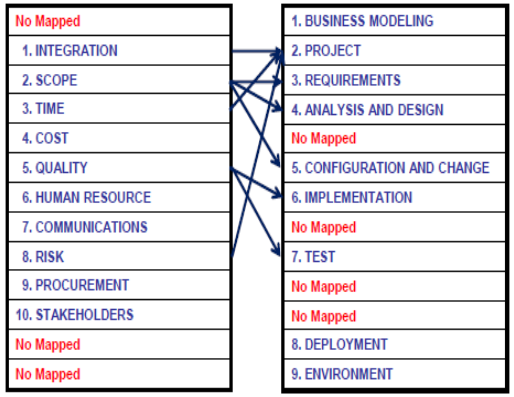

Figure 5 - PMBoK© X RUP® Disciplines

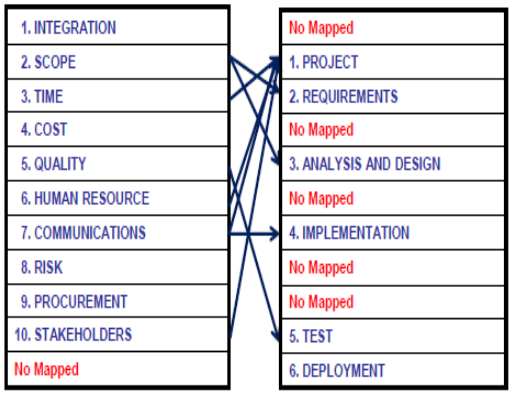

Figure 6 - PMBoK© X SCRUM Disciplines

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Appendix B

Table of Definition of Specific Features of Project } For each YES, add 1 to TOTAL [considering VALUE): If TOTAL = or > 15} SCRUM

Evaluated: by _____ in ____ / ____ / ____ Rmk.: Not sure if TOTAL is out of this range. If TOTAL = or < 5} Sequencial

Project Name/Code: _____

		YES	NO		VALUE		TOTAL
PROJECT	01. Does the Project have an extremely short Deadline to be developed?			X		=	
	02. Does the Project have an extremely controlled Budget that must be utilized in a short period of time?			X		=	
	03. Does the Project have some System Development Tools that enable the construction of the application in a safe and quick way?			X		=	
	04. Does the Project have strategic importance for the Corporation?			X		=	
	05. Does, the Business that the Project will support , have a tendency to suffer constants and impacting changes in their definitions?			X		=	
	06. Are the Decisions about the Project courses in Tactical Level and/or in Operational Level?			X		=	
STAKEHOLDERS	07. Is the Business that the Project will support dominated, in the fullness, by the Stakeholders?			X		=	
	08. Do the Stakeholders have the Power of Decision over the course of the Project?			X		=	
	09. Does the Project have the commitment of Stakeholders, in real-time and effective way, for Requirements Definition and System Testing?			X		=	
	10. Do the Stakeholders have fully notion of the results that are expected in the end of the Project development?			X		=	
DEVELOPMENT TEAM	11. Does the Culture of the Organization accept reduction in the complexity of Systemic Documentation in favor of a greater flexibility in the Project?			X		=	
	12. Does the Development Model utilize the TDD Technique, that is, before the Coding Phase starts the Test Plans should already be ready?			X		=	
	13. Do the members of the Development Team have personality receptive to criticism and suggestions?			X		=	
	14. Do the members of the Development Team have personalities that support psychological pressure regarding compliance with deadlines?			X		=	
	15. Is the Development Team multidisciplinary and is constituted of specialists with a Holistic Vision of Results?			X		=	
	16. Will the Development Team be constituted at the beginning of the Project and will remain integrated to its end?			X		=	
	17. Can the Products to be delivered be partitioned in packages and being delivered to each end of a Coding Phase and Test?			X		=	
	18. Does the Development Management have a structure that allows an effective Configuration Control of the Environment and of the Components?			X		=	
	19. Is there a tool that manages a Component Repository that enables the rapid dissemination and reuse Built Components?			X		=	
	20. Is the "Peer Work", both in Coding Phase and in the Test Phase, well accepted by the Development Team?			X		=	

RMK.: