WORKSHEET OF EXOGENOUS VARIABLES THAT IMPACT THE SUCCESS OF VALIDATION STAGE OF PRODUCT DELIVERY OF A PROJECT

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ABSTRACT

In the theory presented by PMBoK© - Project Management Book of Knowledge the Project Management [1] features - among others - the Disciplines of Scope and Quality. The Discipline of Scope, to become effective, must provide the execution of a hypothetical step (not defined in its text but perceived by the present author of this paper) that can be termed as Planning Stage of Project Result. The Discipline of Quality, to become effective, must provide the execution of an also hypothetical step (also not defined in its text but also perceived by the same present author of this paper) that can be termed as Validation Stage of Product Delivery.

The importance of both Stages is crucial to building a solution that complies with the expectations presented by Stakeholders in the Project Result (which, as already said, are recorded in the Discipline of Scope in accordance with the Planning Stage) and should meet the intended requirements of compliance in Product Delivery (which, as already said, are recorded in the Discipline of Quality in accordance with Validation Stage).

In the execution of Validation Stage of Product Delivery structured in the Discipline of Quality, which occurs immediately as predecessor of the placement of the solution built in Operational Phase Production is used, as reference to parameterize the expected quality, the degree of compliance with the requirements (Essential and/or Desirable) specified in the Planning Stage of Project Result structured in the Discipline of Scope.

Independently of the nature of the Project (if this is to execute a solution for the Civil Construction, Software Development, Product Implementation or others Areas), may be perceived some Exogenous Variables that interfere with the achievement with success of Validation Stage of Product Delivery structured in the Discipline of Quality.

The perception of these Exogenous Variables, which can interfere with Deadlines and Costs initially planned for the implementation of Validation Stage of Product Delivery, is the result of the accumulation of experiences throughout the professional career of more than 40 (forty) years of author this work in projects of various types, besides their additional Technical Certifications 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).

As result of their assessments and surveys in this theme, the author identified and classified the Exogenous Variables perceived between 2 (two) Aspects, which are, the Circumstantial Aspects of the Project and the Specific Aspects of the Team. For each of the 2 (two) Aspects (which are defined in the text of this article in details), 3 (three) Topics are treated (and also defined in the same article with precision).

This paper also presents an Information Collection Form entitled "Evaluation of Impacting Factors in Deadlines and Project Costs" that proposes percentages calculated in benchmarking (but, that can be reviewed according to the reality found), which enables also, and principally, be a checklist as confirmation of the occurrence of the points raised in this paper, so that even other decision-making, regarding the direction of the Project could be thought.

1. PROBLEM STATEMENT

This perception of the existence of these Variables Exogenous also was consolidated in academic studies and research works (the author is Master in IT - Information Technology and Ph.D. in Production Engineering) those 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, WMSCI - World Multiconference on Systemics, Cybernetics and Informatics, sponsored by IIIS - International Institute of Informatics and Systemics).

In fact, studies on this subject made by the author of this article , began in 1985 [2], when he presented a paper (in one National Conference in Brazil) where he addressed his concerns about the impact of Exogenous Variables on the expected project results and effective response to the commitments undertaken by their Managers. This paper describes a method called by the author as MMFV - *Método de Medição de Fatores e Variáveis* (Measurement Method of Factors and Variables) that defines how to apply his theory.

In sequence, in 1989 [3], the same author presented a second edition of the 1985 article (in one International Congress still in Brazil) further deepening the Exogenous Variables that should be retrieved and studied to improve the evaluation of their impacts and risks identified. Much more recently, it means last year, the author used this his theory to build papers to 2 (two) Events [4] [5] regarding those that were mentioned in the first paragraph of this Topic.

Keywords: Project Management; Strategic Planning; Costs; Cronogram; Risks; Exogenous Variables; Budget; Project Duration; Project Impact; Worksheet.

2. LITERATURE REVISION

In search of other academics who could also be studying this subject, and with a more current view, the author retrieves new researches from colleagues working in this field of knowledge.

The Prof. Dr. Georges Le Brun Vielmond [6], professor at PUC-RS (Pontifical Catholic University of the State of *Rio Grande do Sul* / Brazil), has an article that analyzes the Exogenous and Endogenous Variables (besides others factors) that may interfere in the planning of a Project.

This is a paper that only drives an initial thinking about the subject and were not find others articles of this same author, which would show that he has continued to deepen further his studies on this issue. Figure 1 presents his view on these determinants (Exogenous and Endogenous Variables).
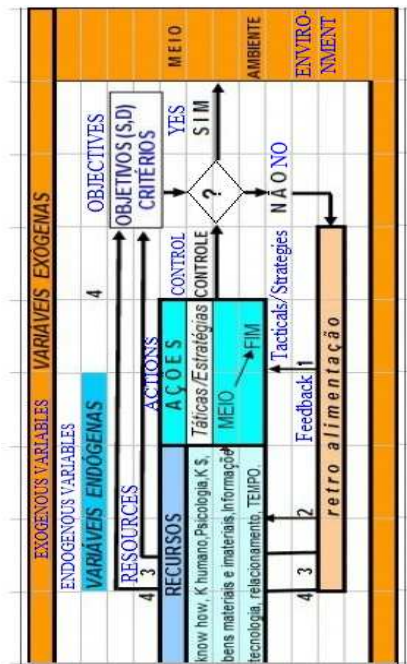
Figure 1 - Exogenous and Endogenous Variables (adapted from [6])

Table 2 - Variables of Complexity and Uncertainty (adapted from [7])

Also another group of scholars of Academic Area [7], UNICAMP - University of Campinas in the state of Sao Paulo/Brazil, studied variables of the attributes of Complexity and Uncertainty that generate impacts on Projects. The Table 1 presents the Table of Evaluation (page 13 of their work) and the Table 2 presents the Table of Variables (of the same paper on page 17), that has to be assessed according to the authors.

Table 1 - Impact Level X Importance Level (adapted from [7])

Rmk.: As can be noticed, these authors had used the Likert Table [8], which graduates the responses of field researches in 5 (five) levels that are the lower, the between the lowest and the intermediary, the intermediary, the between the intermediary and the highest and the highest, in his Table 1.

This paper seems to have an easy approach to comprehension, but it becomes more difficult to understand, as we continue to research more deeply its information.

As for the work of another teacher and colleague who also researched this theme and this field of knowledge, Prof. Dr. Fernando Berssaneti [9] (USP - University of São Paulo, State of São Paulo/Brazil) studied, in his Doctorate Thesis, the identification of Variables that impact the success of Projects, focusing on the Brazilian Companies.

The Table 3 presents a short questionnaire that seeks answers to some issues related to the performance of Projects (which is on page 164 in his Doctorate Thesis). Although also seems initially simple his approach (the same impression equal to the work of the scholars group of UNICAMP), in the sequence of the assessment in his thesis, we note that this is concluded with highly complex and heavy statistical formulas to be applied.

Table 3 - Project Performance Analysis (adapted from [9])

The question that remains pending, even after the analysis of these researches, is establish an approach, more simple and practice, as a first Initial Level for the beginning of application of these ideas in the real world, still not so accurate, but that can bring quick results for a later approach, with more details and complexities, in a second moment.

3. AUTHOR'S APPROACH

As stated, in the last paragraph of the previous Topic, the proposal in this work is to make the application method of valuation techniques of the identified risks in the Exogenous Variables (aimed at reducing its impact on time and cost) to be more assertive as a first approach Initial Level.

The author identified, as result of their assessments and surveys in this theme, the Exogenous Variables and ranked these among 2 (two) Aspects, which are, the Circumstantial Aspects of the Project and the Specific Aspects of the Team. For each of the 2 (two) Aspects, 3 (three) Topics are treated:

1. For Circumstantial Aspects of the Project are evaluated the Power of Policy (importance for the Organization), the Degree of Availability (of Stakeholders in the success of the Project) and the Level of Knowledge (of Stakeholders to contribute with the success of the Project);

2. For the Specific Aspects of the Team are evaluated the Base of Technique (related to the solution to be built), the Experience of Work (in previous Projects of the same nature) and the Motivation of Group (related to engagement in the activity).

For its part, for each of the 3 (three) Topics are defined 3 (three) Graduations (to be more assertive, only three and not five as in Likert Table) for assigning a value that can adjust the Deadlines and Costs pre-committed.

For Circumstantial Aspects of the Project, the 3 (three) Graduations can be evaluated as follows:

a. Power of Policy (importance for the Organization):

High: The project is strategic and all resources (Humans, Financials, Technological, etc.) are available.

Rmk.: The benchmarking of market, resulting from the author's experiences, for the increase in Time and Cost for this Graduation is 0% and 0%, respectively.

Medium: The project is strategic but not all resources (Humans, Financials, Technological, etc.) are available.

Rmk.: The benchmarking of market, resulting from the author's experiences, for the increase in Time and Cost for this Graduation is 25% and 0%, respectively.

Low: The project is not strategic and not all resources (Humans, Financials, Technological, etc.) are available.

Rmk.: The benchmarking of market, resulting from the author's experiences, for the increase in Time and Cost for this Graduation is 50% and 25%, respectively.

b. Degree of Availability (of Stakeholders in the success of the Project):

High: All the Stakeholders already have scheduled their participation in the Project.

Rmk.: The benchmarking of market, resulting from the author's experiences, for the increase in Time and Cost for this Graduation is 0% and 0%, respectively.

Medium: Most of Stakeholders already has scheduled their participation in the Project.

Rmk.: The benchmarking of market, resulting from the author's experiences, for the increase in Time and Cost for this Graduation is 25% and 0%, respectively.

Low: Less than half of Stakeholders already have scheduled their participation in the Project.

Rmk.: The benchmarking of market, resulting from the author's experiences, for the increase in Time and Cost for this Graduation is 75% and 20%, respectively.

c. Level of Knowledge (of Stakeholders to contribute with the success of the Project):

High: All the Stakeholders know the Business Process related to the Project.

Rmk.: The benchmarking of market, resulting from the author's experiences, for the increase in Time and Cost for this Graduation is 0% and 0%, respectively.

Medium: Most of Stakeholders knows the Business Process related to the Project.

Rmk.: The benchmarking of market, resulting from the author's experiences, for the increase in Time and Cost for this Graduation is 25% and 25%, respectively.

Low: Less than half of Stakeholders know the Business Process related to the Project.

Rmk.: The benchmarking of market, resulting from the author's experiences, for the increase in Time and Cost for this Graduation is 50% and 50%, respectively.

For the Specific Aspects of the Team, the 3 (three) Graduations can be evaluated as follows:

a. Base of Technique (related to the solution to be built):

High: All the Technicians master the Technology applied to the Project.

Rmk.: The benchmarking of market, resulting from the author's experiences, for the increase in Time and Cost for this Graduation is 0% and 0%, respectively.

Medium: Most of Technicians masters the Technology applied to the Project.

Rmk.: The benchmarking of market, resulting from the author's experiences, for the increase in Time and Cost for this Graduation is 40% and 25%, respectively.

Low: Less than half of Stakeholder master the Technology applied to the Project.

Rmk.: The benchmarking of market, resulting from the author's experiences, for the increase in Time and Cost for this Graduation is 80% and 50%, respectively.

b. Experience of Work (in previous Projects of the same nature):

High: All the Technicians have experience in Projects of the same nature.

Rmk.: The benchmarking of market, resulting from the author's experiences, for the increase in Time and Cost for this Graduation is 0% and 0%, respectively.

Medium: Most of Technicians has experience in Projects of the same nature.

Rmk.: The benchmarking of market, resulting from the author's experiences, for the increase in Time and Cost for this Graduation is 30% and 0%, respectively.

Low: Less than half of Technicians have experience in Projects of the same nature.

Rmk.: The benchmarking of market, resulting from the author's experiences, for the increase in Time and Cost for this Graduation is 30% and 15%, respectively.

c. Motivation of Group (related to engagement in the activity):

High: All the Technicians are engaged in achievement the activities.

Rmk.: The benchmarking of market, resulting from the author's experiences, for the increase in Time and Cost for this Graduation is 0% and 0%, respectively.

Medium: Most of Technicians is engaged in achievement the activities.

Rmk.: The benchmarking of market, resulting from the author's experiences, for the increase in Time and Cost for this Graduation is 50% and 0%, respectively.

Low: Less than half of Technicians are engaged in achievement the activities.

Rmk.: The benchmarking of market, resulting from the author's experiences, for the increase in Time and Cost for this Graduation is 100% and 0%, respectively.

The Annex A presents an Information Collection Form entitled "Evaluation of Impacting Factors in Deadlines and Project Costs" that can support the process of construction the method proposed in this article.

The observation of a strong existence of the Graduation "High" (which, by definition of the proposal of this article, does not interfere with Deadlines and Costs already calculated for the Project) can also be interpreted as a decrease factor of the impacts of others "negative" Graduations (such as, Medium and Low) detected (by applying a rate of reduction and not an increase rate over the total found).

As for Line of Business Organization, is also possible to assign a Significance Value that could assign a different scenario for the same Deadlines and Costs before pre-committed. This would be very handy if the User of this paper proposal was a Consulting Company that in this way, could typify each Customer (for its Core-Business and its Industry of Actuation, such as, Production, Services, Banking, etc.) and to interpret differently the calculated results.

The interpretation for the filling of the Information Collection Form entitled "Evaluation of Impacting Factors in Deadlines and Project Costs", which is presented in the Annex A, with the proposed percentages of benchmarking of market (resulting from the author's experiences) for the increase in Cost and Time is in the Table 4.

Table 4 - Interpretation for the filling of Annex A

1. Circumstantial Aspects of the Project:

a. Power of Policy (importance for the Organization):
High: [X] = ...0... % and ...0... % ⇨ Rmk.: - Supposed there are no impacts.
Medium: [X] = ...25... % and ...0... % ⇨ Rmk.: - Supposed that there only Impact the Costs.
Low: [X] = ...50... % and ...0... % ⇨ Rmk.: - Supposed that there is also only Impact in the Costs and the double of Medium Graduation.

b. Degree of Availability (of Stakeholders in the success of the Project):
High: [X] = ...0... % and ...0... % ⇨ Rmk.: - Supposed there are no impacts.
Medium: [X] = ...25... % and ...0... % ⇨ Rmk.: - Supposed that there only Impact the Costs.
Low: [X] = ...75... % and ...20... % ⇨ Rmk.: - Supposed that there are Impacts both in the Costs (the triple of Medium Graduation) and in the Time.

c. Level of Knowledge (of Stakeholders to contribute with the success of the Project):
High: [X] = ...0... % and ...0... % ⇨ Rmk.: - Supposed there are no impacts.
Medium: [X] = ...25... % and ...0... % ⇨ Rmk.: - Supposed that there are Impacts both in the Costs and in the Time.
Low: [X] = ...50... % and ...50... % ⇨ Rmk.: - Supposed that there are Impacts both in the Costs and in the Time (the double of Medium Graduation).

2. Specific Aspects of the Team:

a. Base of Technique (related to the solution to be built):
High: [X] = ...0... % and ...0... % ⇨ Rmk.: - Supposed there are no impacts.
Medium: [X] = ...40... % and ...25... % ⇨ Rmk.: - Supposed that there are Impacts both in the Costs and in the Time.
Low: [X] = ...80... % and ...50... % ⇨ Rmk.: - Supposed that there are Impacts both in the Costs and in the Time (the double of Medium Graduation).

b. Experience of Work (in previous Projects of the same nature):
High: [X] = ...0... % and ...0... % ⇨ Rmk.: - Supposed there are no impacts.
Medium: [X] = ...30... % and ...0... % ⇨ Rmk.: - Supposed that there only Impact the Costs.
Low: [X] = ...30... % and ...15... % ⇨ Rmk.: - Supposed that there are Impacts both in the Costs (that keep the same of Medium Graduation) and in the Time.

c. Motivation of Group (related to engagement in the activity):
High: [X] = ...0... % and ...0... % ⇨ Rmk.: - Supposed there are no impacts.
Medium: [X] = ...50... % and ...0... % ⇨ Rmk.: - Supposed that there only Impact the Costs.
Low: [X] = ...100... % and ...0... % ⇨ Rmk.: - Supposed that there only Impact the Costs (the double of Medium Graduation).

4. CONCLUSIONS

As this article presents an Information Collection Form entitled "Evaluation of Impacting Factors in Deadlines and Project Costs" (which has a MS-Excel® spreadsheet to perform its automatic calculations besides presenting the results in graphic format) that proposes percentages calculated in benchmarking, resulting from the author's experiences, it can be concluded how practical this proposal is in reality.

And, indeed, after some simulations in a practical environment, it verified the usefulness of this proposal as an effective management and planning tool in corporate real world.

By the supervised manner with that this work was built (assembly and survey), it is possible to conclude that the proposal presented can be useful. Among suggestions for future work, after new results captured in the field and in new utilizations, the target is to refine more percentages of impacts in Time and Costs to improve benchmarking of ratings.

Despite of this proposal already has a practical approach validated in the Corporate Market, the author is open and feel comfortable to receive new additions from colleagues who are also researching this same area of knowledge. However, new suggestions should be sent after some testing, so that these could be automatically applied to improve this proposal, in order to, make it more powerful.

5. REFERENCES

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Evaluation of Impacting Factors in Deadlines and Project Costs

Budget Value: [ ] / Currency: [ ] | Project Duration (in Days): [ ] | Evaluated: by _____ | Business Organization (Significance Value)> [ ] in ___ / ___ / ___

1. Circumstantial Aspects of the Project: Project Name/Code: [ ]

a. Power of Policy (importance for the Organization):

High	=	% .... => Budget Value:	X .... % / 100% =	Project Duration:
Medium	=	% .... => Budget Value:	X .... % / 100% =	Project Duration:
Low	=	% .... => Budget Value:	X .... % / 100% =	Project Duration:
		Rmk:		

b. Degree of Availability (of Stakeholders in the success of the Project):

High	=	% .... => Budget Value:	X .... % / 100% =	Project Duration:
Medium	=	% .... => Budget Value:	X .... % / 100% =	Project Duration:
Low	=	% .... => Budget Value:	X .... % / 100% =	Project Duration:
		Rmk:		

c. Level of Knowledge (of Stakeholders to contribute with the success of the Project):

High	=	% .... => Budget Value:	X .... % / 100% =	Project Duration:
Medium	=	% .... => Budget Value:	X .... % / 100% =	Project Duration:
Low	=	% .... => Budget Value:	X .... % / 100% =	Project Duration:
		Rmk:		

2. Specific Aspects of the Team:

a. Base of Technique (related to the solution to be built):

High	=	% .... => Budget Value:	X .... % / 100% =	Project Duration:
Medium	=	% .... => Budget Value:	X .... % / 100% =	Project Duration:
Low	=	% .... => Budget Value:	X .... % / 100% =	Project Duration:
		Rmk:		

b. Experience of Work (in previous Projects of the same nature):

High	=	% .... => Budget Value:	X .... % / 100% =	Project Duration:
Medium	=	% .... => Budget Value:	X .... % / 100% =	Project Duration:
Low	=	% .... => Budget Value:	X .... % / 100% =	Project Duration:
		Rmk:		

c. Motivation of Group ((related to engagement in the activity):

High	=	% .... => Budget Value:	X .... % / 100% =	Project Duration:
Medium	=	% .... => Budget Value:	X .... % / 100% =	Project Duration:
Low	=	% .... => Budget Value:	X .... % / 100% =	Project Duration:
		Rmk:		

Rmk: