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Eisenhower matrix * Saaty AHP = Strong actions prioritization? Theoretical literature and lessons drawn from empirical evidences

By

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***Abstract* – This paper proposes a tool resulting from the merging of the *Eisenhower matrix* and *Analytical Hierarchy Process* to strengthen the prioritization of actions for managers. The case study is from a Ph.D. thesis work, which the first phase is to produce the candidate's schedule. An *Eisenhower matrix* is designed and priorities are affected to corresponding quadrant, based on the *Priority Quotient* (PQ) results. As it is too expert, the second phase, concerning a chapter about the calculation of an *Accessibility Index* is about designing easier readable tool directly usable by the managers to undertake their actions, saving time and investment. A 4*4 matrix called *Actions of Governance Matrix* (AGM) accompanied by a *Partial Priority Quotient* (PPQ) scale issued from the *AHP* process is the resulting tool.**

***Keywords* – Actions; AGM; AHP; Eisenhower matrix; PQ; PPQ**.

1. Goal and background

1.1. Papers' goal

Amongst others entry points, this paper starts with and assertion or evidence owned by its authors: "the *best action* is preceded by the *best decision*". Making the best decisions becomes an increasingly demanding task for managers of companies, governmental agencies and many other decision and policy makers ([1]). In both national and international contexts, the other evidence is the interdependency and even interconnectivity of most activities, or many of them. Then, most decision problems are of a multi-criteria nature ([2]). The said criteria fully include the time to save and the profits to draw from an investment or an action. These statements are mainly pointed as the origins of the *Eisenhower Matrix* and the *Analytic Hierarchy Process* that are the purposes of this paper. Its main goal is to combine these two methods and come up with a strong and easy readable tool to lead actions.

1.2. Brief background

The *Eisenhower Matrix* or *Eisenhower Decision Matrix*, is named after Dwight David Eisenhower, an American army general during World War II, who served as the 34th President of the United States the from 1953 to 1961[1]. At the beginning of is presidential mandate, facing the USA economic and politic intern and foreign orientations, he declares during a conference with his cabinet counsellors the following: *"I have two kinds of problems: the urgent and the important. The urgent are not important, and the important are never urgent"*[2]. From then, the *Eisenhower Method* emerged, classifying and planning the tasks relatively to their Urgency and their Importance in four descending priorities as follow[3] :

- *"Important" and "Urgent" tasks*: they receive the highest priority level and should be complete as soon as possible. They are crisis to be solved immediately.
- *"Important", but "Not Urgent" tasks*: these are the long-term goals and tasks, because they are important, but do not have a firm deadline yet. They should be scheduled in a timely manner and done later.

[1] https://luxafor.com/the-eisenhower-matrix/
[2] https://www.business2community.com/leadership/eisenhower-decision-matrix-important-vs-urgent-01372854. It is also rewrite as follows: *"What is important is seldom urgent and what is urgent is seldom important"*. http://www.successinlifee.com/home/priotize-your-task-with-eisenhower-matrix/
[3] https://luxafor.com/the-eisenhower-matrix/ ; http://www.successinlifee.com/home/priotize-your-task-with-eisenhower-matrix/; https://www.business2community.com/leadership/eisenhower-decision-matrix-important-vs-urgent-01372854

- *"Not Important", but "Urgent" tasks*: these tasks can be transferred or delegated to other professionals, because they are trivial than the two precedents.
- *"Not Important" and "Not Urgent" tasks*: they are most distractive and should be eliminated or dumped, because they could be a complete waste of time.

The matrix representing the method is a two times two squared box named the *Eisenhower Box*[4] Its representations vary from an activity to another with the same background idea: the good time management and prioritizing (Fig.1.). That is why it is also known as the *Time Management Matrix*[5].

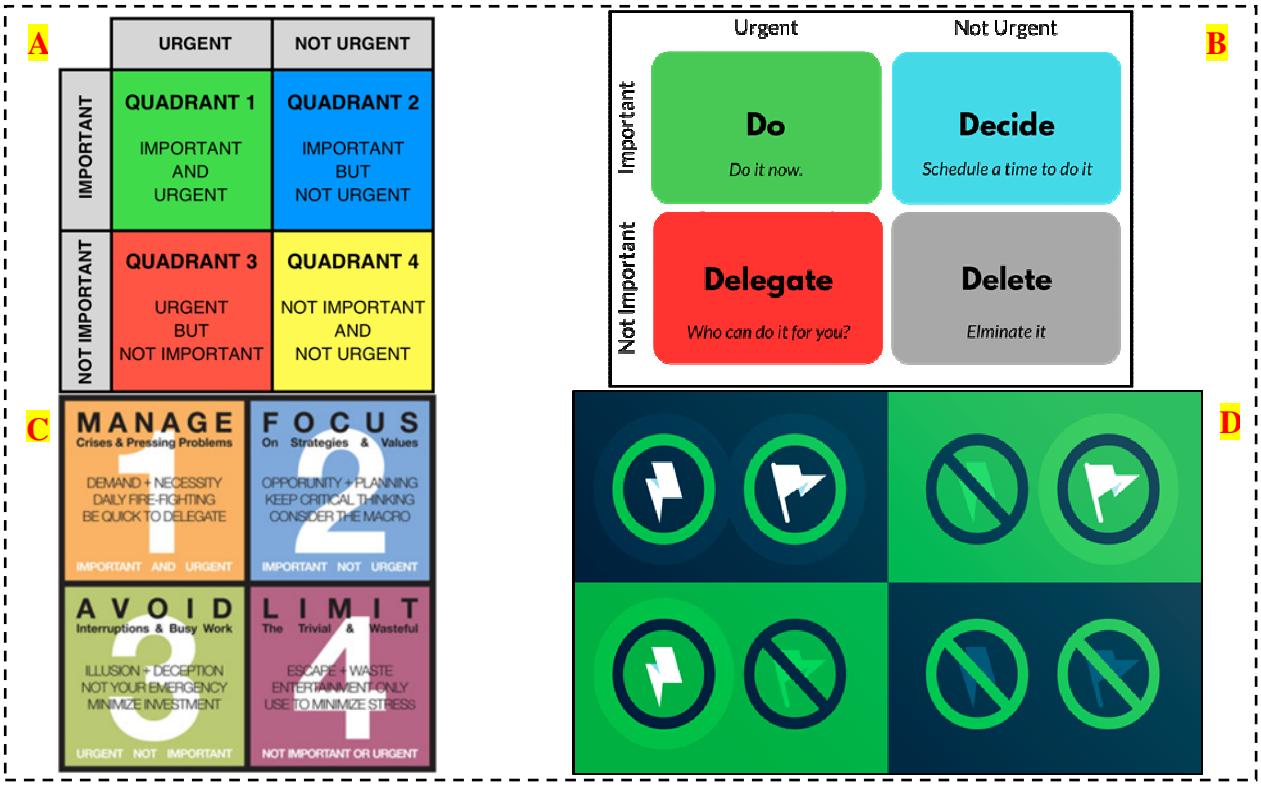

Figure 1. Four representations of the Eisenhower matrix. A-The "*Literally expressed tasks*" box[6]; B-The "*four D*" box[7]; C-The "*Manage-Focus-Avoid-Limit*" box[8]; D-The "*colors and signs*" box[9].

[4] https://luxafor.com/the-eisenhower-matrix/
[5] https://www.youtube.com/watch?v=DX4LStJGny4
[6] https://flipboard.com/@philmerricks/the-procrastination-matrix/a-BKwnJLK8RsybQuLO6r9FvQ%3Aa%3A292712840-44c0fe87bf%2Fwaitbutwhy.com

Two decades after Eisenhower's matrix, Thomas L. Saaty developed the *Analytic Hierarchy Process*, *AHP*, between 1971 and 1975. It is a theory and methodology for relative measurement, used to derive ratio scales from both discrete and continuous paired comparisons ([3], [4], [1]). In fact, the everyday problems, from the most basic to the most complex can often be presented as a *hierarchy* with the same basic structure. ([5]). Either it is an object, a feeling, an idea or another entity, it should be studied relative to other similar entities and related to them by making comparisons, such a way that the resulting decision is less influence by personal judgement and as objective as possible ([6], [7]). For these reasons, the *AHP* focuses on defining priorities, based on the *proportions* between entities and ***not*** their *exact measurements* ([4], [1]). The process follows four main steps: ([6])

1- Define the problem and determine the kind of knowledge sought.

2- Structure the decision hierarchy: break down the decision into a hierarchy of goals, criteria, and alternatives.

3- Construct a set of pairwise comparison matrices. Each element in an upper level is used to compare the elements in the level immediately below with respect to it.

4- Use the priorities obtained from the comparisons to weigh the priorities in the level immediately below, until the final priorities of the alternatives in the bottom most level are obtained.

The comparison needs a scale of numbers that indicates how many times more important and dominant one element is over another with respect to the criterion or property with respect to which they are compared. ([6]; Tab.1.)

[7] https://luxafor.com/the-eisenhower-matrix/
[8] https://www.business2community.com/leadership/eisenhower-decision-matrix-important-vs-urgent-01372854
[9] https://evernote.com/blog/work-effectively-with-the-eisenhower-matrix/

Table 1. The fundamental scale of absolute numbers ([6])

Intensity of importance	Definition	Explanation
1	Equal importance	Two activities contribute equally to the objective
2	Weak or slight	
3	Moderate importance	Experience and judgement slightly favour one activity over another
4	Moderate plus	
5	Strong importance	Experience and judgement strongly favour one activity over another
6	Strong plus	
7	Very strong or demonstrated importance	An activity is favoured very strongly over another; its dominance demonstrated in practice
8	Very, very strong	
9	Extreme importance	The evidence favouring one activity over another is of the highest possible order of affirmation
Reciprocals of above	If activity ***i*** has one of the above non-zero numbers assigned to it when compared with activity ***j***, then ***j*** has the reciprocal value when compared with ***i***	A reasonable assumption

Then, the *AHP* logically starts from subjective judgments that are to be converted and hierarchized in objective ones. Its position in the scientific debate is a transversal and merged one, between the hard operations research, the soft operations research and the decision analysis. ([1]; Fig.2)

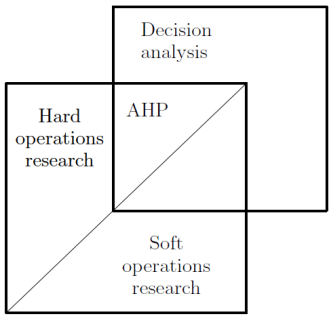

Figure 2. The position of the AHP in the scientific debate ([1])

2.3. Common points, divergences and questioning

As described above, *Eisenhower matrix* and *Analytic Hierarchy Process* are interested on the prioritization for better productivity and outcomes. Both of them are classified as *Multi-Criteria Decision Analysis* (MCDA), also known as the *Multi-Criteria Decision-Making* (MCDM), concerned with structuring and solving decision and planning, as well as evaluating multiple conflicting criteria in decision-making[10].

[10] https://en.wikipedia.org/wiki/Multiple-criteria_decision_analysis

Nevertheless, the *Eisenhower method* focuses on solving time and task management issues caused by bad prioritizing[11]. Every worker, from the one targeting daily or weekly goals to the one seeking annual goals, uses it. The *Analytic Hierarchy Process* helps the decision maker to set priorities in the most objective approach and make the best decision. If time saving is implicitly enabled, it is not its main goal, and more, the method mainly ask for some logic and mathematics from the simple to the more complex. However, what most decision-makers need, is to conduct their actions, with the best benefits in the shortest time. One tool composed from the two methods would be advantageous to solve this issue. This said, *how time saving and beneficial could be the action(s) after combining the two decision-analysis or decision-making methods in one tool ?* To answer this question, the study is based on the assumption that *merging the two methods would provide a powerful and easy readable tool that helps the companies, government and others users to improve their focus, for an efficient productivity and the best choice amongst others*.

2. Methodology

It consists in two parts.

2.1. Preparing the tool for an expert purpose

The study is based on a chapter of a PhD thesis in geography. One objective amongst others is to assess the accessibility in different districts belonging to the same division, with the scope of solving identified issues. Following the example of *Steve Covey's Tree* (fig.3), there is a main goal or mission set here as *producing an accessibility index*, with principles of the spatial analysis.

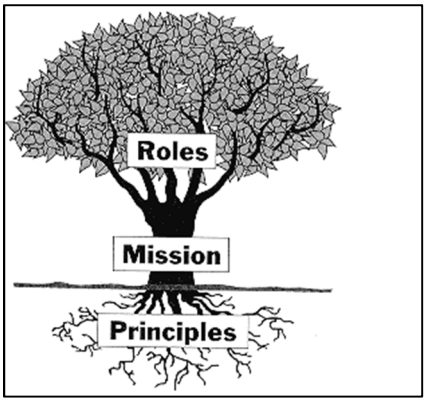

Figure 3. Covey tree [12]

[11] https://luxafor.com/the-eisenhower-matrix/
[12]**Steve Covey:** http://eisenhower-matrix.com/first-things-first/

The roles to be play by the expert are elaborated in technical tasks and they are listed. (Tab.2.)

Table 2. From principles to tasks on a technical approach

Principles / Technical basics	Technical mission	Technical roles	Technical tasks/Data (Actions)
- Spatial analysis *- Statistics* *- Decision-analysis*	*Produce an accessibility index*	Data collection	Vectors files (Buy and download)
			Reports (Copy)
			Web data (Download)
			Fieldwork data (Travel and interview)
		Implementation	Database (Create, update, fill)
			Analysis (Perform)
			Map (Layout)
			Easy readable tool (Build)
		Delivery	Committee restitution (Prepare)

A Priority Quotient (PQ) is calculated for each task by using the following formula[13]:

Priority Quotient = *Ease factor * Urgency factor * Importance factor * Consequence factor*

Different factors are ranked to enable their fit in a matrix as follows:

- *Ease factor (Ef)* ranks the tasks from a scale of 1 (easy) to 4 (difficult);
- *Urgency factor(Uf)* ranks the tasks from a scale of 1 (not urgent) to 4 (very urgent);
- *Importance factor(If)* ranks the tasks from a scale of 1 (not important) to 4 (very important);
- *Consequence factor (Cf)* ranks the tasks from a scale of 1 (low consequence, low impact) to 4 (high consequence, high impact).

On one hand, between the different tasks of the data collection, those to be copy or download are obviously easy to conduct than those to be buy or needing to travel. On the other hand, the technical implementation uses to be balanced at every step. These judgements done on previous experiences have then enabled to calculate the following priority quotients. (Tab. 2.)

[13]The formula is adapted from http://blog.scribblepost.com/use-the-priority-quotient-formula-to-know-which-tasks-to-do-first/. The importance factor is added according to the goal of the study concerning *Eisenhower method*.

Table 2. Priority Quotient for technical tasks

Technical roles	Tasks (Actions)	Judgements				PQ
		Ef	*Uf*	*If*	*Cf*	
Data collection	Vectors files (Buy and download)	4	4	4	4	***256***
	Reports and documents (Read & Copy)	4	4	4	4	***256***
	Web data (Download)	4	4	4	4	***256***
	Fieldwork data (Travel, interview, etc.)	4	4	4	4	***256***
Implementation	Database (Create, update, fill)	4	3	4	4	***192***
	Analysis (Perform)	4	3	4	4	***192***
	Map (Layout)	4	2	4	4	***128***
	Easy readable tool (Construct)	4	2	4	4	***128***
Results	Committee Restitution (Prepare)	4	1	1	4	***16***

After obtaining the **PQs**, an Eisenhower **2×2** matrix is built and each task is affected to corresponding quadrants. (Fig.4.). It serves for the experts' time saving usage.

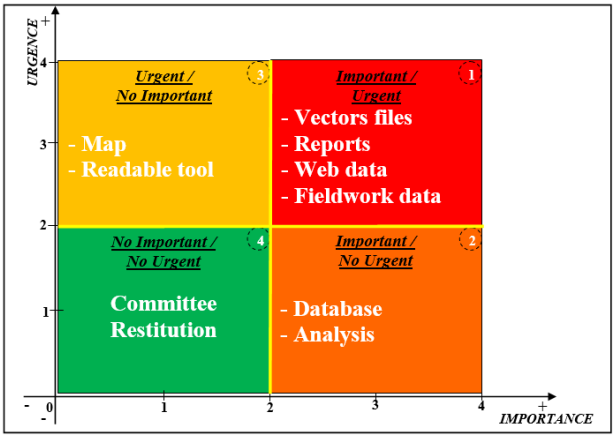

Figure 4. Adapted *Eisenhower matrix* to the priority quotient tasks

Although the matrix matches the needs of the practitioner, it can be more complex to read because the location of tasks in quadrants relatively to their **PQs** need more accuracy. That is why it is important to build a more precise one for the purposes of the government managers, concerning the level of accessibility.

2.2. Preparing the tool for governmental purposes

This point is about the tasks of constructing an easy readable tool, while keeping the same goal of the chapter, which is "*Build an Access Index*". After the data are collected, the phase of implementation can start. The *Analysis Hierarchy Process* is performed and the problem is structured with three criteria and nine sub-criteria: (Fig.5)

- Criterion 1 is the *Infrastructures* and five sub-criteria descend from it: airport, national road, regional road, division road and rural road.

- Criterion 2 is the *Driving speed* and two sub-criteria descend from it: *incidents* (interruptions) and *average speed*.

- Criterion 3 is the *Topography* and two sub-criteria descend from it: *altitude* and *slopes*.

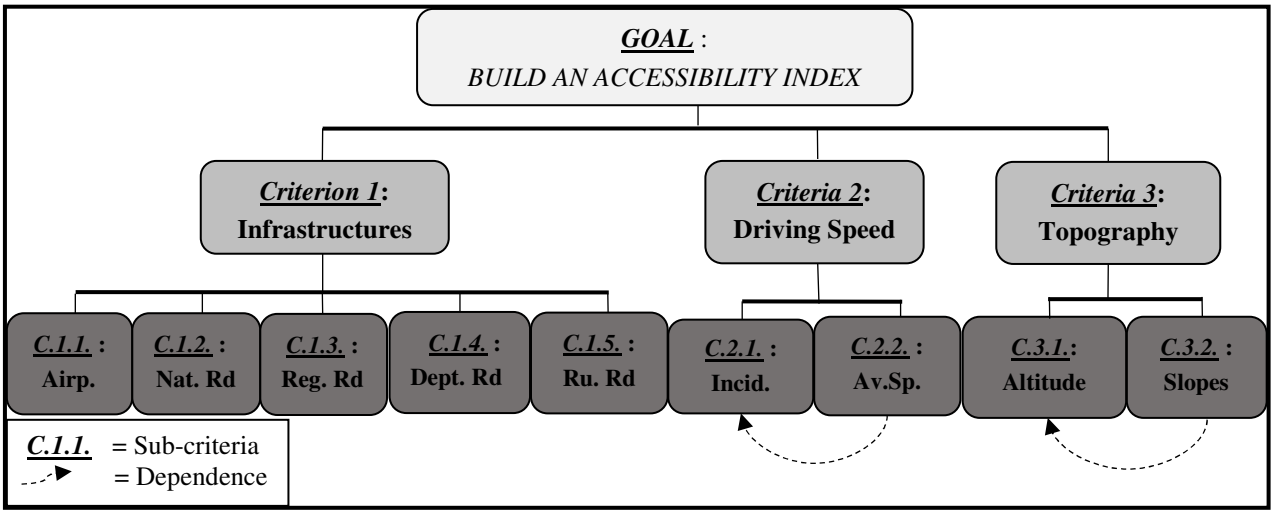

Figure 5. The Analytic hierarchy process structure

A pair comparison of sub-criteria and criteria enable to derive the weights corresponding. (Tab.4)

Table 4. Weights of Criteria and sub-criteria

Criteria	Weights	Sub-criteria	Weights
Infrastructures	***0.731***	*Airport*	***0.374***
		National Road	***0.235***
		Regional Road	***0.125***
		Departmental road	***0.0773***
		Rural Road	***0.048***
Driving Speed	***0.188***	*Incidents (Interruptions)*	***0.0431***
		Average Speed	***0.0371***
Topography	***0.081***	*Altitude*	***0.032***
		Slopes	***0.0285***

After building the *Analytic Network Process* between criteria and sub-criteria in the *Super Decision Software* (SDS), the values of the *Accessibility Index* are obtained. The details are giving the table 5.

Table 5. Values of Accessibility Index in the nine districts

AI Order	*Infrastructure*	*Driving Speed*	*Topography*	***Accessibility Index***
1	0.6087986	0.018166	0.0809513	***0.708***
2	0.291723	0.018183	0.080982	***0.3909***
3	0.2018	0.0118	0.081	***0.295***
4	0.1165	0.0116	0.081	***0.2091***
5	0.11532	0.01098	0.08096	***0.207***
6	0.08221	0.00133	0.08099	***0.1645***
7	0.080544	-0.00161	0.080978	***0.16***
8	0.071075	0.007673	0.080964	***0.1597***
9	0.0303	0.0086	0.081	***0.12***

Using *Accessibility Index (AI)*, with a *Partial Priority Quotient* (*PPQ*) just using the *Urgency factor* (*Uf*) and the *Importance factor* (*If*) is calculated for each district. The formula used is the following:

$$\mathbf{PPQ = [(Uf * If) - AI]}$$

It has been decided to give the ***Uf*** and ***If*** values based on the main criterion of infrastructures. The availability, the quality as well as the length of the different infrastructures from the airport to the rural road have been taken in account. The value is more important when the infrastructure does not exist. Then, the ***PPQs*** values are the following: (Tab. 6.)

Table 6. Partial Priority Quotients in the nine districts

AI Order	***AI***	***Uf***	***If***	***PPQ***
1	*0.708*	*1*	*1*	***0.292***
2	*0.3909*	*2*	*3*	***5.6***
3	*0.295*	*2*	*4*	***7.7***
4	*0.2091*	*2*	*4*	***7.8***
5	*0.207*	*3*	*4*	***11.7***
6	*0.1645*	*3*	*4*	***11.8***
7	*0.16*	*2*	*4*	***7.8***
8	*0.1597*	*2*	*4*	***7.8***
9	*0.12*	*4*	*4*	***15.8***

An *Eisenhower matrix* 4 x 4 is constructed, based on the maximum of the ***Uf * If*** value. Beside there is a scale graduated according to ***PPQs*** values, to ease the reading of priorities in actions. All the steps are detailed in the workflow below (Fig.6)

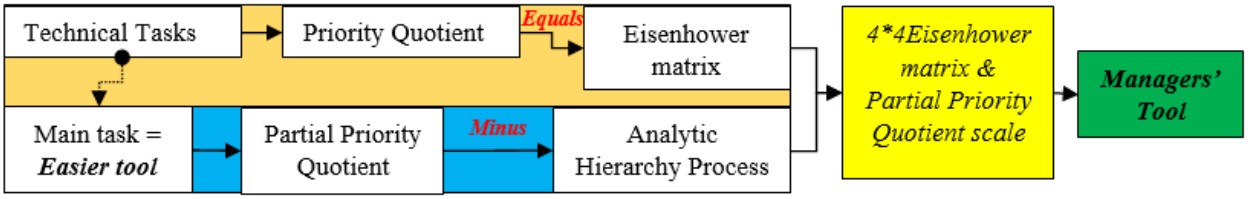

Figure 7. Diagram of the steps

3. Results and lessons drawn

3.1. The *Accessibility Governance Matrix*, a *4* x *4 Eisenhower Matrix*

The new matrix is named *Accessibility Governance Matrix (AGM)*, adapted from the *Eisenhower matrix*. The dimensions are *4* x *4*, and the two axes of *Urgency* and *Importance* are graduated from 1 (low) to 4 (high). The PPQ scale make it easy to read graduated from 1 (lowest) to 16 (highest). (Fig.7.a)

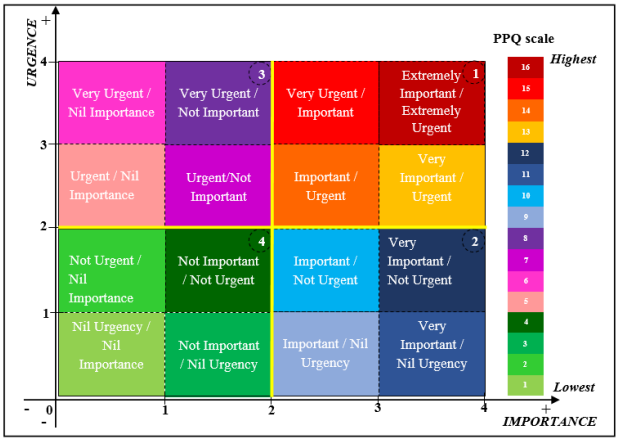

Figure 7a. The *Accessibility Governance Matrix* with qualifiers coordinates

The *AGM* has some specificities that need to be detailed.

- The four basic quadrants of the *Eisenhower matrix* are now sub-matrixes of the AGM, and each is divided in four sub-quadrants that ease to locate with accuracy the level of importance and urgency.
- Absolute superlatives are added to basics qualifiers to express the extreme quality and degree of integrated priority to the relevant quadrants.
- Precedence of urgency and importance depends on the proximity or distance of the axes on which they are represented. However, the higher extreme quadrant, qualified as "*Extremely*

Important / Extremely Urgent", gave precedence to importance, which assumes quick turnaround planning for areas of deficiencies presented as crises.

- The axes of urgency and importance are graduated, in order to identify and frame numerically the sub-quadrants and quadrants, as well as their priority contents

Numerical coordinates are used to locate each sub-quadrant. (Fig.7.b)

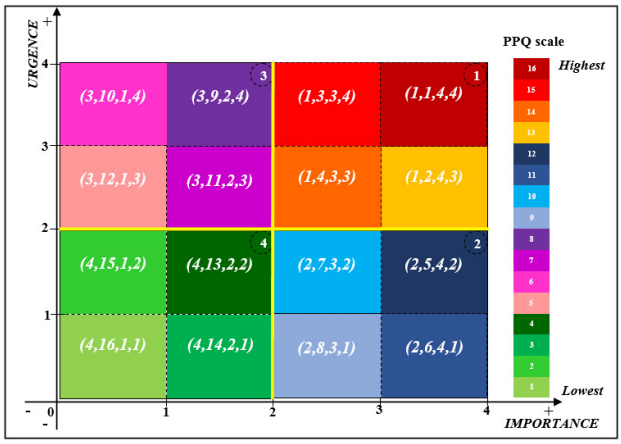

Figure 7.b. The *Accessibility Governance Matrix* with Numerical coordinates

The first value is for the sub-matrix. The second is related to the sub-matrix quadrant. The third and the fourth values are designating respectively the importance and the urgency. With the abbreviations of the qualifiers, the correspondence is made with the numerical ones to deduct the matrix coordinates. (Tab.7)

Table 7. Equivalency between qualifiers and numerical coordinates

Matrix coordinates								
AGM	***Sub-quadrant 1***		***Sub-quadrant 2***		***Sub-quadrant 3***		***Sub-quadrant 4***	
	Qualifiers	*Numerical*	*Qualifiers*	*Numerical*	*Qualifiers*	*Numerical*	*Qualifiers*	*Numerical*
1	*EI/EU*	(1,1,4,4)	*VI/U*	(1,2,4,3)	*VU/I*	(1,3,3,4)	*I/U*	(1,4,3,3)
2	*VI/NoU*	(2,5,4,2)	*VI/NiU*	(2,6,4,1)	*I/NoU*	(2,7,3,2)	*I/NiU*	(2,8,3,1)
3	*VU/NoI*	(3,9,2,4)	*TU/NiI*	(3,10,1,4)	*U/NoI*	(3,11,2,3)	*U/NiI*	(3,12,1,3)
4	*NoI/NoU*	(4,13,2,2)	*NoI/NiU*	(4,14,2,1)	*NoU/NiI*	(4,15,1,2)	*NiU/NiI*	(4,16,1,1)

From the statements above and based on the results of the Partial Priority Quotient (PPQ) calculated for the nine districts, the priorities coordinates are the following. (Tab.8)

Table 8. Final values of the Partial Priority Quotients for the nine districts

AI Order	*AI*	*Uf*	*If*	*PPQ*	*Priority order*	*Qualifier*	*Numerical*
1	*0.708*	*1*	*1*	***0.292***	*9*	*NiU/NiI*	(4,16,1,1)
2	*0.3909*	*2*	*3*	***5.6***	*8*	*I/NoU*	(2,7,3,2)
3	*0.295*	*2*	*4*	***7.7***	*7*	*VI/NoU*	(2,5,4,2)
4	*0.2091*	*2*	*4*	***7.8***	*4*	*VI/NoU*	(2,5,4,2)
5	*0.207*	*3*	*4*	***11.7***	*3*	*VI/U*	(1,2,4,3)
6	*0.1645*	*3*	*4*	***11.8***	*2*	*VI/U*	(1,2,4,3)
7	*0.16*	*2*	*4*	***7.8***	*5*	*VI/NoU*	(2,5,4,2)
8	*0.1597*	*2*	*4*	***7.8***	*6*	*VI/NoU*	(2,5,4,2)
9	*0.12*	*4*	*4*	***15.8***	*1*	*EI/EU*	(1,1,4,4)

The table 8 above coupled to the *Accessibility Governance Matrix* and the *Partial Priority Quotients'* scale give then more precise information concerning the order of intervention and actions. The government managers know exactly where to go in first position, and what is not urgent now. Although their some changes on the middle of the table, the district number 1 presenting the highest *Accessibility index*, 0.708, appears to be the less worrying, because it records the less *Partial Priority Quotient*, 0.29 ; while the district number 9 presenting the lowest *Accessibility index*, 0.12, is the most worrying, with a *Partial Priority Quotient* of 15.8. Now just remains to the final user the management of their time, others adjustments according to their will.

3.2. Some more highlights

It appears that for each user the first approach by just using the *Eisenhower matrix* with the Priority Quotient is of course indicated especially for some experts. That has been the case in the first phase of the study, concerning the preparation of the GIS expert facing the Ph.D. committee. However, as the final tool combining *Eisenhower matrix* and *Analytic Hierarchy Process*, bring more, it is also clear in managers' minds how they should divide the time and plan their activities, according to the priority proposition. An example is given in table 9.

Table 9. Proposition of time distribution

	Proposed time distribution								***Overall***
AGM	***Sub-quadrant 1***		***Sub-quadrant 2***		***Sub-quadrant 3***		***Sub-quadrant 4***		
	Planning	*Execution*	*Planning*	*Execution*	*Planning*	*Execution*	*Planning*	*Execution*	
1	50	50	60	40	45	55	50	50	*30*
2	75	25	85	15	70	30	80	20	*60*
3	40	60	30	70	45	55	35	65	*8*
4	50	50	60	40	45	55	50	50	*2*
									100

It can be noticed that the main percentage of time goes to the Sub-matrix 2, that ask to a little more of planning (80%) before acting (20%). That sub-matrix of the AGM is the equivalent of the second quadrant in *Eisenhower matrix*, commonly preferred by authors an expert because it is probably the most productive zone. Then, when tasks are important but not urgent, this means, that the user supposingly have time to make them well[14].

Moreover, this tool is enough flexible because the different codes or values inside the mega-matrix can differ from a user to another. It is the same thing as the time distribution; it is up to the user.

To end up with the lessons, it is the accessibility tool to non-mathematician. In effect, the designer as well as the user does not need mathematic skills. Hence, if some complex decision-making problems need strong mathematic skills to design an *Analytic Hierarchy Process*, it is simple for others purposes for the basic user ([4]); while *Eisenhower matrix*, including *Priority Quotient* is qualified easy to use by many authors[15].

4. Discussions and outlook

The present approach does not focus that much on mathematic, but most on a logical reasoning concerning an expert that can use the relatively complex first version (See fig.1) and the end user who just need to use the result to plan his actions. Then, it will be important to give a test in a complex structured problem.

Then, it can be assume with reference [4] that "*we are all fundamentally decision makers. Everything we do consciously or unconsciously is the result of some decision*." Adding to this reason the need of efficiency, the concurrence, the lack of time faced by the government leaders, the growing of dependency and connectivity between different activities, decision-analysis or decision-making processes should be ease to improve actions resulting, in terms of a "*Multiobjective Optimization*" ([8]).

[14]Steve Covey: http://eisenhower-matrix.com/first-things-first/

[15] http://blog.scribblepost.com/use-the-priority-quotient-formula-to-know-which-tasks-to-do-first/

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