3D Work Breakdown Structure method

By Jean-Yves Moine

1. Introduction

After more than fifteen years of consulting on different kinds of projects, I propose a new vision of Work Breakdown Structure (WBS): the 3D WBS concept.

Since the beginning of my career, the tree structures have always been in the heart of my thoughts. I had to find a way to build schedules and budget decompositions well and quickly. Many tree structures exist; they are described in books like the PMBOK Guide from PMI and others books. These structures include:

- ✓ **GBS** (Geographical Breakdown Structure),
- ✓ **PBS** (Product Breakdown Structure),
- ✓ **SBS** (Systems Breakdown Structure) or **FBS** (Functional Breakdown Structure),
- ✓ **ABS** (Activity Breakdown Structure),
- ✓ **OBS** (Organization Breakdown Structure),
- ✓ **RBS** (Resources or Risks Breakdown Structure),
- ✓ **CWBS** (Contract Work Breakdown Structure),
- ✓ etc.

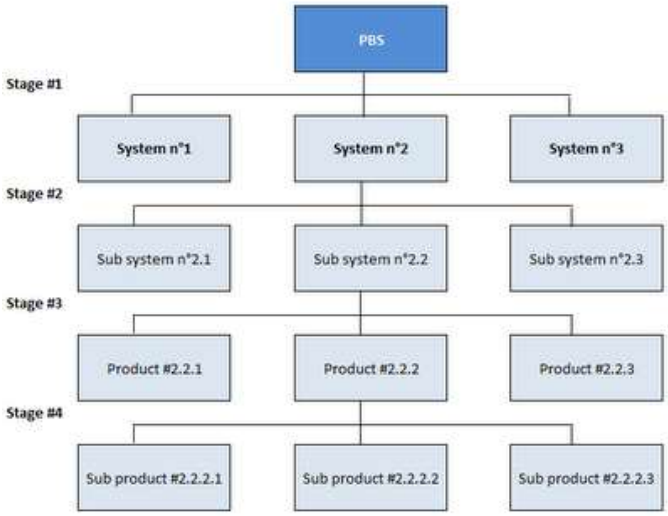
The question was: how all these structures are mixed?

One day, during one mission on a huge railway project in Qatar I realized that for the construction phase, activities (ABS) were deployed on products (PBS) and products were constructed somewhere (ZBS).
There were three dimensions and the WBS could be represented by one cube under the construction phase.
Hence, there was one cube under others phases: basic design, detail design, procurement, construction and commissioning, knowing that phases are the level #1 of the ABS.
Later, I understood that there was the same cube under each phase. Finally, there was only one WBS cube to describe the project.

The 3D WBS model was born.

2. Product Breakdown Structure (PBS)

Product Breakdown Structure (PBS) is constructed by Systems, sub systems, products and sub products, as shown on the picture below. Products are an extension of Systems.



Systems are functional systems. The tree of functional systems is called **SBS**, for System Breakdown Structure. Sometimes it is called FBS for Functional Breakdown Structure, it depends of the company.

A system can be "Radio system" or "Waste water system", "Ventilation system", etc. Some equipment are working together to perform a functional need, equipment belong to one functional system.

Products can be deliverables, equipment, materials, civil works components.

Products (PBS) are included in Systems (SBS). PBS is an extension of SBS. When we talk about PBS, I consider SBS and its child: the PBS.

The PBS answers the question: "What?"

3. Activity Breakdown Structure (ABS)

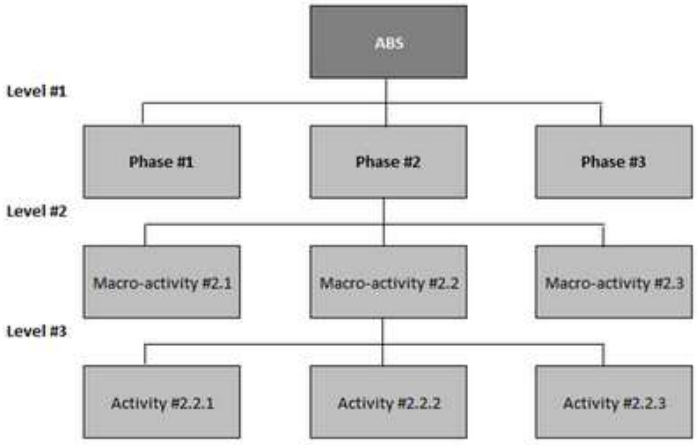
Activity Breakdown Structure (ABS) is constructed by phases, macro-activities, activities and sub activities.

Activity means ACTIONS.

Activities linked together are called a PROCESS.

For example, general design, detail design, procurement, construction, are activities.

The picture below shows an ABS.



To be noted that there is a chronology between activities. First we do the Activity #2.2.1, then activity #2.2.2 and then activity #2.2.3.

The ABS answers to the question: "How?"

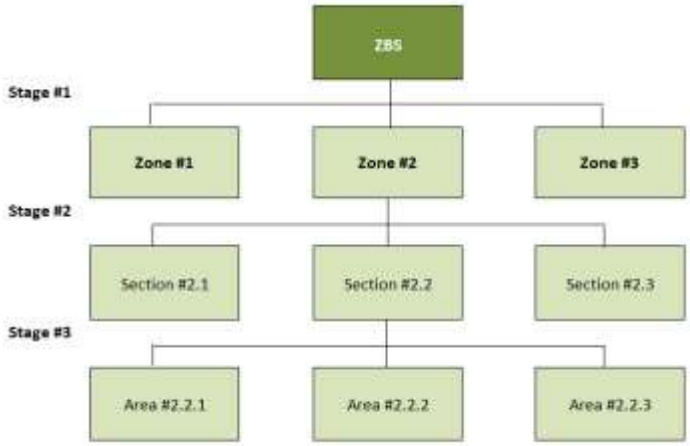
4. Zone Breakdown Structure (ZBS)

Zones are Physico-functionnals, they are divided by Areas, Sections, for instance.

The tree structure that supports Zones is called **ZBS** (**Zone Breakdown Structure**).

ZBS can be a topographic view of the construction site of a project, it can be a notion of **geography**. ZBS can be also viewed as **functional zones**, like for design phase and commissioning phase for instance.

An example of ZBS is shown below.



For EPC projects (Engineering, Procurement, Construction), ZBS is a geographical part of the construction site, we can name this tree structure GBS (Geographical Breakdown Structure).

For IT projects, ZBS can be viewed as “Releases” of software (functional Zones).

For Products development projects, ZBS can be viewed as “Versions of prototypes” (functional Zones).

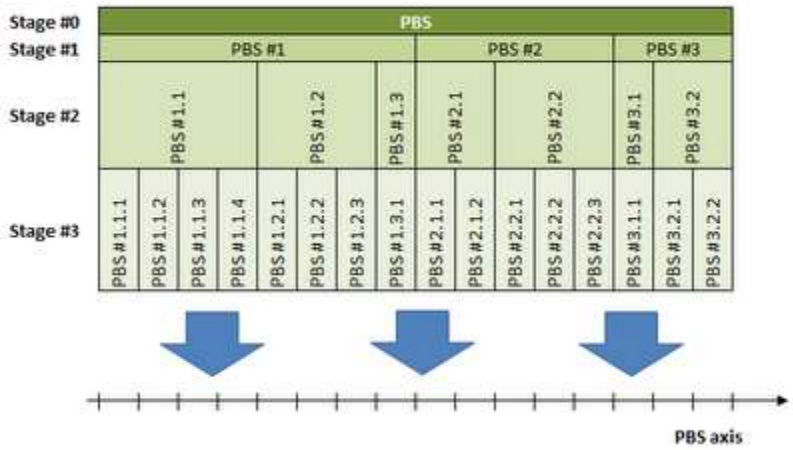
Zones are a group of Products.

The ZBS answers to the question: "Where?"

5. Projection of the tree structures

Each tree structure (ZBS, PBS and ABS) can be projected on one axis.

The figure below shows a PBS projected on one axis.



For the ZBS and the ABS, it is the same logical.

To be noted that either level #2 of the tree structure can be projected on the axis, or level #3, it depends of the needs.

The projection of one stage is linear, but the projection of the overall tree structure is not linear. The picture below shows a PBS projected mathematically on one axis.

If we project two tree structures, we obtain a square including little squares inside the overall square. If we project three tree structures, we obtain one cube, including 3D little cubes inside the overall cube.

To be noted that there is a "chronology" in this projection.

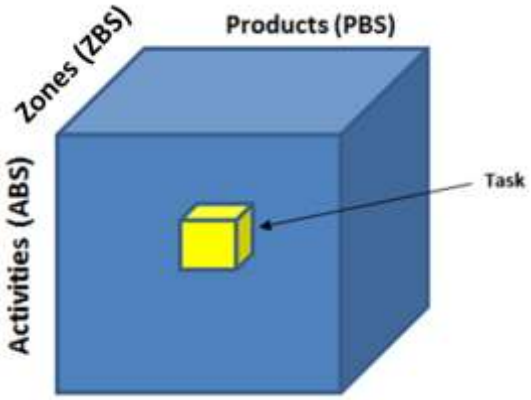
Because there are three tree structures that compose the WBS (THE WORK), there are three axis and in the space it forms one cube: the **WBS cube**.

6. The WBS cube

The WBS is a crossing between three breakdown structures: ZBS, PBS and ABS.

Because three elementary tree structures are projected on the axis of the cube, we find "**3D little cubes**" inside the WBS cube. These 3D little cubes are the **tasks** of the project.

The WBS cube is shown on the picture below.



We can write:

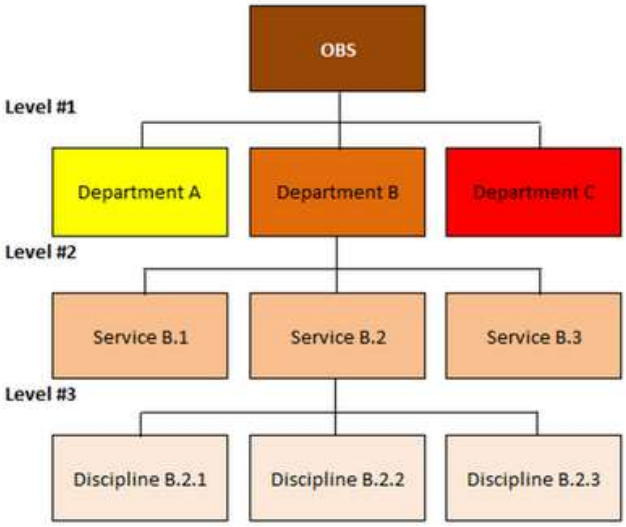
Schedule tasks = WBS = ZBS x PBS x ABS

7. Organization Breakdown Structure (OBS)

The organization is described by the **OBS** (Organization Breakdown Structure).

OBS includes Departments, Services, Disciplines, project team, etc.

The picture below shows a generic OBS.

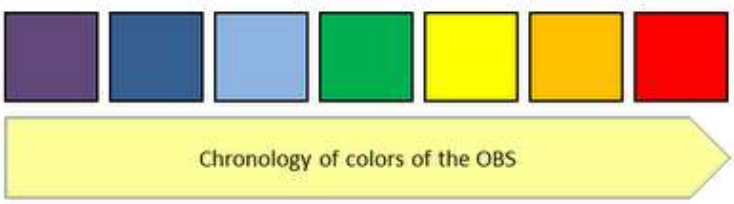


There is a chronology of each branch of the OBS, it is quantify by colors.

As you can see on the above picture, each branch of the OBS has a color.

It means for instance that the discipline “Electronic” is closer from the discipline “Electrical” than from the discipline “Civil works”.

The chronology baseline is shown on the picture below. It is given by the visible spectrum of colors.



OBS is extended by Resources (**RBS**, Resource Breakdown Structure).

This chronology of colors will be used for the interfaces quantification; precisely for the complexity of the interfaces.

8. Responsibility Assignment Matrix (RAM)

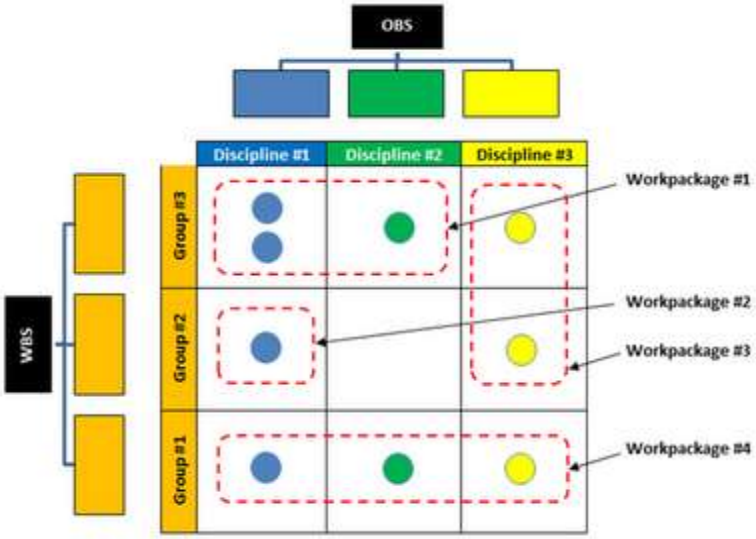
OBS and WBS are crossed in a matrix way.

This matrix is called the **RAM (Responsibility Assignment Matrix)**.

At the crossing of the OBS and WBS we find two kinds of information:

- ✓ The affectation of the resources on the schedule tasks, at the last levels of the tree structures;
- ✓ The definition of the work packages, with an unique responsible, at a middle of the tree structures.

A 2D representation of this RAM is shown below.



9. The project cube

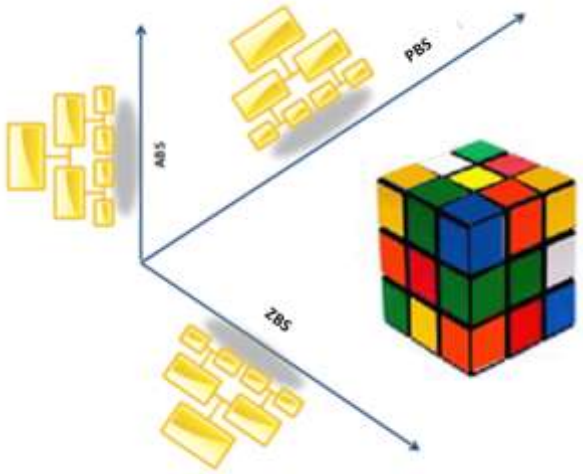
The RAM (Responsibility Assignment Matrix) symbolize the Organization (OBS) which works (WBS), in another words it forms the project.

The RAM can be presented in 3D. Because the WBS cube has three dimensions, and because the OBS is represented by colors, we obtain a 3D cube colored.

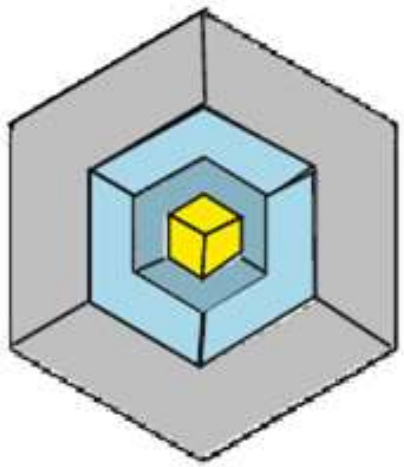
It forms the **project cube**.

An "***OLAP***" (On Line Analytical Processing) presentation of the project cube is shown below.

A "**Rubik's cube**" presentation of the project cube is shown below.



"***Russian boxes***" presentation of the project cube is shown below. It supposes that all the stages of the elementary tree structures are projected on the axis of the WBS cube together.

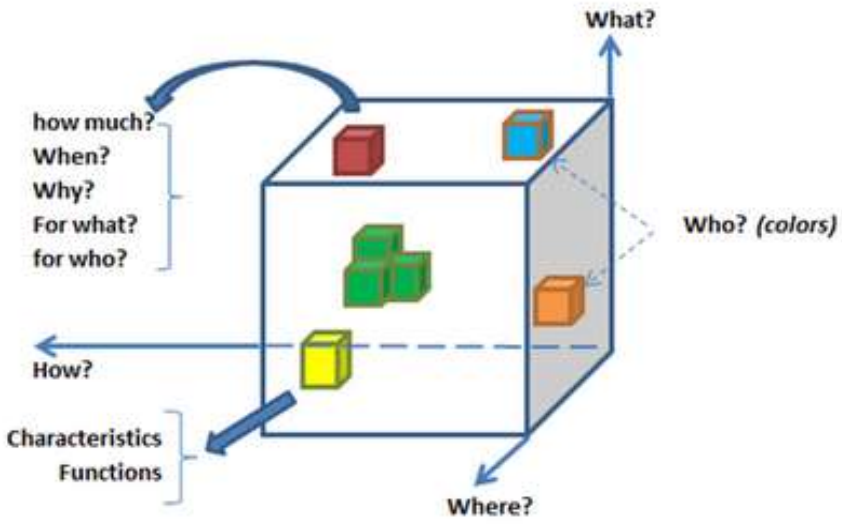


We can write:

Project cube = OBS x WBS = OBS x ZBS x PBS x ABS

Do you need to have information? Just ask it (send a request) to the project cube!

An interpretation of what the project cube can solve is shown on the picture below.



ZBS (Where?), PBS (What?), ABS (How?) and OBS (Who?) form the structure of the project.

Others answers project cube can give are:

- ✓ Who does what?
- ✓ What is the duration and the cost of this task?
- ✓ What are the **goals and the** objectives?
- ✓ Who is the client of this product?
- ✓ Why are doing this product or this activity?
- ✓ etc.

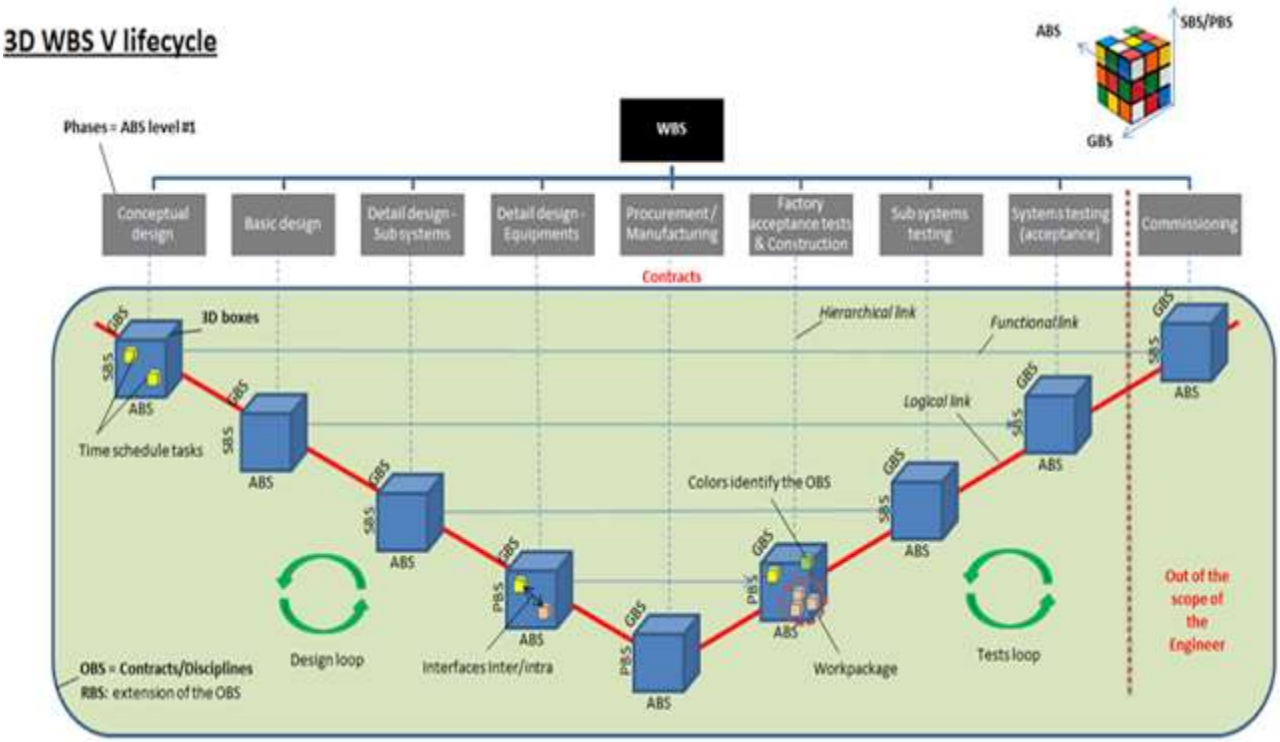
10. 3D WBS V lifecycle

The 3D V lifecycle of the project can be imagined.

It must be recalled that there is only ONE project cube.

However, we can imagine WBS cubes under each phase of the project (***level #1 of the ABS***). It is just one vision, another vision of the project.

The picture below shows the 3D V life cycle of one project.



We study (ABS) functional Systems (SBS) by big Zones (ZBS), then we study (ABS) sub Systems (SBS) by more précises Zones (ZBS) in detail design phase (ABS), then we specify (ABS) Products (PBS).

After, we do the procurement/manufacturing (ABS) of these products (PBS), and then we install/construct (ABS) the Products (PBS) somewhere (ZBS) in the construction phase (ABS, level #1).

Near the end of the project, we test (ABS) products (PBS), then we do the pre-commissioning (ABS) and the commissioning (ABS) of sub Systems (SBS) and Systems (SBS) in a general Zone (ZBS).

At the end of the project we test (ABS) the overall Product (PBS) in all Zones (ZBS).

To be noted that ZBS, PBS and ABS become more accurate near the construction phase, they become more concrete whereas at the beginning and at the end of the V lifecycle they are abstracts.

It exists in this 3D V lifecycle:

- ✓ ***Hierarchical links*** between the WBS cubes and the phases (ABS level #1),
- ✓ ***Logical links*** inside the WBS cubes and between WBS cubes,
- ✓ ***Functional links*** between opposites WBS cubes (on the same row).

The 3D V lifecycle of the project guaranteed that what is studied is tested at the end of the project. It guaranteed a completeness of the schedule tasks.

11. Three natures of logical links

In a schedule, Finish to Start (FS) logical links are usually used to build the network of tasks.

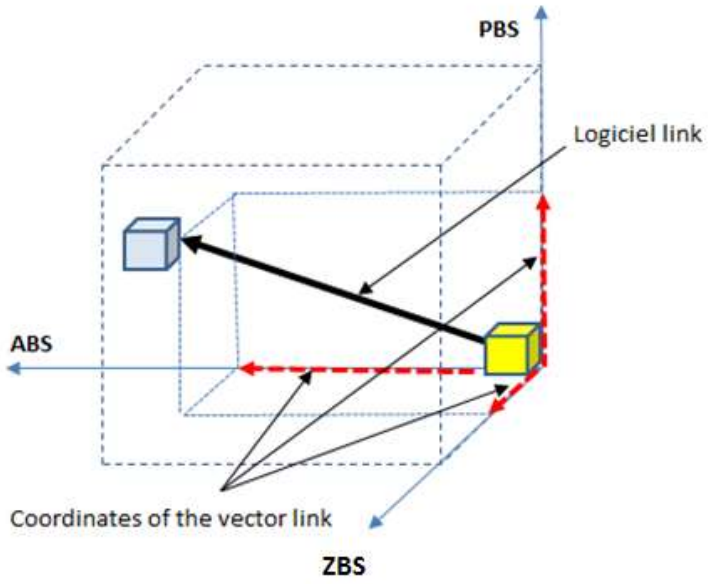
An example of Finish to Start (FS) logical link is shown on the picture below, in a Gantt diagram.

But this Finish to Start (FS) logical link has three coordinates in the WBS cube.

One logical link has a coordinate which predominate among others, therefore there are three natures of logical link (FS):

- ✓ Zone: for instance, for a railway project, when the track goes thought different locations on the construction site;
- ✓ Product: for instance when the cables are installed after the radio equipment;
- ✓ Activity: for instance when preparatory works must be done before the earthworks.

The WBS cube and the coordinates of the logical links is illustrated on the picture below.



12. The WBS matrix

All the schedule is described in the « **WBS matrix** ».

The list of tasks is given by an algorithm which extracts the tasks from the WBS cube, and the WBS matrix is this algorithm.

A simplified version of the WBS matrix is shown below.

Areas (GBS)	Area #1			Area #2				Activitys (ABS)				
	Area #1.1	Area #1.2	Area #1.3	Area #2.1	Area #2.2			Activity #1		Activity #2		
Instancied Products (PBSi)	Product #1.1_A	Product #1.1_B				Products (PBS)		Activity #1.1	Activity #1.2	Activity #2.1	Activity #2.2	Activity #2.3
	x	x				Product #1	Product #1.1	1	2		3	
			x				Product #1.2		1	2	3	
				x			Product #1.3	1	2		3	
					x		Product #1.4		1	2	3	
			x	x		Product #2	Product #2.1	1	2		3	
				x			Product #2.2			1		2
					x		Product #2.3		1	2	3	

To be adapted on each project

Standard part

One algorithm extracts the list of tasks from the matrix to be imported in the planning software

TASKS		
Areas (GBS)	Products (PBS)	Activitys (ABS)
Areas #1.1	Product #1.1	Activity #1.1
Areas #1.1	Product #1.1	Activity #1.2
Areas #1.1	Product #1.1	Activity #1.3
Areas #1.2	Product #1.1	Activity #1.1
Areas #1.2	Product #1.1	Activity #1.2
Areas #1.2	Product #1.1	Activity #1.3
Area #1.3	Product #1.2	Activity #1.2
Area #1.3	Product #1.2	Activity #2.1
Area #1.3	Product #1.2	Activity #2.2
...	...	...

We can see that Activities (ABS) are deployed on Products (PBS) and Products are assigned into a Zone (ZBS).

Products are instantiated (a kind of clonage) before being assigned somewhere (ZBS); they are instantiated to become unique, with a specific name. An instantiated Product is the same than the generic Products in terms of planning, it is the same Activities to produce it, but assigned in another Zone.

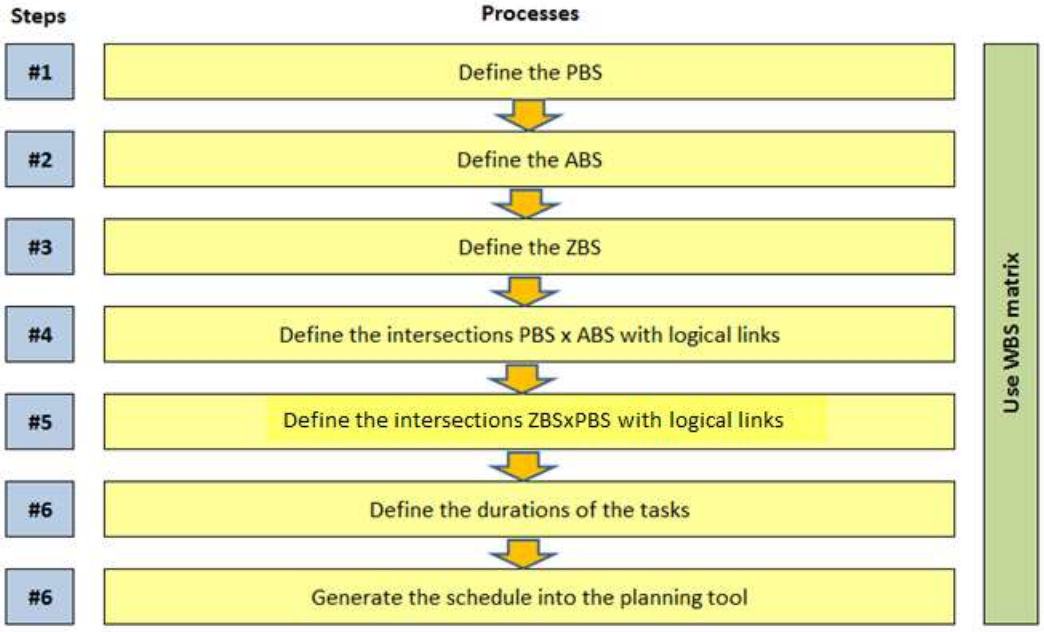
This simplified WBS matrix can be done with MS EXCEL, an algorithm in VBA EXCEL extracts all the tasks from the WBS matrix by analyzing all the correspondences, with all the necessary attribute codes (contracts, work packages, disciplines, ZBS, PBS, ABS levels #1, 2, 3, etc.) and even durations, etc.

The tasks are scheduled because there are some "order numbers" in the WBS matrix; these numbers are on the row of the Products (PBS) crossed with the Activities (ABS). It is the successors: Activities are deployed on Products.

With such a MS EXCEL tool, you can build a well structured 3000 tasks schedule in two weeks otherwise it takes two months to do the same job. The WBS matrix generates 80% of the time schedule. The principle is to import the list of tasks scheduled, resulting from WBS matrix treatment, into the planning software. WBS matrix is a prototype software.

Thus, no need to enter dates anymore in the planning software!

The process to build a schedule is given in the table below.



Jean-Yves Moine is developing with a partner **Cubix 360 software**. First released on **April 15th, 2013**. Cubix 360 in its 2013 version will allow one to build quickly and well a schedule based on the WBS 3D method: http://cubix360.fr/

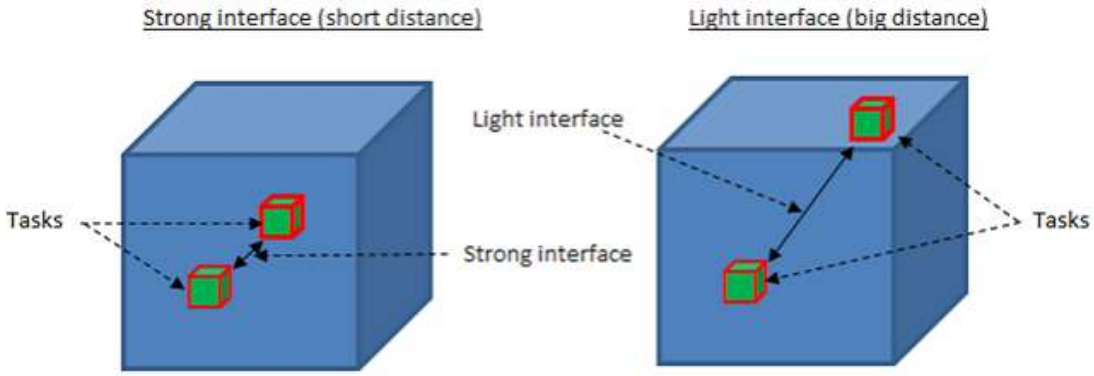
13. Interfaces identification

Because the axis of the WBS cube has been graduated with a chronology, distances can be calculated between 3D little cubes (tasks).

We can write the following principle, taking in account the work:

The more the distance between two 3D little cubes is low, the more the tasks are interfaces.

This is illustrated on the picture below.



The formula to calculate the distances between two 3D little cubes is very simple, it is:

$$Distance\,(T(b)-T(a)) = \sqrt{(l-i)^2+(m-j)^2+(n-k)^2}$$

With T(a) = Task (#a) = {ZBS (i) ; PBS (j) ; ABS (k) } and
with T(b) = Task (#b) = {ZBS (l) ; PBS (m) ; ABS (n) }, the coordinates of the 3D little cubes inside the WBS cube.

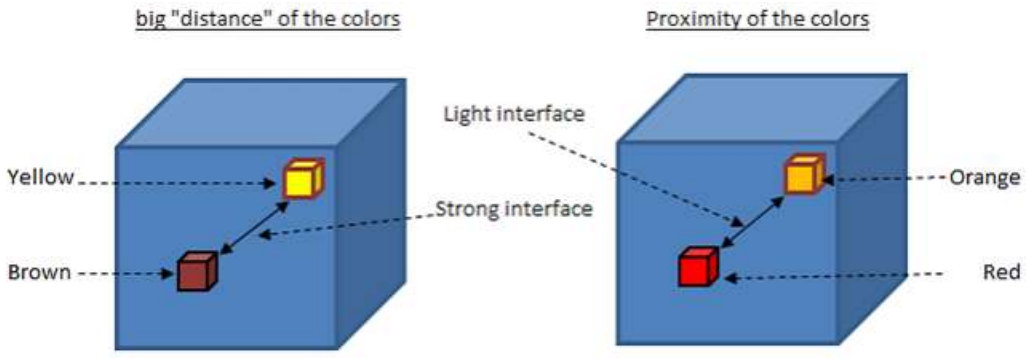
In this the 3D PERT diagram, each little 3D cube have start and finish dates, calculated by the schedule algorithm. When the distance between 2 little 3D cube is calculated, **if the two 3D little cubes are running at the same time, the interface is proved**.

To be noted that all overlaps between tasks are not systematically interfaces.

We can write another principle, taking in account the organization:

The more two 3D little cubes (tasks) are far in the Organization (OBS), we mean far in the visible spectrum of colors, the more the interface is difficult to manage.

This is illustrated on the picture below.



For instance, if an Electrical Engineer works with an Electrician on the same document, it is easier for them than if he works with a civil works expert.

There are three kinds of interfaces:

- ✓ Zones (ZBS),
- ✓ Products (PBS) or Functional Systems (SBS),
- ✓ Activities (ABS).

There is no doubt that the interface identification, in a mathematical way, like it is explained in this article, is the most added value of the 3D WBS model.

To be noted that the client can be included in the OBS, so external interfaces can also be identified.

14. Work Package identification

The work packages are defined on the WBS.

At the crossing between Products (PBS) and Activities (ABS) we define the first part of work package identification.

For instance, we can put numbers to identify the work packages.

But the Zones (ZBS) have also a role in the work package identification. So, we create a neutral number “0” (Zero).

GBS Level 1	Secteur n°1	Secteur n°1	Secteur n°2	Secteur n°1	Secteur n°1	Secteur n°2	Secteur n°1	Secteur n°1	Secteur n°2	Secteur n°1	Secteur n°1	Secteur n°2
GBS Level 2	Tronçon n°1	Tronçon n°2	Tronçon n°3	Tronçon n°1	Tronçon n°2	Tronçon n°3	Tronçon n°1	Tronçon n°2	Tronçon n°3	Tronçon n°1	Tronçon n°2	Tronçon n°3
PBS instancié				Réseaux téléphonie n°1	Réseaux téléphonie n°2	Réseaux téléphonie n°3	Emetteur n°1	Emetteur n°2	Emetteur n°3	Recepteur n°1	Recepteur n°2	Recepteur n°3
KP Start	3000	7000	10000	0	3000	7000	1500	5500	8500	1500	5500	8500
KP Finish	0	3000	7000	3000	7000	10000	1600	5600	8600	1600	5600	8600
1000	0	0	0									
1001	0	0	0									
1002							0	0	0			
1003										0	0	0
1004				0	0	0						
1005	0	0	0									
1006	4	4	4									
1007												

PBS Level 1	PBS extended Level 2	ABS Level 1	Etudes	Etudes	Approvisionnement	Montage	Montage	Montage	Essais	Essais	Essais
		ABS Level 2	Etudes générales	Etudes détaillées	Approvisionnements	Pré-installation	Montage	Cablage	Test équipement	Tests système	Tests d'ensemble
Communication	Système Radio		1	1							
Communication	Système téléphonie		2	2							
Communication	Emetteur radio				1	1	1	1	1		
Communication	Récepteur radio				1	1	1	1	1		
Communication	Réseaux téléphonie				2	2	2	2	2		
Communication	Système Radio									1	
Communication	Système téléphonie									2	
Communication	Système global communication										0

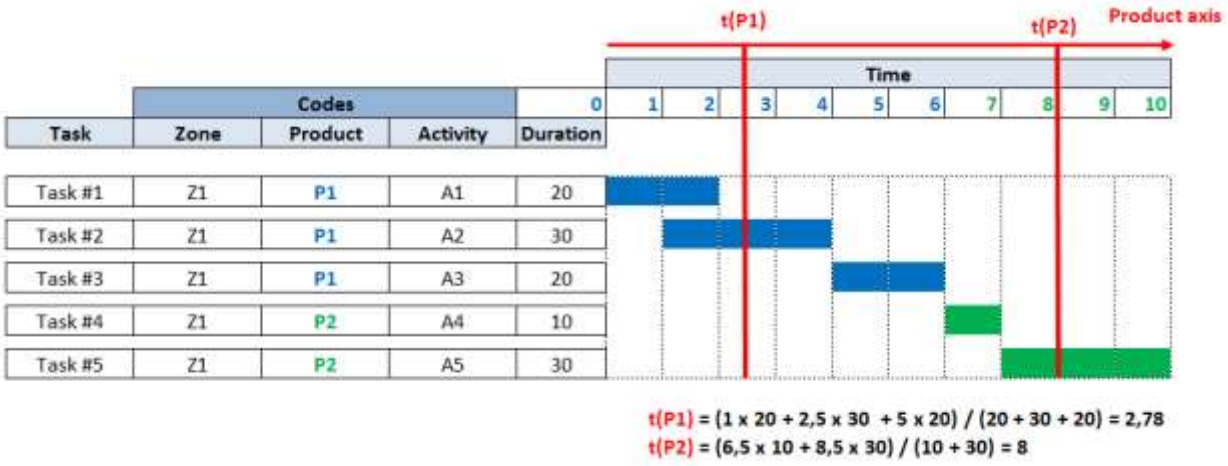
- ✓ If there is a zero in a cell of the table ZBSxPBS, the work package is defined in the matrix PBSxABS.
- ✓ If the is a zero in a cell of the table PBSxABS, the work package is defined in the matrix ZBSxPBS.
- ✓ If on one line, there is no zero, priority to the matrix ZBSxPBS for the work package definition.

15. Graduation of the WBS cubes axis

Graduation of the WBS cube's axis, which concerns the ABS, PBS and ZBS axis of the 3D Gantt, is fundamental for the project interfaces calculation. This graduation allows one to calculate the distance between two 3D little cubes (tasks) with the norm of vector formula, so the criticity of the interface can be calculated.

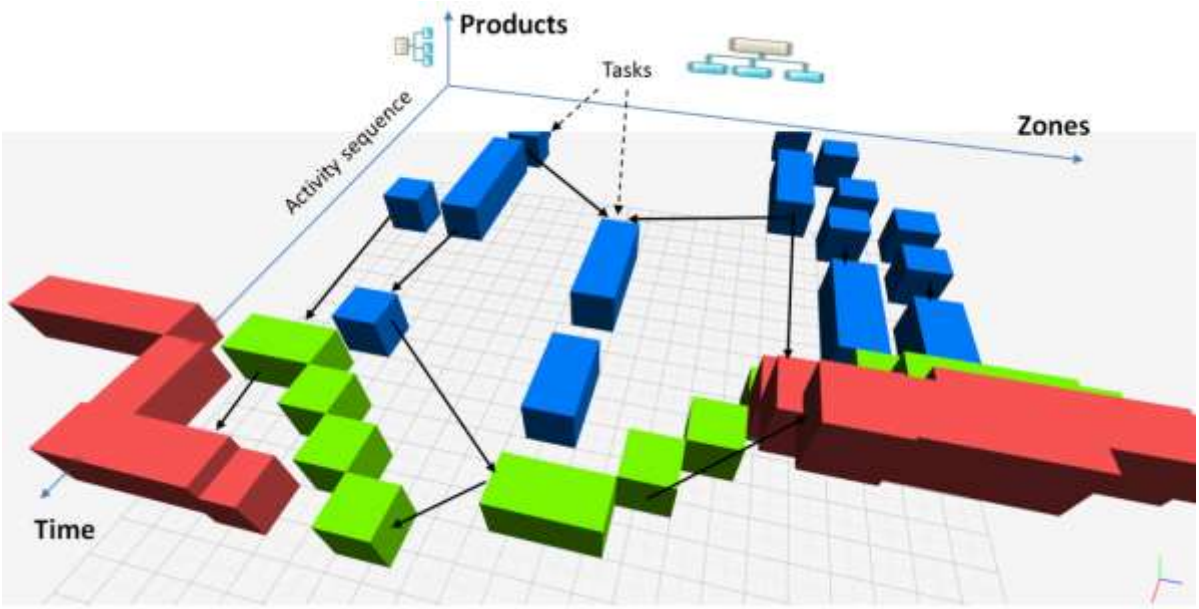
To graduate the axis, a scheduling must be launched, then the dates are calculated and it is then possible to calculate the barycentre, in terms of date, of each group of tasks that belongs to one Activity, Product or Zone. The coordinate of each Task is given by its mean date, the duration of the task is the weight for the barycentre calculation. The codification of the tasks allows to define which task belongs to which Activity, Product or Zone. The scheduling allows also to define if the task are running at the same, in others words if the tasks are really in interfaces. That's why we say that the tree structures ABS, PBS and ZBS have a chronology, Activities, Products and Zones have a position in the time and on the WBS cube's axis.

In the example below, the Product (PBS) axis is graduated, as explained before, with the help of the schedule.



16. The 3D Gantt

The 3D Gantt, resulting of the 3D WBS, allows first of all to identify graphically the importance of the project interfaces by evaluating the distance between the tasks, but it allows also to display a 3D time-location diagram.



The tree structures Zones and Products are projected on the axes of a reference 3D landmark. These tree structures integrate an order which specifies that such or such element is closer than another. The third axis is time.

The 3D Gantt put the Activities in this reference land mark with three dimensions: Zones, Products and time. Catches separately they are activities or actions deployed on a Product to produce it, knowing that these Activities are assigned to a

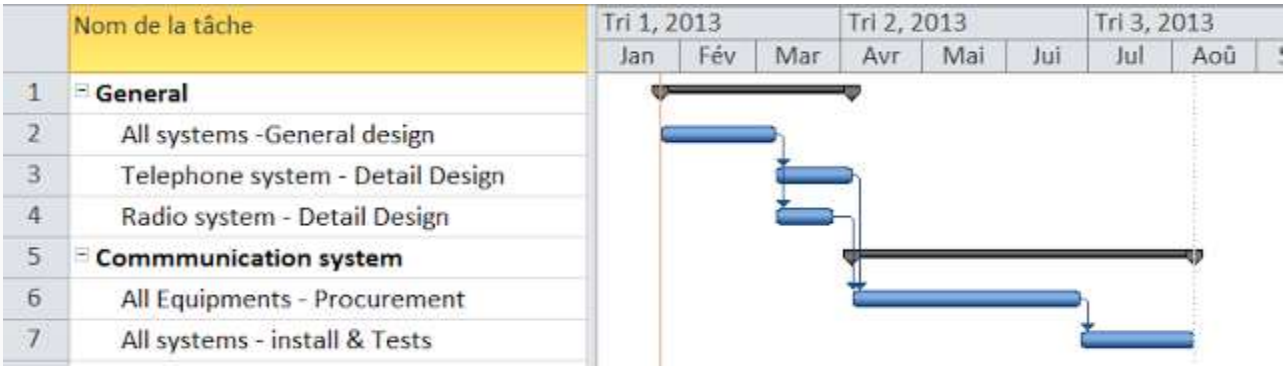
certain Zone. But taken in the context of the 3D reference land mark, it is schedule tasks. Indeed, in the 3D model, a task is the concatenation between a Zone, a Product and an Activity, for example “New-York-Track-Installation” is a task.

Compared to a classical Gantt diagram, with an axis tasks and an axis time, the 3D Gantt allows **to better visualize the logical links of schedule**. The logical links are not superposed anymore in 3D.

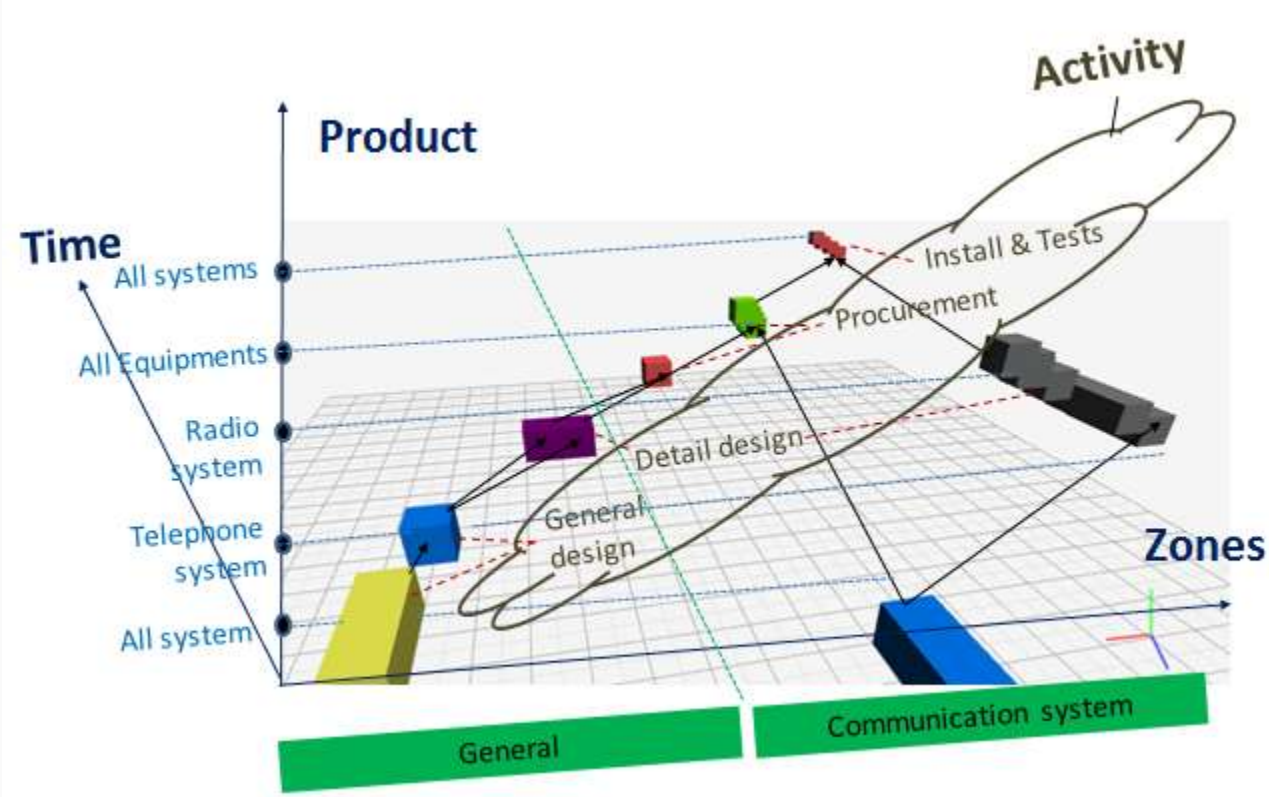
The 3D Gantt integrates concept of interfaces. It results from the 3D model that there exist interfaces on work, of types **Zone (co-activity)**, **Product (Physical)** or **Activity (Temporal)**. The principal contribution of the 3D Gantt it is that **it makes possible to graphically visualize the criticity of the interfaces** (importance) by evaluating the distance between 3D little cubes (tasks): the closer the little 3D cubes are, the more the tasks are in interface. **3D Gantt also allows to evaluate the complexity of the interfaces** by comparing the colors of the 3D little cubes. Indeed, more the colors of the 3D little cubes are distant on the visible spectrum from the colors, more the interface is complicated to manage.

Lastly**, 3D Gantt is at the same time-location diagram** or time-distance diagram, very much used on the linear projects of infrastructures like the construction of highways, networks of tramways, subway, installation of pipeline, the very high buildings, etc. Indeed, in 3D, the couple Product-Activity is positioned on a Zones reference land mark or Geographical (the distance axis) and on the temporal axis, there is thus well also a diagram distance-time.

Here is a classical Gantt diagram, for a communication project.



Same thing in 3D, with 3D WBS method.



Interfaces can be read directly on the 3D Gantt by evaluating the distance between tasks.

The more is distance is small, the more the interface is critical.

17. Advantages and benefits of the 3D WBS

Time-saving and effort-saving

Within the tasks of the project to be achieved, the factorization of the Activities (how?), Products (what?) and physico-functional Zones (where?) used as well as the simple filling of corresponding factorized "WBS matrix" (prototype software) makes it possible **automatically to develop the** whole of the tasks of the project. The time saved compared to a manual construction of a WBS can be considerable as soon as the number of tasks is important. For example, with the WBS matrix tools and 3D WBS method, it is possible **to build a schedule of 4,000 tasks in 4 days whereas a traditional approach requires a few two months of work**. **The average factor of time saving in general is of 10x**.

Detection of possible synergies

The principle of factorization according to three dimensions of the tasks also supports a more thorough **rationalization** of the planning of the tasks by putting forward the Activities, the Products and the Reference Zones which build the tasks, to better

compare the tasks between them and thus if required to consider more easily certain **synergies** (using for example common resources) between the tasks. These possible synergies can make it possible to improve the creativity and to optimize the realization of the tasks.

***Coherences** of the durations and the costs*

The comparisons of tasks between them made easier by factorization according to three dimensions Activities, Products and Zones, allows at the request of carry out monitoring over the durations even the costs, by pointing the **statistical discrepancies** on the durations and the costs entered by the user for certain of the same activities and even products, of which it can be interesting to check coherence.

Identification of the interfaces

The automatic identification of the project interfaces is a world exclusiveness in 3D WBS model.

The interfaces:

- ✓ of type Zones (co-activity), i.e. interfaces between two entities (e.g: people or companies) separate working in close or identical Zones;
- ✓ of the type Product (physical), i.e. physical interfaces or functional interfaces between the components of the project;
- ✓ and of type Activities (temporal), i.e. actions which take place at the same time;

are in the heart of the project management and often represent the hard and critical points of the project. The 3D model makes it possible to identify them (to list them) mathematically and by means of computer, which makes it possible to identify the projects risks and also to define a strategy of work packaging minimizing the consequences of the risks and exploiting opportunities. Moreover, the 3D model makes it possible to quantify these interfaces, in terms of criticity (distance between two little 3D cubes or tasks), of complexity (degree of distance in term of organization), as well as durations of covering between the tasks.

A better understanding of projects

The 3D model poses simple mathematical explanations on concepts up to that point vague, which makes it possible to rationalize certain methods of the project management.

For example, the 3D model tells:

- ✓ that there exist **three natures of logical links**, i.e. Zone, Product and Activity. This makes it possible to build the schedule of the project in a more methodical way;
- ✓ another example, the 3D model says that there exist **three types of interfaces**: Zones, Products, Activity whose criticality is a function of the distances between

these elements and whose complexity is a function of the heterogeneity of the organization which works;

Even the **concept of work and tasks** of the project is better defined and understood, because the 3D model poses that "to work, it is to do (Activity) something (Product) somewhere (physico-functional Zone)".

The concept of levels of schedule is cleared up. A schedule of level two corresponds to two levels of detail of the Activities. A schedule of level three corresponds to three levels of detail of the Activities, etc.

To have an integrated project management

The 3D WBS makes it possible **to naturally connect** all the disciplines (or sets of themes) of the project management described in the PMBOK from PMI. The 3D model also makes it possible **to produce dashboards and multi-disciplines reports,** for the decision makers.

A better structuring of projects

The WBS of the project is not carried out any more by successive decomposition starting from the top of the tree structure of work (approach top-down) but by crossing (development) of the three elementary breakdown structures, namely the breakdown structures Zones, Products and Activities, which constitute the 3D WBS. Just like the traditional approach these tree structures are mutually exclusive and collectively exhaustive. However, in the 3D WBS method, the **rationalization of the items** of reference which are the Zones, Products and Activities, allows to employ the **same expressions for same semantics**, and, by crossing them, to preserve the maximum of coherence in the definition of the tasks. Moreover, there exists a **systematic algorithm** of creation of the WBS (method): whatever the project: Activities are deployed on Products, which are possibly instantiated (specified) before being assigned at Zones. This rationalizes the manner of obtaining the complete list of the tasks of the project.

Reconciliation of the costs and the time

It results from the 3D model that a schedule (WBS) corresponds for a given Zone, with the detail of a Product in Activities, in other words, an explicit schedule "How it is necessary to work". Whereas a structure of costs (CBS, Cost Breakdown Structure) corresponds often for a given Zone, to the detail of an Activity in Products, in other words, "one quantifies something" (what). Thus, the 3D model shows us **geometrically that there exists an optimal level of structure of management of the costs and time**, taking the shape of a common cube which one can see in the 3D WBS. It becomes possible, compared to a traditional approach or the costs and the time are managed by the different applications, **more naturally to implement the method of**

the Earned Value Management (EVM) thanks to the accessibility to the data (given in the same application one), even on an extremely complex and huge project.

Reasoning in "Top-down" instead of "Bottom-up"

One does not reason anymore on the last levels of the breakdown structures. The 3D project management implies that one affects anymore systematically of the elementary resources on elementary tasks of schedule, which is unmanageable and complicated when the number of data is important to manage, but one places oneself on the level which one wishes, according to the need and of the information one has, to assign for example groups of resources to groups of tasks, with a single person in charge by group. **This makes it possible to manage things which, at the beginning, were extremely complicated, while them making simple and practical**. The approach Top-down is more natural since it leaves simplest (of the concept) to go towards more complex (the concrete detail). For example, the 3D model recommends a planning on two floors (Top-down): macro-schedule (upper floor) sends objectives to detailed schedule and reassembles indicators of advance and variations.

More the project is huge and complex, more the 3D model brings added-value

The 3D WBS makes it possible **to apprehend in a rational and structured way a project**, whatever it is (industrial, infrastructures, product development, IT). The very solid structuring of methodology allows a high level of coherence, exhaustiveness and automation; what makes it possible to gain in effectiveness (results and time-saving) and in efficiency (saving in means, of resources and profit of costs). It is possible thanks to the 3D model to have the good information at the good moment, acicular towards the good person.

Setting forward of the project management by the variations

In the 3D model, it is considered that **to manage a project is to manage the variations**. Thus, a whole methodology is proposed to manage the variations which are regarded as qualitative risks. The variations can be of standard "evolution", "additional work" or "internal reorganization", they have a state (approved, not approved or in the course of approval), a cause (real or potential), a gravity, a probability of occurrence, an impact (hope of profit), and a single person in charge. There exist processes of management of the variations (corrective action plan) associated with sheet of variations (formalization).

Generic breakdown structure for the classification of the risks

There arises from the 3D model **a generic structure of risks** making it possible to accommodate the risks of all the types of projects (industrial, infrastructure, product development and IT). The risks are indeed internal (company) or external (contractual), and in each one of these cases, they can be dominant natures Zone or Product or Activity or Organizational or carried by a lot (intersection between the organization and

work). The risks of interface with the external world with the project are also classifiable in one structured dedicated.

Capitalization of the discipline data and the processes

The 3D model poses that a standard or standard schedule does not exist because the Zones are different from a project to another. For example, a project carried out in Paris or New-York does not have inevitably same geographical cutting. On the other hand, for a line of Product or a kind of project, the Products and the deployed Activities are standard, as well as the generic logical links between these two tree structures (within a Zone, whatever it is). It is then possible to have quite useful models during the creation of a new project. This allows an appreciable time-saver during the structuring and the planning of a project and also makes it possible to homogenize and standardize the projects between them, in terms of deployed Products and process of realization.

18. Definitions

PBS, Product Breakdown Structure or Products. Hierarchical tree structure of Products. Generally, PBS contains functional systems at the highest levels of the tree structure and physical components at the lowest levels of the tree structure. For example: 'Technical specification', 'Calculation note', 'Project plan', 'Transformer', Railway', are products. It is the deliverables. More generally, 'equipment', 'materials' and 'civil works components' are pure Products. 'Radio communication system' is also contained in the PBS, it is a functional system but also a Product within the meaning "large".

ABS, Activity Breakdown Structure or Activities. Hierarchical tree structure of Activities. An Activity is an Action, a set of Activities forms processes. An Activity can be a verb. For example 'studies', 'design', 'purchase', 'construction', 'installation' are Activities. **An Activity is not a Task**. Activities are deployed on Products, it is the processes that build Products.

ZBS, Zones Breakdown Structure or Zones. Hierarchical tree structure of Zones. ZBS is physico-funtional Zones, it can be geographical or functional. The meaning of ZBS depends of the project type. For an EPC (Engineering, Procurement, and Construction) project, ZBS is group of functional systems for the design and the commissioning phases. And ZBS is geographical areas for the construction phase. For Product development project, ZBS is waves of prototypes. For IT projects, ZBS is released/functional increment/Target machine type. For example, Zones of a linear project can be defined by: 'lines', 'sectors', 'stations/inter-stations' and 'sections'. It is locations here. In the WBS elaboration algorithm, Zones are the destination of Product during the project life, Products are grouped by Zones or Products are assigned into Zones.

WBS, Work Breakdown Structure. Hierarchical tree structure of Work. WBS is the whole of work to be carried out within the framework of a project. **The last levels of the WBS are the tasks**. WBS is a crossing between Zones, Products and Activities.

Task. It is the last item of the WBS, the Task is included in the WBS. A task is not an Activity. Task is the Work.

OBS, Organization Breakdown Structure. Hierarchical tree structure of the organization. OBS is the internal vision of the company's organization. OBS can also be the project team. For example, levels of OBS can be: 'Departments', 'Services', 'Disciplines', 'Teams'. OBS is extended by RBS, Resource Breakdown Structure.

Project interfaces. Degree of interaction between two tasks. When there is an overlap between two tasks, it can be an interface but not always. There are three types of interfaces: Zone, Product and Activity. Criticality of the interface is given by the distance between two tasks, in the project cube. Complexity of the interface is given by the difference of task's colors (OBS) in the visible spectrum of colors, in the WBS cube.

About the Author

Jean-Yves Moine

Project management consultant, Jean-Yves Moine has been working in project control for more than fifteen years, in prestigious French companies, on more and more huge and complex projects, in different sectors in France and abroad. Knowing that the Work Breakdown Structure is the heart of the project control, during his different missions he developed an approach to structure quickly and well the schedules: the **3D WBS** model. Most of his add value is to establish it in the beginning of the project and then create a system to manage costs and time linked together, taking in account the risks.

He has a good knowledge of the project management theory, he has already written four books, published by the French Normalization Association (AFNOR). He has just finished another book about “3D project management – the project cube” published in mars 2012. He used to write some articles which are published in the project management workbooks of the AFNOR and in the AFITEP (French project management association) magazine.

Because he practiced in a lot of grand companies, he also has a good knowledge of project management tools like PRIMEVERA P6, MS PROJECT or TILOS. A Specialist in project management (especially time, costs and risks), he likes to transmit his knowledge, to train and to manage these elements. The more the project is huge and complex, the more he can add value.

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