

# **Using Microsoft Project in highways project planning**

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## **Abstract**

Project management is a new science that has been very recently systemized. However, in previous decades, project management was preceded as an artistic approach toward the implementation of a specific project. For instance, the occurrence of this art appears in many great buildings such as the pyramids. Nowadays, project management has become a science with specific criteria because of many factors such as the increase in the number of tasks at work that should be completed at a specific period of time. And by the development of the work methods there was a need for new tools that can help manage big size project and projects with more complexity. Projects now tend to be more complex, which brings the point of changing the project management methods that can be based on three points, according to J. Davidson Fram in his book “The New Project Management Tools for and Age of Rapid Change Complexity and Other Business Realities”, that are :

- 1- Project management should be more costumer focused
- 2- Project management should explore new management tools
- 3- The need to redefine the project managers roles

And by then, project management can be considerate as of the new developed engineering disciplines.

## **Keywords:**

Project management; Microsoft Project; Linear Planning; Highways; Tilos; Software

## **1. Microsoft Project:**

Microsoft project is one of the appearances of the change in the project management field, since it is one of the most developed procedures to go through and tools to uses in order to reach a high quality project results.

Microsoft Project is a tool that helps managing portfolios and implementing projects in different fields by scheduling, budgeting, and allocating human and material resources.

## **2. Exploring Microsoft Project:**

### **2.1 Templates**

First of all, Microsoft project suggests several templates depending on the field and the purpose of the project, as it can be personalized depending on the users need.

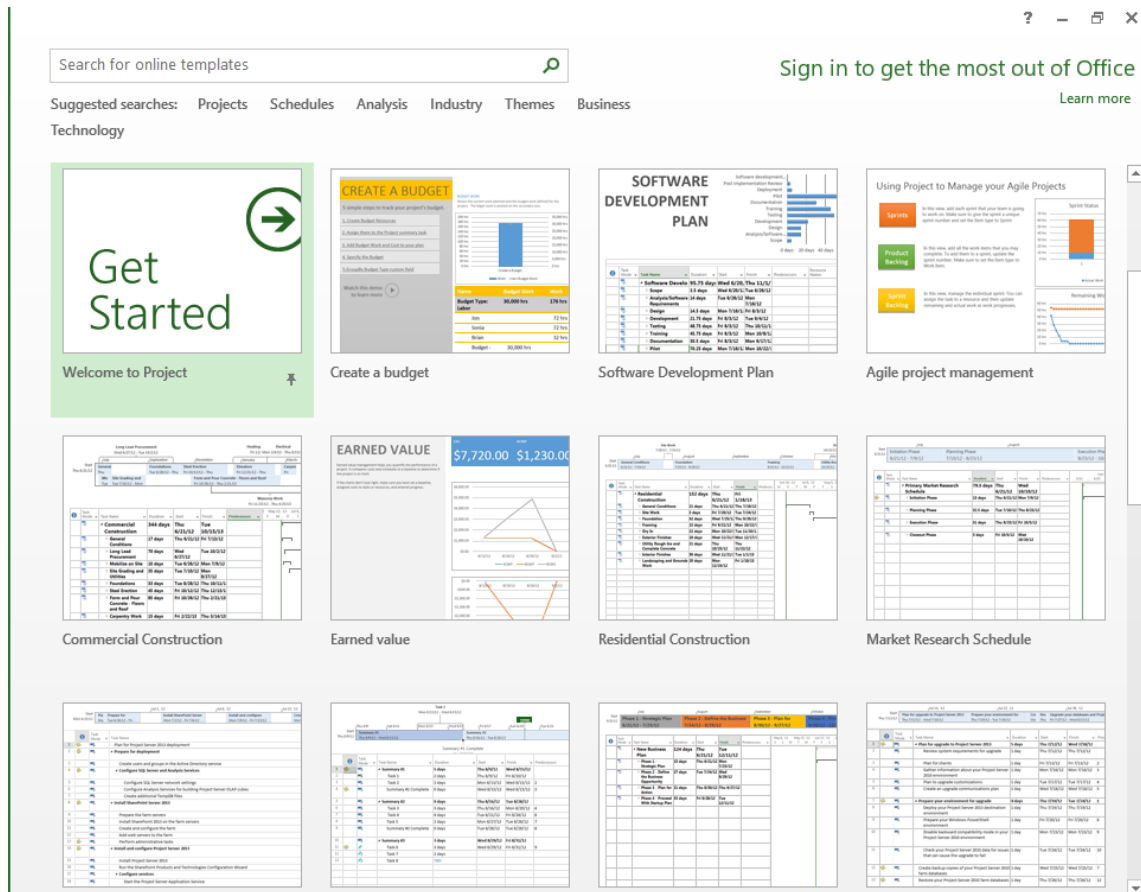


Figure 1: Microsoft project templates

For instance, there is professional templates related to budget analysis, software development, startups, commercial constructions, marketing campaigns, project management, as there is personal templates such as wedding planning etc..

## 2.2 Creating a new platform project:

As mentioned by Elaine Marmel in his book “Microsoft Project 2007 Bible”, planning for a project in Microsoft project needs to follow different steps to get the result.

The image shows a screenshot of the 'Task Information' dialog box in Microsoft Project. The dialog has a title bar with a close button (X) and a tabbed interface with the following tabs: General, Predecessors, Resources, Advanced, Notes, and Custom Fields. The 'General' tab is selected and contains the following fields and controls:

- Name:** A text input field.
- Duration:** A numeric input field with up/down arrows and an  **Estimated** checkbox.
- Percent complete:** A numeric input field with up/down arrows.
- Priority:** A numeric input field with up/down arrows.
- Schedule Mode:** Two radio buttons:  **Manually Scheduled** and  **Auto Scheduled**.
- Inactive:** An  checkbox.
- Dates:** Two dropdown menus for **Start:** and **Finish:**.
- Display on Timeline:** An  checkbox.
- Hide Bar:** An  checkbox.
- Rollup:** An  checkbox.

At the bottom of the dialog are three buttons: **Help**, **OK**, and **Cancel**.

**Figure 2:** task information on Microsoft Project.

1- Determining the tasks results:

By determining the tasks, it is meant that the user should determine the major tasks that can define the major actions to be done and break them down to minor tasks or subtasks.

2- Establishing Time limits

After defining the major and minor tasks, the user should define the time limits and deadlines of each subtask, which, by the end of filling the starting and ending time columns, will automatically define the starting and ending time of the major tasks.

Defining the time limits will help the manager keep in track of the progress of the work by respect to the actual date

3- Defining resources

Each task should be performed by a specific person or team, and by defining the resources the project manager can assign each task to the correspondent team. This step helps defining the availabilities of the workers to perform each task at a time or several tasks at a time.

4- Linking the tasks

The relation between tasks can appear either at the level of time or resources. By these steps, the project manager should pay attention to the relationship between the tasks in terms of the order of tasks (which task comes before which), and the period of time that links between them (eg: tasks 2 should be performed three week before task 1).

5- Gantt Chart:

The Gantt chart contains two parts:

- The table part that was filed with the previous information and show the name of task , starting and ending time
- The chart part is the graphic representation that helps graphically defining the time limits of the tasks and the relationship between them.

### 3. Scheduling Method for Highway Construction:

In the journal “Developing a Traffic Closure Integrated Linear Schedule for Highway Rehabilitation Projects” written by Haribol Sharma, Charles McIntyre, Zhili Gao, and Tang-Hung Nguyen, “The success of any construction project is largely dependent on the selection of the planning, scheduling, and controlling system

adopted for the project.” The differentiation of the projects makes the planning tasks very challenging that is why there should be the use of the available tools that helps with the organization of those complex projects.

Same thing for many linear projects, taking the example of the highways and railroads, in which time and space must be taken into consideration.

Introducing Microsoft project in linear scheduling is a need especially when it comes to the construction part of the project.

#### **4. Using Microsoft project in a specified highway construction project:**

**Eg: Building Line T2 and extension of line T1: Tramway in Casablanca**

Realizing a project in real may not match with the plan that was previously planned for on paper or on software (Microsoft project), because of the different obstacle that can happen and lead to a change in the date or resources. For this reason, managing several related schedules of the same project might be a demanding task that needs both effort and time, and sometimes can lead to committing mistakes.

The problem that was faced during the work is that a change in any date, and most of the times the major dates- the dates of the administrative orders in the tramway project-, the manager has to manually change all the other dates in the other schedules. Since the firm has about 30 schedules of different public contracts, the changes make the task very complicated and sometimes will be filled the schedules with wrong information.

##### **1. Solution:**

To solve this problem, there was the suggestion of a platform that will gather all the existing data on one spreadsheet of Microsoft project, and that will help the workers to easily manage them. The reasons behind choosing Microsoft project as software to work with is because it is easy to read compared to Tilos, and it has some of the functions that will be needed exactly like Microsoft Excel, but it helps relating between the tasks, so whenever there is a change in one date, it will affect the other dates. Moreover, after filling the data, it displays automatically the Gantt chart of the tasks.

##### **2. Comparison with Tilos and Microsoft excel Softwares :**

Before choosing Microsoft project, there was several trial of different softwares to compare the feasibility of having the needed results starting with the one that seemed easy to read and will give the right result which are Tilos.

##### **Tilos Trial:**

Tilos is software that can graphically provide a good linear scheduling, since it is a way to link graphically between the time and the place functions, and the result was looking like this.

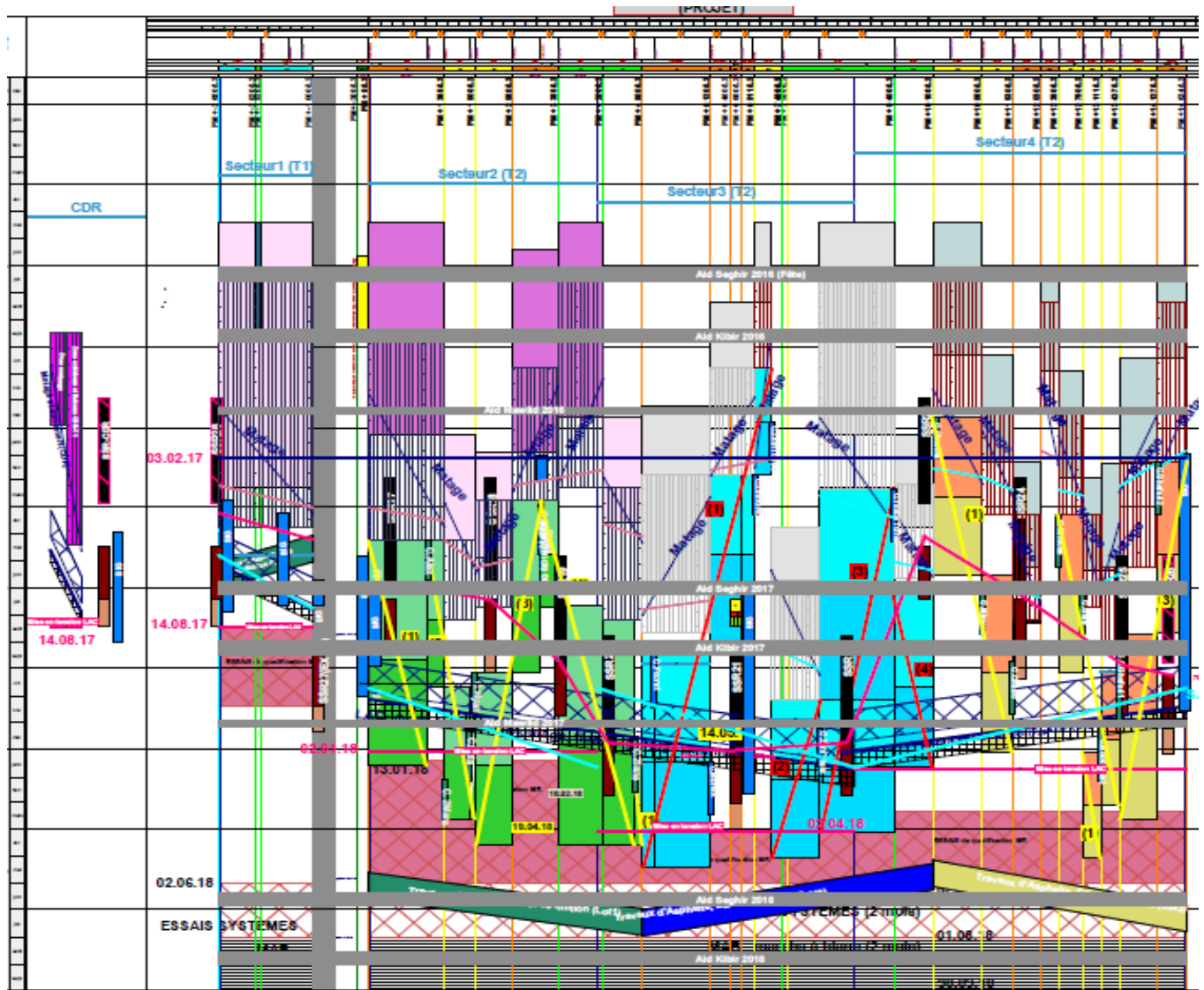


Figure 3: Planning platform on Tilos divided by Sectors.

Tilos software allows getting different information in one document by using different shapes and colors.

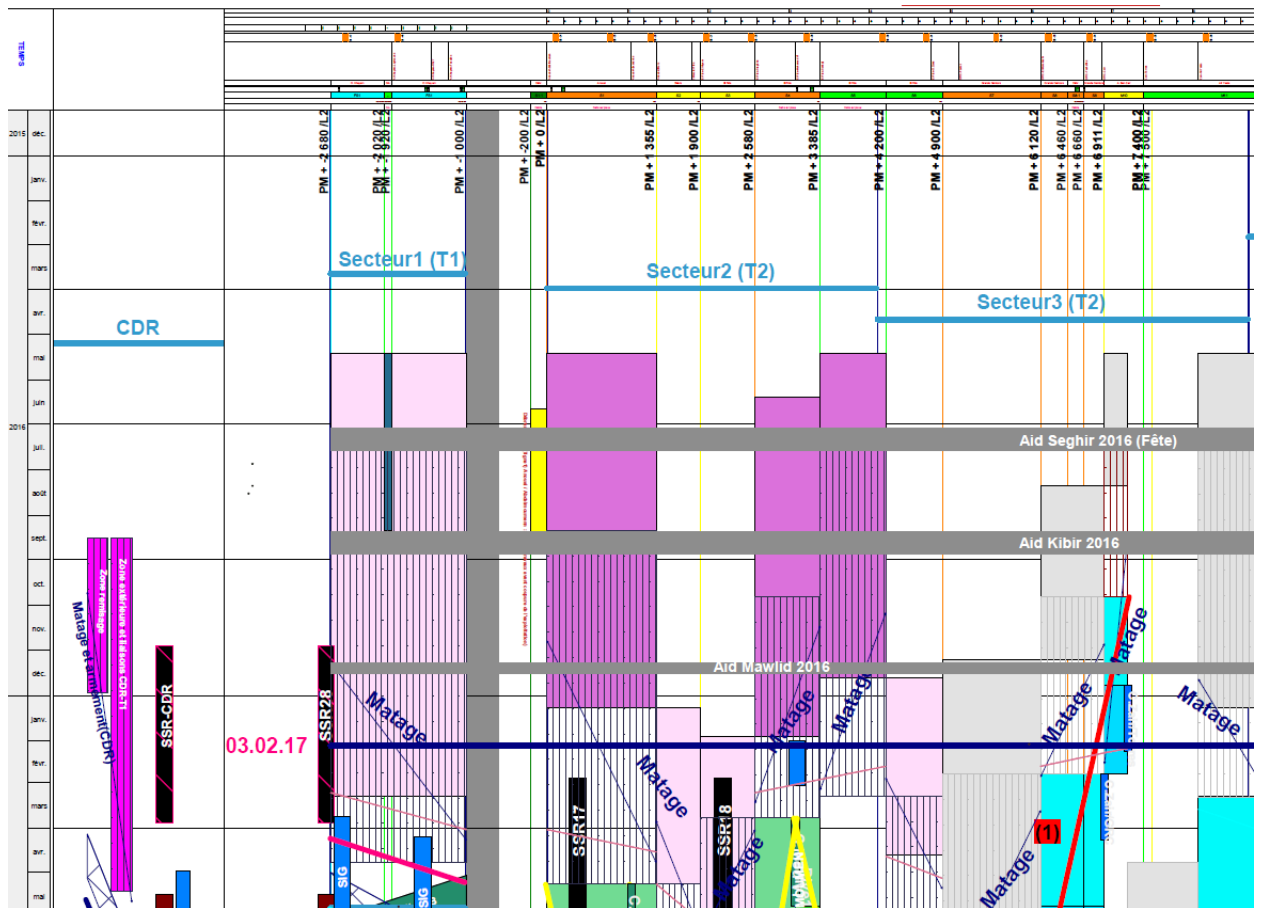


Figure 4: Zoom of the planning

For more understanding of Tilos software, this image shows a zoom of the platform that is divided by the different sectors of the project. After filling the needed information, the result is represented as follow:

- The horizontal axis represents the distance, divided by the PMs (Meter point)
- The vertical axis represents the time, divided by months
- The bars represent the different project per each sector, limited by the time, the meter points and the holidays in which the work should stop.

The good part about using Tilos in linear planning is its ability to keeping track of the progress of the project by using estimated percentages in either time based or distance based, and by that it gives the possibility to change the information to meet with the deadlines by providing different suggestions, for instance asking the project owner to provide another team that can work similarly on the project. To realize the evaluation, CID technicians should prepare a weekly report by visiting the sites and evaluating the work, its progress and estimating the percentage of the work done.

**Problem:**

The problem with using Tilos is that it is hard to read the information since it is linked with each other and is a bit confusing.

#### Excel Trial:

One other alternative can be Microsoft Excel.

Microsoft Excel is softwares that gives the ability to work with functions, graphs, and formulas.

Project	Ordre de service plannifié	Ordre de service (Date limite de notification)	Ordre de service notifié	Ripage	OSn-OSP	Observation
PVF	3/15/2016	4/30/2016	4/22/2016	0	38	Impacte tous les marchés
CDR	4/19/2016	5/27/2016	9/3/2016	-99	137	
LAC, NRJ, BAT	6/20/2016	7/28/2016		0	-42541	
SIG	7/29/2016	7/29/2016		0	-42580	
Billetique	6/15/2016	6/15/2016		0	-42536	
FOURNITURE ET POSE DU MOBILIER DES STATIONS	7/4/2016	7/4/2016		0	-42555	
CDM	7/21/2016	7/21/2016		0	-42572	
Travaux d'aménagement façades à façades (LOT :	7/28/2016	7/28/2016		0	-42579	
TEF	8/1/2016	8/1/2016		0	-42583	
MAL	8/1/2016	8/1/2016		0	-42583	
Sablrier	8/1/2016	8/1/2016		0	-42583	
SLT	8/10/2016	8/10/2016		0	-42592	
GTC-PCC	8/29/2016	8/29/2016		0	-42611	
INFRA	9/1/2016	9/1/2016		0	-42614	
SAEIV	9/5/2016	9/5/2016		0	-42618	
CFA (TAV)	9/20/2016	9/20/2016		0	-42633	

Figure 5: Excel table for the administrative orders of the project changes.

This table was basically done for one specific date, which is the date of the administrative order, for the analysis of the changes and their impact on the other projects.

- The first column has the name of the 16 different projects of the Tramway project.
- The second column contains the administrative order dates that was planned in the very beginning of the project that were subject of changes depending on the progress of the project, knowing that the change of dates for some projects may affect the period specialized for other projects.
- The third column contains the maximum date of change of the administrative order, and that means that any date chosen after this date will affect the non-respect of the deadline.
- The fourth column has the final date in which the project officially started.
- The fifth column is the difference between the maximum date of the administrative order and the date of the official start.
- The sixth column is the difference between the official start of the project and the date of administrative order planned.
- The last column contains further comments to be added.

#### Problem:

The problem with using this method is that a table should be generated for each specific type of dates, which means that there will be the same initial problem of using many tables and many documents to find the right information.

#### Ms Project Trials:

The first idea we had about Microsoft Project is, first of all, to prepare a document in which all the schedules of the same project can be gathered, and by then link the date of each project by the date of its administrative order. The document the first major tasks defined.

	Nom de la tâche	Start	Finish	Duration	Predecessors
1	▶ <b>Ordre de service de démarrage</b>	15/03/2016	01/12/2016	261 days	
12	▶ <b>CDR</b>	08/08/2016	08/03/2018	577 days	
24	▶ <b>Extension Ligne 1</b>	21/06/2016	15/05/2018	693 days	
37	▶ <b>Ligne2</b>	21/06/2016	14/06/2018	723 days	
49	▶ <b>CDM</b>	27/10/2016	14/06/2018	595 days	

Figure 6: Project Section classification on Ms Project.

- The first one contains the dates of the administrative orders, so after indenting it, it looks exactly like this:

	Nom de la tâche	Start	Finish	Duration
1	▲ Ordre de service de démarrage	15/03/2016	13/10/2016	212 days
2	Plate forme voie ferrée	15/03/2016	22/04/2016	38 days
3	CDR	19/04/2016	09/06/2016	51 days
4	LAC-NRJ	20/06/2016	05/07/2016	15 days
5	Mobiliers de stations	14/07/2016	14/07/2016	0 days
6	CDM	21/07/2016	21/07/2016	0 days
7	SIG	29/07/2016	29/07/2016	0 days
8	SLT	22/08/2016	22/08/2016	0 days
9	SAEIV & Radio	05/09/2016	07/10/2016	32 days
10	Cfa, PCC & GTC	07/10/2016	07/10/2016	0 days
11	Billettique	13/10/2016	13/10/2016	0 days

Figure 7: The Administrative orders of different subproject on Ms Project.

Each row contains the name of the different projects and the date of the administrative order.

- The second one contains the dates of the CDR that is an abbreviation of “Centre de Remisage” in French, which refers to the storage in which the tramway cars will be left. This is the result obtained :

	Nom de la tâche	Start	Finish	Duration	Predecessors
1	▶ Ordre de service de démarrage	15/03/2016	13/10/2016	212 days	
12	▲ CDR	08/08/2016	31/10/2017	449 days	
13	Bâtiment de dépannage	08/08/2016	09/05/2017	274 days	3FS+60 days
14	Bâtiment d'exploitation sans finition Ext.	08/08/2016	20/08/2017	377 days	3FS+60 days
15	Bâtiment de remisage sans finition Ext.	19/02/2017	18/08/2017	180 days	3FS+255 days
16	PVF y compris revêtement - Zone remisage	06/11/2016	19/02/2017	105 days	3FS+150 days
17	PVF y compris revêtement - Zone extérieur	06/11/2016	04/07/2017	240 days	3FS+150 days
18	NRJ	03/09/2016	29/08/2017	360 days	4FS+60 days
19	LAC	07/11/2016	28/08/2017	294 days	4FS+125 days
20	SIG	15/05/2017	21/08/2017	98 days	7FS+290 days
21	RMS	15/06/2017	14/08/2017	60 days	10FS+251 days
22	Equip. Cfa	07/07/2017	05/10/2017	90 days	10FS+273 days
23	GTC	05/10/2017	31/10/2017	26 days	10FS+363 days
24	▲ Extension Ligne 1	21/06/2016	23/05/2018	701 days	

Figure 8 Storage building subprojects on Ms Project.

The first column contains the names of the subprojects in the CDR part, the second contains the starting day of the project that is linked to the predecessors (column 5) which are the dates of the administrative order. For instance, in the 20<sup>th</sup> row, the starting date of the SIG project (signaling project), is linked to the finishing date of the administrative order that happens to be in the 7<sup>th</sup> row + 290 days, which explains the “7FS+290 days” in the predecessors column.

The duration column is a link between the starting and the finishing date of each subproject.

- The third and the fourth ones contain the different task of the extension for line T1 and the new line T2, that will look similarly like this :



▲ Extension Ligne 1	21/06/2016	23/05/2018	701 days	
Fondation de voie, multi et massifs LAC	21/06/2016	17/04/2017	300 days	2FS+60 days
Voie ferrée y compris revêtement	21/06/2016	01/06/2017	345 days	2FS+60 days
NRJ	03/09/2016	29/08/2017	360 days	4FS+60 days
LAC	25/12/2016	30/08/2017	248 days	4FS+173 days
SIG	26/03/2017	21/08/2017	148 days	7FS+240 days
Mobiliers de stations	10/04/2017	25/05/2017	45 days	5FS+270 days
SLT	05/01/2017	12/03/2017	66 days	8FS+136 days
SAEIV	13/10/2017	22/04/2018	191 days	9FS+371 days
RMS	15/06/2017	14/08/2017	60 days	10FS+251 days
Equip. Cfa	08/01/2018	08/03/2018	59 days	10FS+458 days
GTC	08/03/2018	09/04/2018	32 days	10FS+517 days
Billettique	16/05/2018	23/05/2018	7 days	11FS+580 days

Figure 9: The different subproject on Line T1 of the tramway (Microsoft Project).

Similarly to CDR part, both line T2 and extension line T1 are characterized by the starting date, the finishing date, the period between the starting and the finishing date, and finally a predecessor that links the finishing date of the administrative order and the starting date of the task or subproject. (See Appendix 1)

- The fifth part contains the dates of the built of the CDM which is an abbreviation of “Centre de Maintenance” in French, which refers to the maintenance center. As the name shows it, it refers to the place where the tramway cars get the needed maintenance.

49	▲ CDM	27/10/2016	14/06/2018	595 days	
50	Bâtiment de maintenance Sans finition Ext.	27/10/2016	23/08/2017	300 days	6FS+90 days
51	Bâtiment station de service sans finition Ext.	27/10/2016	24/07/2017	270 days	6FS+90 days
52	Bâtiment de remisage sans finition Ext.	27/10/2016	22/09/2017	330 days	6FS+90 days
53	PVF y compris revêtement - Zone Accès	26/12/2016	25/04/2017	120 days	6FS+150 days
54	PVF y compris revêtement - Zone Peigne	24/02/2017	22/10/2017	240 days	6FS+210 days
55	PVF y compris revêtement - Remisage	22/09/2017	20/01/2018	120 days	6FS+420 days
56	PVF y compris revêtement - Station de service	23/08/2017	21/12/2017	120 days	6FS+390 days
57	NRJ	30/12/2016	06/02/2018	403 days	4FS+161 days
58	LAC	18/01/2017	13/04/2018	450 days	4FS+180 days
59	SIG	01/09/2017	31/01/2018	152 days	7FS+399 days
60	RMS	21/12/2017	05/04/2018	105 days	10FS+440 days
61	Equip. Cfa	29/01/2018	30/04/2018	91 days	10FS+479 days
62	GTC	30/04/2018	14/06/2018	45 days	10FS+570 days

Figure 10: Microsoft Project platform for the CDM part.

As a result the new Gantt chart will look like:

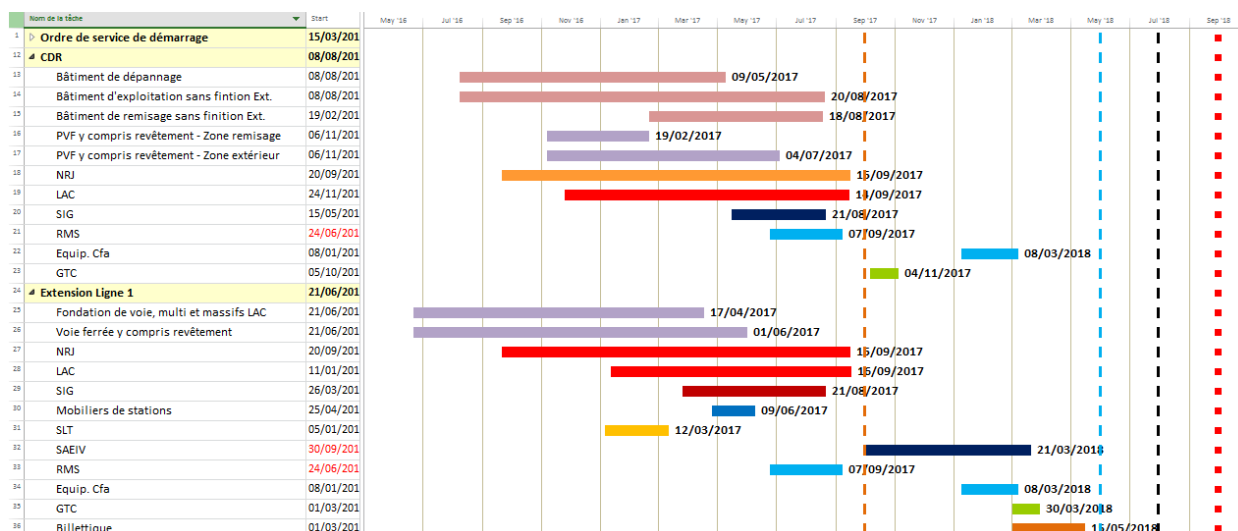


Figure 11: Gantt chart of the final Critical pathway platform.

This platform looked very helpful and easy to read so working with it would be much easier. In which there are clearly some deadlines, as mentioned before, that shouldn't be exceeded. Secondly, it is a platform that shows the most detailed information about each different section. For instance, for Section 1 PK from 0 Km to 1 355 KM from Sector 2 of Line T2, the details will be displayed this way:

46	▲ Secteur 2	11/02/2016	30/05/2018	839 days	
47	▲ S1: PK0+000 au PK1+355	11/02/2016	23/11/2017	651 days	
48	Fondation de voie, multitubulaire et massifs LAC	18/05/2016	26/02/2017	284 days	2FS+26 days
49	Travaux de voie ferrée y compris	18/05/2016	16/06/2017	394 days	2FS+26 days
50	▲ NRJ	26/02/2017	23/11/2017	270 days	
51	▲ SSR2-17	26/02/2017	23/11/2017	270 days	
52	GC	26/02/2017	24/09/2017	210 days	4FS+236 days
53	Equipements	26/02/2017	25/09/2017	211 days	4FS+236 days
54	Mise en tesion	26/02/2017	23/11/2017	270 days	4FS+236 days
55	▲ LAC	25/11/2016	03/09/2017	282 days	
56	Matage	25/11/2016	24/04/2017	150 days	4FS+143 days
57	Armement	25/11/2016	03/09/2017	282 days	4FS+143 days
58	▲ Mobilier de stations	24/02/2017	10/04/2017	45 days	
59	Mobiliers de station S2-24	24/02/2017	10/04/2017	45 days	7FS+146 days
60	Mobiliers de station S2-25	24/02/2017	10/04/2017	45 days	7FS+146 days
61	SLT	11/02/2016	12/02/2016	1 day	
62	Equip. Cfa	11/02/2016	12/02/2016	1 day	
63	Epu	11/02/2016	12/02/2016	1 day	
64	Infa	11/02/2016	12/02/2016	1 day	

Figure 12: Section 1 from sector 2.

### The Final Platform:

After the previous temptations to get the right critical path that can show us the progress of the work for this project, the Gantt chart (Figure 24) resulted can be easily read and can provide all the information needed. In this platform the tasks are related and any change of any information will automatically change all the information of the related tasks thanks to the critical pathway that resulted from the tasks deadlines.

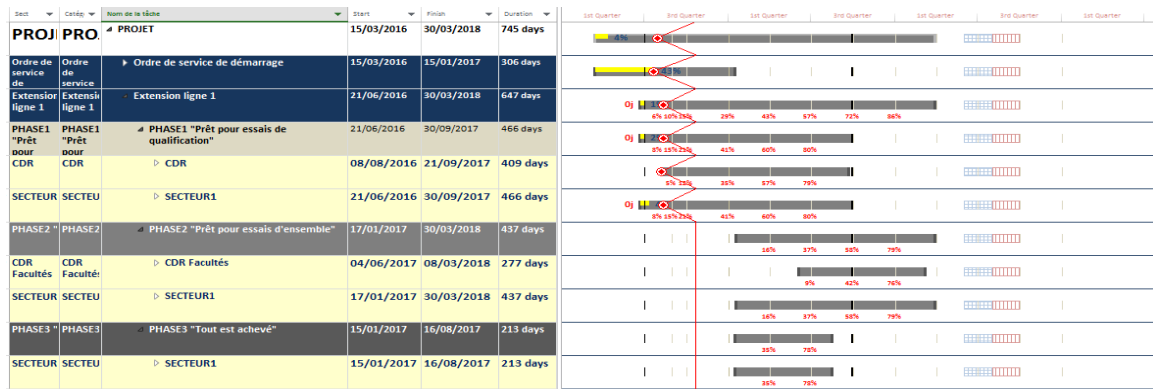


Figure 13: The final Gantt chart of the critical path for the Tramway project.

Name	Appearance	Show For ... Tasks
Tâche		Normal;Active;Not Critical;Not Manually
Fractionnement		Normal;Split;Active;Not Critical;Not Manu
Jalon		Milestone;Active;Not Group By Summary
Récapitulative		Summary;Active;Not Manually Scheduled
Récapitulatif du projet		Project Summary
*Regrouper par en-tête		Group By Summary
Échéance		
Critique		Normal;Critical;Active;Not Placeholder
Fractionnement critique		Normal;Critical;Split;Active;Not Placeholder
Avancement		
Manual Progress		Normal;Manually Scheduled
Essais Ensemble		
Marche à blanc		

Figure 14: The key to the symbols in the final Gantt chart

### Conclusion:

The keys factor of the developpement of the project management field can be related to the method of planning and scheduling tasks. That's why there is a need of continuous development in terms of the planing tools.

### References:

- [https://books.google.co.ma/books?hl=fr&lr=&id=ZOG2mr6qJ\\_sC&oi=fnd&pg=PR9&dq=project+management+tools&ots=bLWiVjGjAT&sig=bVS-K4atFpxO1uvsmCrLR81x4IA&redir\\_esc=y#v=onepage&q&f=true](https://books.google.co.ma/books?hl=fr&lr=&id=ZOG2mr6qJ_sC&oi=fnd&pg=PR9&dq=project+management+tools&ots=bLWiVjGjAT&sig=bVS-K4atFpxO1uvsmCrLR81x4IA&redir_esc=y#v=onepage&q&f=true)
- [https://books.google.co.ma/books?hl=fr&lr=&id=rUOrTNgNI7oC&oi=fnd&pg=PR29&dq=microsoft+project&ots=69eIfubE6t&sig=82Ecmr9E5bqy4y6bDLpJnA58HvE&redir\\_esc=y#v=onepage&q&f=false](https://books.google.co.ma/books?hl=fr&lr=&id=rUOrTNgNI7oC&oi=fnd&pg=PR29&dq=microsoft+project&ots=69eIfubE6t&sig=82Ecmr9E5bqy4y6bDLpJnA58HvE&redir_esc=y#v=onepage&q&f=false)
- <http://eds.a.ebscohost.com/eds/pdfviewer/pdfviewer?sid=feaea816-0284-4ad7-b906-b2a58708441e%40sessionmgr4006&vid=0&hid=4208>
- <http://eds.b.ebscohost.com/eds/pdfviewer/pdfviewer?sid=30fc292f-0832-4ef6-950a-263e864bcf42%40sessionmgr104&vid=0&hid=119>
- <http://eds.b.ebscohost.com/eds/pdfviewer/pdfviewer?sid=14a3e133-538c-4ca7-946d-a10646f672c5%40sessionmgr101&vid=0&hid=119>