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PROJECT MANAGEMENT MONITORING AND INFORMATION SYSTEMS

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INTRODUCTION:

A project management information system (PMIS solution) is a way to organize how a project manager gives and receives project information and data over the course of a project. In other words, it's a centralized storage hub for all essential project information. Nowadays, developers have created Modern, cloud-based PMIS software that can store and process documents, links, notifications, emails, designs, written content, team messages, lines of code, and other project-based information and distribute those automatically and without mistakes.

In our work, we will go through the monitoring and information systems used in project Management step by step;

- Describing the PMIS,
- Defining the Monitor System designs,
- Demonstrating the data collection processes,
- Showing different project reports
- Demonstrating the EVC
- Presenting the types of software put in place to be used in different Projects

We will base the examples on several packaging projects that we came across in the past few years we have worked in the industry.

I) DESCRIPTION OF PMIS

a) Monitoring and Information Systems

Monitoring is the collecting, recording, and reporting of information concerning The writing is clear and informative, but it could benefit from a more engaging tone to capture the reader's interest. Additionally, it would be helpful to include examples or case studies to illustrate the benefits of using a PMIS solution. Finally, a section on potential challenges and how to overcome them could be added to provide a more comprehensive understanding of the topic on any aspects of project performance that the project manager wishes or ought to know.

The processes consist of evaluating and controlling projects, however, in this case, the evaluation and the control of projects' fundamental approaches are different, if not on the opposite sides, from the ones of project selection and planning.

Because the logic of selection dictates the components to be evaluated adding the fact that the details of the planning have to expose the elements to be controlled.

b) The Planning - Monitoring - Controlling Cycle

This cycle of project management involves observing the process after project implementation, identifying problems and risks, and deploying a mitigation strategy to control the new process. Here, the key points are the schedule, the budget, and the specifications.

It is essential for completing a project on time, on budget, and within the scope as monitoring and control processes identify deviations from the project plan and ensure that the performance within the project is seamless, efficient, and on track. Illustrated by Figure 1.



Figure 1: Planning, Monitoring, and controlling cycle

i. Planning

It is the initial part of the cycle and consists of defining the budget and the schedule of the project. It should be instigated in the early stages of the Project life cycle.

Its methods require a significantly greater investment of time and energy, which once set up considerably reduce the extent and cost of poor performance and time/cost overruns. Let's consider a Project to produce 100 000 Easter Boxes of *Les Miraculeux* in Packaging company X, with a value of €100,000 and maintain a 25% net margin on the Project, as the initial step of the PMC cycle, the PM should:

- **Brief receipt:** Document detailing all the requirements of the Easter box package
- Evaluate the design of the box
- **Quoting process:** Set of costs needed to drive the complete project in a financial document
- Establish a timeframe or schedule for the production of the package,
- Present the project to the Stakeholders or decision-makers of *Les Miraculeux*.

ii. Monitoring

This phase is about assessing what work has been completed in the project including, costs, risks, and issues. Here the PM needs to juggle several responsibilities, including keeping to the schedule, staying within budget, and managing Risk.

In the case of our Easter box packaging project, the monitoring phase consists of:

- **Easter box's business case:** Here the PM has to track the Project costs, Identify the outcome of the Project, Make sure the Project's deadline is aligned with the initial schedule, and define the different risks such as delays in raw material delivery, transportations delays, logistics unforeseen issues.
- **Project Plan:** Here the PM prepares a specification document (it confirms the Mockup of the box matches all the requirements and needs of *Les Miraculeux*) without it the Easter box project couldn't be implemented. Then he checks the Printing file along with the digital and physical Mock-up test approval.
- **Stage Plan:** Here the PM schedules the deadline for each stage of the Easter box's project. For example, if the Box has to be delivered in 6 weeks, the PM sets delivery of raw material to 1 week, treatment of the material to 3 days, printing and physical proofs to 1 day, tests of Printing machines to 1 day, and the production of the easter boxes in 1 week, quality control and conditioning to 1 week, transportation to 1 week. Leaving 1 week for risk and issues management in case they occur. Check that the design meets all technical printing and production standards
- **Project Initiation document:** Here the PM hands over the Production execution plan that illustrates the technical drawings of the box, the list of materials used for its production, and ink color codes to be printed on the box. This document will, later on, be handed over to the Production manager.
- **Work package:**

- **End Project Report:** Here the PM establishes a report for the C-level or board members to confirm the handover of the goods to *Les Miraculeux*. The report will assess the actual project performance compared to its initial dateline and most importantly if the net margin was initially set was respected.
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- **Post Project Review:** This step documents the feedback provided by the company *Les Miraculeux* on their Easter Box. It also documents the lessons learned on undertaking the project and the recommendations for improvements on future projects.

iii. Controlling

This phase usually relates to stages in given projects. Its stages are established to control the delivery of the project's outputs and outcomes and can be defined in Project management as either **event-driven**, meaning the control happens because a specific event has taken place; in this case, a project initiation document, or **time is driven** meaning regular process feedbacks such as checkpoint, highlight reporting or status meetings.

It also assists with the monitoring phase by the provision of required review points such as stage assessments. In the Easter Box's Project, the key program and project controls will be as follows:

- **Change Control Strategy:** The PM has to plan an alternative in case they face issues in the production of 100 000 boxes with the raw material needed to produce the entire quantity delivered in batches within 1 week between the deliveries, there's transportation delay, or production issues. To keep the PID and the margin on track
- **Highlight report:** the PM sets Bi-weekly meetings with Internal stakeholders to give an overview of how the project is ongoing and anticipate delays or risks before they hinder the entire project
- **Checkpoint Report:** The PM sets a Weekly status meeting with the Team members involved in the execution of the project to keep track of the ongoing stages of the project et in the stage plan
- **Project Issues and Risk Management log:** in this stage the PM enlists any unforeseen risks that can be a threat to the successful delivery of the 100 000 boxes on the dateline and matters that occurred in the Project and are brought to the attention of the project team, requiring an answer,

II) MONITOR SYSTEM DESIGN

Developing an efficient Monitoring system should cover these 4 majors areas:

1. Collect and manage the information: the information must be qualitative, quantitative, formal, and informal.
2. Enhance, and analyze the information: all the information gathered above must be analyzed with the individuals involved in the project.
3. Communicate: this stage of the system can also be referred to as feedback since the PM should be communicating the information to those who will be using it.
4. Help with strategy and operational management decisions.

Moreover, for a project to be monitored properly in an Organization, 2 types of systems should be considered. However the size and complexity of the monitoring system will depend on the project, the objective, and the monitoring's area of intervention, but also on the budget and the skills available within its team or its partners.

Therefore, we can define the following systems:

- **A system shared with the project key actors:** This agreement allows the project to draw on the knowledge of the various actors and helps prevent the feeling of control that can arise if the monitoring is misunderstood, which can sometimes lead to biased information. Therefore it is essential to have the agreement of the key actors and a shared understanding of the usefulness of the approach.

As a concrete example for this model, we will use the Project authorization and expenditure control system information flow. Source: Dean (1968), and apply it to our project example.

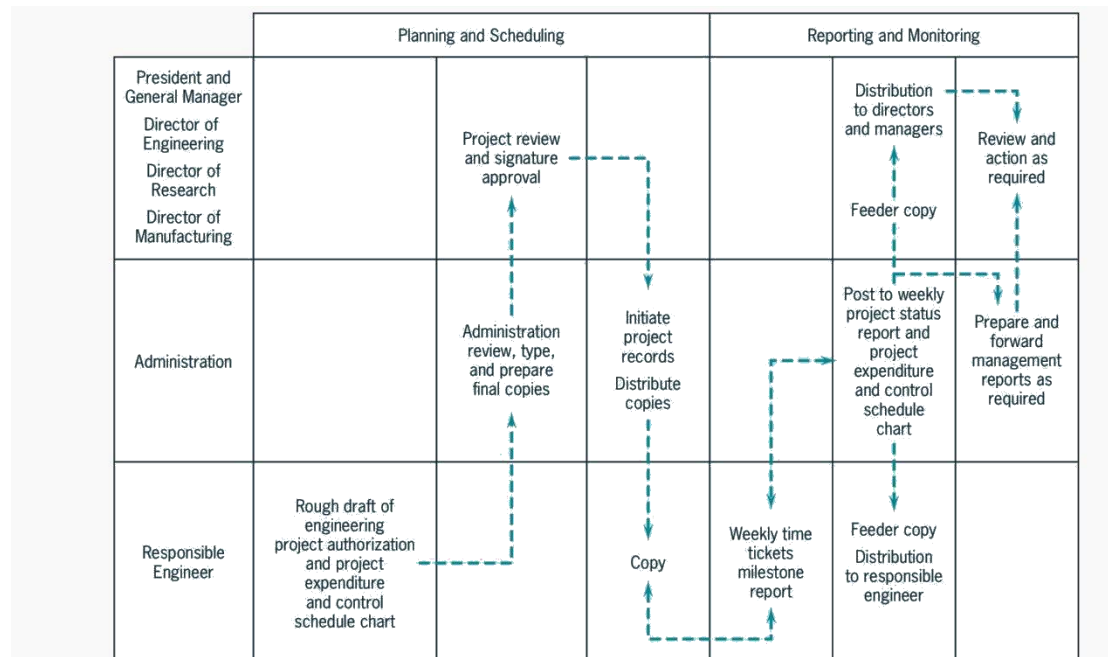


Figure 2: Information Flow for the Planning - Monitoring - Controlling Cycle, © 2006 John Wiley and Sons, Inc.

- **A system that is integrated with project management:** Here monitoring is a cross-cutting approach, which should be shared amongst a diverse group of actors, contributing to collecting, and analyzing data, to feed project strategic and operational management. The strategic Project Manager is in charge of monitoring the outcomes, coordination, partnerships, and the budget or funding within the project, whereas the Operational project manager will be monitoring the activities, the means, the planning, and the outputs of the projects.

The image below illustrated the system description and its comparison based on our sample project.

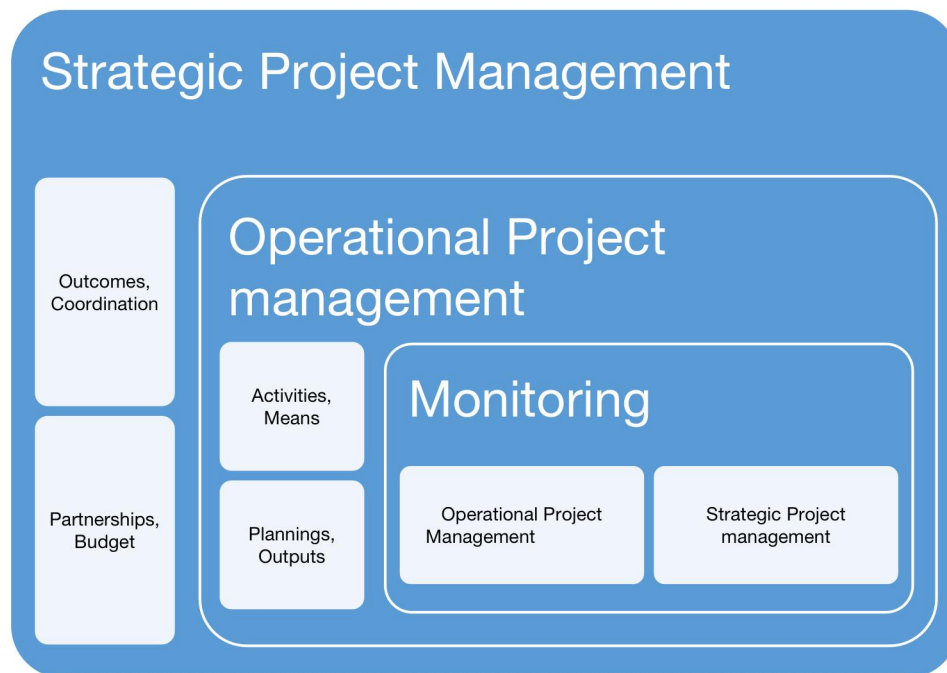


Figure 3: Planning, Monitoring, and controlling cycle

III) Data Collection

It is necessary to define precisely what pieces of information should be gathered and when a large proportion of all data collected take one of the following forms:

- Frequency counts
- Raw numbers
- Subjective numeric ratings
- Indicators
- Verbal measures

How to define all data:

To undergo proper data collection for a given project, we have to take into account the different challenges one shall encounter when following the steps below:

Type of data collected: here the focus should be on how detailed the data are collected. It is generally desirable to be as accurate as possible, but then there is a risk of not being able to interpret results that are too detailed or which require specialist knowledge to be interpreted.

Data collected by others: here the reliability of the data must be verified and it must relate to the target population for the period covered by the project. It is also important to make sure that the data provided by others can meet the information requirement of a project.

Skills required to manage the data: here the PM has to make sure that the team and/or the partners have the qualities needed to collect, process, or analyze the proposed data.

Accurate and reliable data collection method: this point is essential to determine the degree of error in terms of methods of measurement and the possibility of obtaining the same result each time the measurement is retaken, regardless of when or who measures it. The PM needs to go through it to define the anticipated method.

Combine supplementary methods: In this part, the methods chosen should complement one another, reduce the risk of bias and ensure triangulation.

In other words, the strengths of a selected method cover (at least partially) the weaknesses of another, and the various perspectives on the intervention are therefore taken into account.

Appropriate to the context: with this method, the PM makes sure that the project matches its real-time situation. Examples of contexts we can list are cultural (woman's abortion), and environmental (sustainability, biodegradable products).

Financial means required to organize other methods: In this step, the PM has to make sure that the Organization or the partners have enough resources to collect, process, or analyze the data; as he has to verify if the costs of implementing the method once covered will result on the expected benefits.

Beneficiaries involved with the monitoring: Here the PM has to determine to what extent the methods he is using will allow all parties involved to monitor the project.

After the data collection has been completed, progress reports should be generated. These reports include project status reports, time/cost reports, and variance reports. Causes and effects should be identified and trends noted. Plans, charts, and tables should be updated on a timely basis.

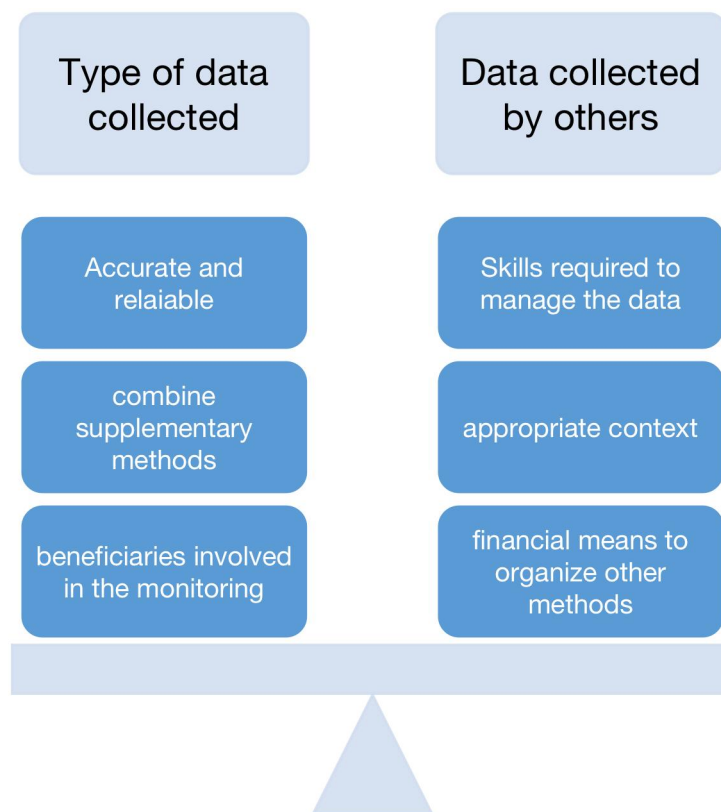


Figure 4: Definition of Data Collection

IV) Reporting:

Reporting in project management simply refers to providing a high-level overview that offers the critical data the project generates in a simple, easy-to-use format.

This step in the monitoring system is essential to the success of the project since it provides an open view into what's happening and what to do about it for the entire team. Without adequate reporting, the project team and project stakeholders will end up being in the dark, unable to put their finger on what's going on with the project. And as a result, it's all too easy for the project to fail, simply because the right insights aren't getting through and therefore, appropriate decisions aren't being taken.

Overall, project management reports are important because of it:

- Shows the project team what they are working, so they can explain why it's working and focus more on it.
- Uncovers what's not working so the team can investigate and determine an appropriate course of action i.e. what to do about it with the help of the project dashboard.
- Gives the team a 360°overview of how the project is doing so they can determine what steps to take next

1) The different types of project management reports

a) Project status report

It is a report that shows stakeholders a general overview of how well the project is advancing toward its targets. It can be thought of as a general update that's designed to keep stakeholders or project progress, emerging issues, and key points to note, all at a glance.

b) Project health report

They are designed to update stakeholders on whether the project is either advancing as projected, in danger of stagnating, or completely stagnated. And make it easy to identify when something's wrong so the team can identify what and get it out of the way.

The project health report answers the following questions:

- Are we on track to deliver this project on target? Have we stagnated?
- How far off are we from the target?
- What needs the most attention to get us back on track?

c) Team availability reports

It functions like a team calendar that shows every team member's schedule so it's easy to see who's occupied and when they are busy. This way, stakeholders who are planning for a project requiring input anywhere can see which team members can be assigned, those who can safely take on more work, as well as those who are at full capacity and might need assistance.

They are mostly needed because they make the visualization easy considering how much everyone has on their plates so work can be more evenly distributed to achieve

faster results, higher efficiency, and most importantly, prevent project burnout between teams. Moreover, it plots staff names against calendar days, with either a color tone or a written designation showing their workload for each calendar day.

2) How to create effective reporting:

Effective reporting is gathering the best methods that'll help you establish reports that enable project stakeholders to make informed decisions. To offer all the information generated from the projects in a simple format for stakeholders to understand and apply those insights.

We have listed the methods below:

- **Maintain data at the center of the report:** Reports must present solid data that stakeholders can look at and get an idea of the big picture.
- **Illustrate the data:** for a good report, we have to Apply as many images, charts, and graphs as possible, wherever appropriate to fully illustrate the implications of whatever data you present with the help of visuals provided by the tool the PM is using to track the project.
- **Leave room for constructive communication:** the reports shouldn't be documentation that spits out data and get over with it. It rather should try to explain the data and its implications while inviting further questions. By proceeding this way, the PM ensures collaboration on the project between stakeholders, who are on the same page and get a full picture of what you're trying to convey.

V) EARNED VALUE CHARTS (EVC)

Commonly called Earned Value Analysis, it is a method that allows the project manager to measure the amount of work performed on a project beyond the basic review of cost and schedule reports. It provides a method that permits the project to be measured by the progress achieved.

Then the project manager is able, using the progress measured, to forecast a project's total cost and date of completion, based on trend analysis or application of the project's "burn rate". This method relies on the project's earned value, known as a key measure in project management.

Unlike traditional management, in the Earned Value Method, there are three data sources:

Planned value (PV);

Actual value (AV); and

The earned value of the concrete work already completed.

To establish the earned value chart, the PM has to go through these 8 steps effectively. For small projects, establishing the EVC takes five minutes once the PM learns how to do it.

- **Settle the Percentage of Completion:** here the Project manager has to determine the percentage completed of each task needs to be determined. Once correctly done, it brings the workload down to reasonable levels and prevents abuse when project team members exaggerate. For example, they might tell a task is 80% complete when in reality it is completed at 50%.

- **Settle the Planned Value (PV):** also known as Budgeted Cost of Work Scheduled, the PV is defined as the amount of the task that is supposed to have been completed. Moneywise, it is a portion of the task's budget.

For example, let's go back to our packaging project to select the task of ordering the raw material for the production of easter boxes and say that:

The task budget is €100,000,

The task start date is March 1st, and

The task finish date is March 10th.

If it's January 6 today, the task is supposed to be 60% complete.

Therefore, **PV = \$100,000 x 60% = €60,000.**

- **Settle the Earned Value:** known as Budgeted Cost of Work Performed, the EV is the amount of the task that is completed. It is, again, in monetary terms a portion of the task budget.

If we use the same example task from the PV:

The task budget is €100,000, (same as above)

The task start date is March 1st, and (same as above)

The task finish date is March 10th. (same as above)

And find out the actual percent completion of the task (step PV) is 40%, then

$$EV = €100,000 \times 40\% = €40,000.$$

- **Achieve the Actual Cost:** also known as the Actual Cost of Work Performed (ACWP), the AC is the actual cost of the work. Since most projects have these well-defined via accounting or project management software, we will not go into great detail here.

For our example project let's assume the actual cost of the example task is **€35,000**.

After this step, the information-gathering phase is complete.

The following calculations represent the application of the earned value analysis to keep your project on schedule and budget.

- **Count the Schedule Variance:** The Schedule Variance represents the schedule status of the project. It is obtained by deducting the Planned Value from the Earned Value. We illustrated the formula below as a reference.

$$SV = EV - PV$$

If we refer to our above examples the schedule variance is:

$$SV = €40,000 - €60,000 = -€20,000.$$

A negative schedule variance means the task is behind schedule whereas a positive schedule variance means it is ahead of schedule.

- **Count the Cost Variance:** The Cost Variance represents the cost status of the project. It is obtained by deducting from the Earned value the actual costs. We have placed the formula below for reference.

$$CV = EV - AC$$

Based on our above example the cost variance is $CV = €40,000 - €35,000 = €10,000$.

A positive cost variance means it is under budget whereas a negative cost variance means the task is over budget.

- **Count the Other Status Indicators:** Although the SV and CV are the minimum requirements and work well for small projects, other variables are derived from them which the Project Manager might want to calculate. Such as follows.

➤ **Schedule Performance Index (SPI):** expressed in percentage terms, it represented the value of the project's completion according to its schedule. And is obtained by dividing the Earned value by the Planned value, as illustrated by the formula.

$$SPI = EV / PV$$

Based on our example, if the $SPI = €40,000/€60,000 = 0.67$, it means the project is **33% behind schedule**.

➤ **Cost Performance Index (CPI):** Also expressed in percentage terms, the CPI is obtained by dividing the Earned value by the Actual cost of the project, as

illustrated in the formula below.

$CPI = EV / AC$

In our example project, if $CPI = €40,000/€35,000 = 1.14$ means the project is 14% under budget, meaning we need to find 14% of value to reach the budget. In case we would have obtained a percentage of 0,9 then it would have meant that the project is 10% over budget.

- **Estimate at Completion (EAC):** it represents the expected budget at the end of the project given the variances that have already taken place. And it is obtained by adding to the Actual costs, the value resulting from deducting the Earned value from the Budget at completion. There are various ways to assume this value, but assuming that the past variances are likely to persist, we can use the formula below to determine its value.

$EAC = AC + BAC - EV$

In our case study, the BAC was set as € 100,000€ then the $EAC = €35,000 + (€ 100,000 - €40,000) = €95,000$.

- **Estimate to Complete (ETC):** it represents the expected cost to finish the rest of the project; we can calculate it by deducting the actual costs of the project from the Estimate value at completion. Shown as listed below.

$ETC = EAC - AC$

In our project's example, the $ETC = €95,000 - €35,000 = €60.000$

- **To Complete Performance Index (TCPI):** it is the required CPI necessary to finish the project right on budget. It is obtained by dividing the value 1 resulting from the deduction of the EV in the BAC; with value 2 resulting from the deduction of AC in the BAC. As shown in the formula below.

$TCPI = (BAC - EV) / (BAC - AC)$

In our case study, the $TCPI = (€100,000 - €40,000)/(€100,000 - €35,000) = 0,92$.

It means the project is overperforming by 8%, then everything is on track. On the other, if we might have obtained a value of 1,25 it would have meant that we need to find 25% efficiencies to finish the project on budget.

- **Compile the Results:** This step represents the total variance of the project and can be reported to management, clients, and stakeholders.

Here, the results are as instantaneous as the input data, that is, in our case study, if we input the percent complete as of right now the status reported will be as of right now as well.

- **Interpreting the Results:**

The calculations of the SV and the CV already give the basic indicator of the project

progress.

The amount of the variance can be compared to the project's budget to see how concerning it is. For example, a variance of €100 on a €10,000 project is not that concerning but a €1,000 variance might need some attention.

If we obtain a negative value, it indicates an undesirable situation such as described below.

- If the schedule variance (SV) is negative, you are behind schedule.
- If the cost variance (CV) is negative, you are over budget.

In our case study, the schedule variance was -€20,000 and the cost variance was €10,000. This means that the project is behind schedule, but it is being performed efficiently and is cost-positive.

Good project control often means that the instantaneous project status snapshot is not as important as the trend the indicators are making over time. If we refer to our case study, if the SV has been increasing, then maybe our project will finish on time even though it's behind schedule today.

Moreover, It is a well-understood concept that if a project falls behind its schedule early, it will tend to continue falling further behind throughout its entire life.

The Earned Value Chart will alert all parties involved in the project if they are even one hour behind and allow them to take the necessary remedial action. The value of this in producing successful projects is almost unequalized.

VI) SOFTWARES:

Choosing the right software is imperative because it can either hinder or facilitate every part of a business. The first step is defining the problem by asking ourselves a series of questions that will help an organization in selecting the appropriate software, such as:

Does the current system meet the organization's needs?

Should they need improvements or a complete overhaul of the system?

Do they need a customizable system?

Will the new system integrate with the existing infrastructure?

Will there be a need to train end users, and if so, what will the training cost be?

The project Manager should also take into consideration, the Characteristics of generally desirable attributes in project management software, to select the most appropriate software. Such as listed below:

- Friendliness
- Schedules
- Calendars
- Budgets
- Reports
- Graphics
- Charts
- Migration

After asking some of these questions, the next step is investigating whether their preferred project management software works with the methods currently used by the organization; and determining all end users.

Meaning if the software will be used by project managers only, there's no need to implement an overly complicated system. On the other hand, if the end users include customers and other external stakeholders, you should choose software with an intuitive and simple-to-use interface.

We identified throughout our research four main types of project management software such as: individual, collaborative, integrated, and cloud-based. And we are going to investigate which are best to use under different circumstances.

Individual Software: This type of project management software uses one application, such as spreadsheets, to manage all the processes within an organization. Here, the project manager can install the software throughout the organization and give users access only to what's important to them. As an example, we can list Asana, and Trello (image below for reference)

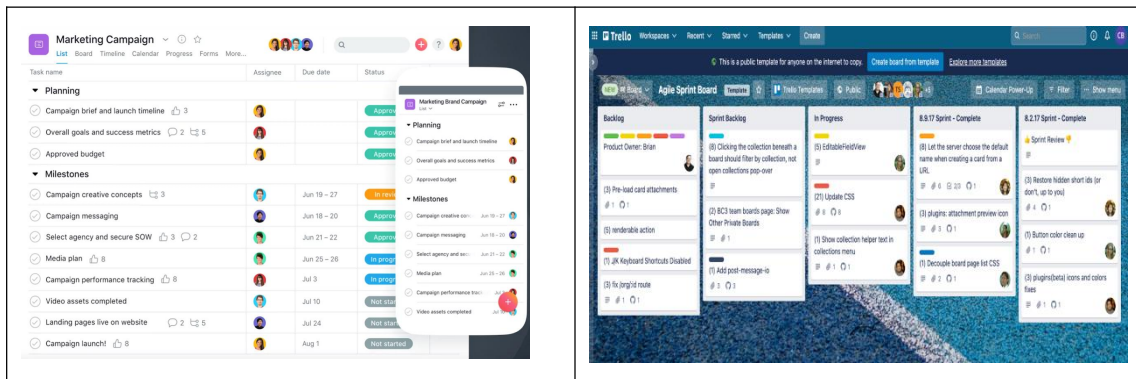


Figure 5: Example of Individual Software

Collaborative Software: This software works by bringing stakeholders on board and stored data can then be accessed and manipulated by anyone with access. One of the advantages of this software is that it's highly customizable to reduce conflict.

However, collaborative project management software may not be suitable for organizations that need access to data concurrently, as it struggles to process data simultaneously.

For example, we can list: Smartsheets and teamwork.com

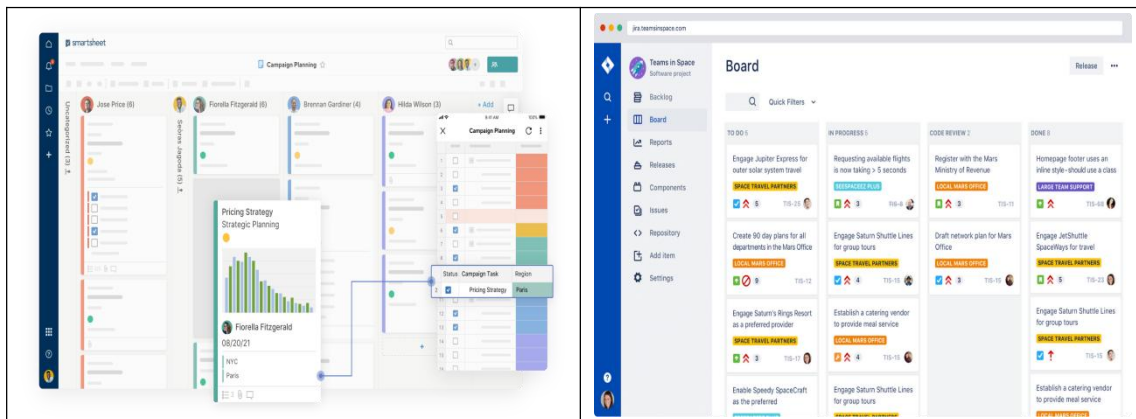


Figure 6: Example of Collaborative software

Integrated Software: This type of software solves the problem faced by collaborative software, executing different projects concurrently. It's possible in integrated software to create different users with different access codes, preventing data from landing in the wrong hands and promoting accountability.

The data in this type of environment is fed into a mainframe, allowing different users to access data simultaneously. Moreover, data and information are integrated and can be accessed from a central dashboard, making it easy to analyze data.

An example of an integrated package is Microsoft Project (image below for reference)

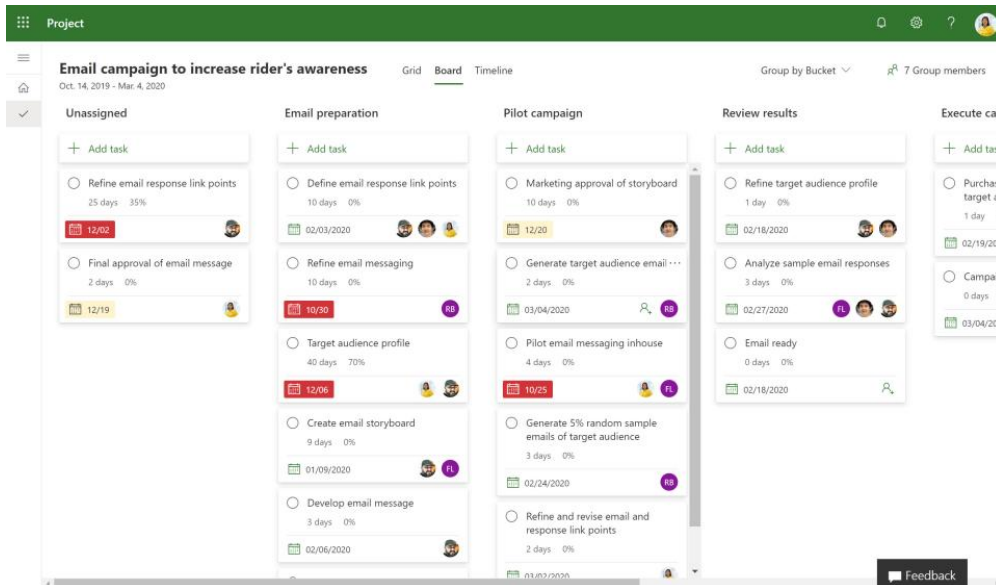


Figure 7: Example of Integrated software

Cloud-Based Software: This software is a management app that is hosted in the cloud. One of the benefits of this structure is that it enables access to data from anywhere there is internet access. Cloud-based Softwares also have other benefits, such as providing the ability to customize based on your individual needs. For example, we have the Project Manager app and Wrike.

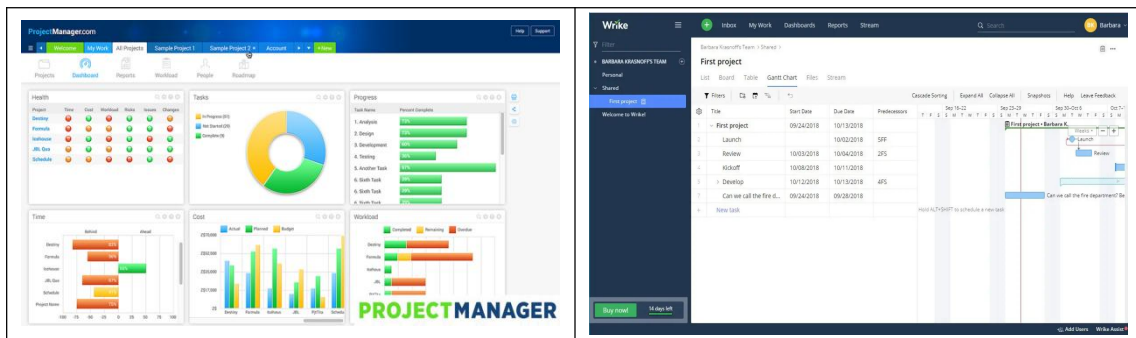


Figure 8: Example of Cloud-based software

In our case example, we have selected Asana as the software for the Project as in our case, we can predefine tasks and split them as per each team project's role. Stakeholders can follow up on the project and check if it is on track according to the schedule and the BAC.

CONCLUSION:

Coming to and of our essay on the Monitoring and information systems in project management, we, first of all, described what Monitoring and information systems are, by defining its systems and explaining the concept of a closed-loop system, then we showed how the systems are designed and defined how data are collected during a project and showed different ways in which the projects are reported. Moreover, we explained how to calculate, read and analyze the Earned value charts and what type of software can be used according to each specific type of project, along with the specificities of each type of software.

Throughout our research, we came to know that, even if the guidelines have the same names, they differ in their implementation according to each domain and each organization that intends to manage its projects according to their specific needs. thus our study relating essentially to the management of the projects of company X in the field of packaging was established to understand how the monitoring and information system is carried out for a project of production boxes of 100,000 boxes Easter for their client Les Miraculeux.

In summary, we can say that Monitoring an information system toward established performance, schedule, and cost targets requires more than designing a system and putting a plan in place. It requires the total commitment of the performing organization with constant communication of the project team involved; even if, the communication can be complicated by the tension that often exists between technical people and commercial people involved in the project. Plus the involvement and help of the customer.

And Since daily and regular communication is necessary for the management of a project, it would be more ingenious to establish a communication subsystem and integrate it into the monitoring and information system. doing so would increase the likelihood of completing any projects initiated in an organization. and would grant the Project itself autonomy allowing the Project manager to better anticipate unforeseen events and correct them before they escalate.

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