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Bridging the Gantt
Integrating Project Management
and Task Management

GIAC (GCPM) Gold Certification

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Abstract

The Gantt chart is a time-tested tool that enables Project Managers to visualize work elements, resources and dependencies. Personal task management techniques focus on enabling individuals to understand what action they need to do next to accomplish larger goals. The gap between these processes is well recognized and this paper proposes methods for bringing the two closer together; helping Project Managers translate their macro-level plans into action.

1. Introduction

To Project Management (PM) novices, the Gantt chart is often seen as the central tool of the project management process. The chart's creation and maintenance often becomes the focal point of effort for the project staff. "Feeding the beast" with near-constant updates has potential to overrun resources, in particular as a Gantt chart grows to include ever-deeper levels of detail. The responsibility for its maintenance may be devolved to middle management or to the employees who should be focused on doing project work. The return on investment of this time management tool quickly drops off as it becomes increasingly burdensome.

This scenario poses a particular risk in small and medium-sized organizations that do not have dedicated PM staffs. Managers, responsible for their assigned operations and personnel, and also burdened with delivering projects may not realize the full benefits of time management tools as they bridge the responsibilities of a Project Manager and functional manager. Ultimately, they need to strike a balance between time spent managing and time spent doing.

1.1. Scope and Limitations

This paper will examine the current doctrine of Project Time Management and assess the effectiveness of its most popular tool, the Gantt chart. It will also outline Task Management techniques and goals, and propose efficiencies to be gained in drawing clearer linkages between these two processes.

It will explore this nexus, proposing a simplified workflow with available tools. It will seek to enable a mutually beneficial existence of these processes, in a manner that promotes Projects Managers' goals and the operational effectiveness of 'tactical-level' employees with as little unnecessary overhead as possible. It's important to consider this question in some context; the key to Project success does not reside exclusively in with time management visualization and associated processes. The project manager's fundamental skill is effective communications with his team and project stakeholders. This paper will show how better time management processes and technology can aid a project manager in ensuring an effective and open communication, up and down the chain.

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2. Project Time Management

Time management is a critical PM process, vital to delivering projects “On time, on budget”.

More often than not however, projects deliver late. According to McKinsey & Company research, the average tech project is 7% late (Bloch et al, 2012). Time overruns alone are identified as the primary cause of 11% of overall project failures. In recent years, the popularization of myriad PM software tools such as Microsoft Project and Primavera has likely contributed to the misconceptions that good time management equals a robust Gantt chart. When personnel untrained in PM are asked what comes to mind at the term "Project Management" the image is often that of a Gantt chart.

2.1. The Gantt Chart in Project Management

Henry Gantt developed the Gantt chart over a hundred years ago and popularized it for project management shortly thereafter (Gcek, 2008). At the time, the concept was considered revolutionary in the field of management. It was conceived to illustrate a project schedule, highlighting a number of variables including: (Wikipedia, 2013)

- Name of each activity
- Start and Finish dates
- Dependencies/precedence
- Percentage complete

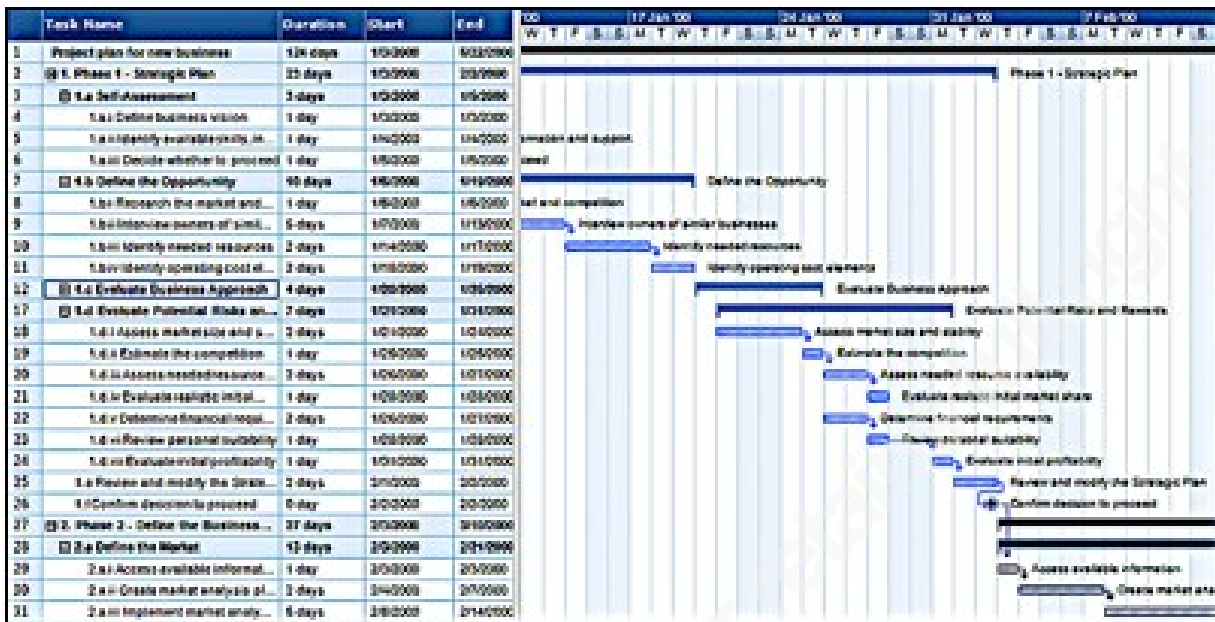


Figure 1 - Gantt chart (Matchware, 2013)

With the advent of accessible computing and simplified software in the 1980s, the use of Gantt charts exploded and it has provided real benefit to managers' abilities to outline, organize, plan and execute projects. The visualization of project schedules allows managers to easily analyze dependencies and resource bottlenecks in their projects.

3. A Critical look at the Gantt chart

At its most fundamental level, the Gantt chart shows the relationship between work elements over a time span. They are used most extensively for production planning, scheduling and control (Ghosh, 2013).

3.1. Benefits

Like any tool, the Gantt chart is used and misused in any number of ways. The goals of its user will define its effectiveness for a given task. It does, however offer a number of positive advantages to a manager faced with complex projects: (Answers, 2013).

- Clarity - The Gantt can help visualize complexities of a plan. Humans are great at analyzing visual data, and a Gantt can help highlight areas of slack space in the schedule, critical dependencies and unexploited opportunities for concurrent activity.

- **Communication** - A clear chart that represents multiple tasks, stakeholders and dependencies can be an effective communications tool to provide situational awareness both to senior management and to project stakeholders. Teams can gain a quick appreciation of their own progress with respect to other teams, with whom they might not interact with on a regular basis.
- **Coordination** - Gantt charts provide a glimpse of time and resource scheduling at the macro level, allowing project managers and team leaders to collaborate on sequencing and conflict resolution.
- **Flexibility** - This attribute may be a double-edged sword (as we'll see later). The flexibility offered by software-generated Gantt charts can enable rapid high-level impact assessments (i.e. what happens to my critical path if this work element slips by 2 weeks).
- **Accountability** - By placing tasks in a simple to understand format and clearly linking interdependencies, team leaders can be made accountable for impacts their team's performance has on others.

3.2. Drawbacks

Before critiquing the Gantt chart, it is worth noting again that it was designed for a particular purpose. Much criticism stems from the evolution of its use, or shortfalls in domains for which it was never intended. Gantt charts illustrate a key truism of any visualization: "Every notation highlights some kinds of information at the expense of obscuring other kinds" (Green & Petre, 1984). In effect, highlighting some aspects of a dataset will necessarily obscure others. That said, there are a significant number of drawbacks to the Gantt:

3.2.1. Visual/Analytical Ineffectiveness

- Most Gantt charts are "analytically thin, too simple, and lack substantive detail" (Tufte, 2013). project managers must apply substantial analysis to get value; the axiomatic "garbage in/garbage out" applies.

- Gantt charts don't scale well in the vertical axis. As a project manager, you may manipulate the chart by collapsing sub-tasks into larger components but as a viewer, when a chart begins to exceed the page/screen it's viewed/printed on it becomes difficult to grasp and loses the very context it is designed to give (Bowen, 2013).

3.2.2. Inflexibility

- Gantt charts can be inflexible when used for planning. They force managers to complete all time/resource estimates for project activities up front. Significant effort needs to first be applied to developing a detailed WBS before those tasks are laid out in a Gantt, lest a major item be missed, leading to significant changes to the schedule later once resources have already been committed. WBS decomposition and the subsequent Gantt need to follow the 100% rule, which states that the sum of the work at the "child" level must equal 100% of the work represented by the "parent". (Bowen, 2013). This can be challenging as the project manager and stakeholders may not always know what is required of a task (particularly in 'knowledge work' fields)
- Gantt charts don't really deal with sub-WBS activity tasks, and if leveraged into this space, quickly balloon in size and management overhead (Thaxter, 2013).
- Detail tends to trail off when planning far out: often not enough is known about the WBS elements and their required effort. This lessening of detail over the timeline may lead to false analysis of total project delivery times and poor scheduling decisions.
- Gantt charts are rigid and demand inflexible start and finish dates. It is well understood that change will occur, and that managers need to respond quickly and appropriately. Tools which add significant overhead to this decision making process often give way to more flexible ones like spreadsheets and to-do lists, which can be customized in a moment to suit the need (Gupta, 2013).

3.2.3. Resource intensiveness

- Constant ‘care-and feeding’ is required by the project manager to keep the chart up to date.

The effort is proportional to number of tasks and amount of detail included; the more detailed the plan, the more work will be required to keep it up to date (Ghosh, 2013).

3.2.4. Contextual Concerns

While traditional time management practices are flexible enough to be applied to a wide breadth of projects, they are rooted in an industrial age mentality (Booker, 2007). There is significant emphasis on in-depth upfront planning rather than incremental, iterative or collaborative planning. Knowledge-based projects, in particular, require a degree of flexibility in their time management, which may not be necessary in more traditional ‘widget-making’ projects. The type of problem-solving involved in knowledge work can prove very difficult to characterize in an upfront planning process; how can a PM (or even a contributing stakeholder) know with any certainty how long it will take to write a policy, review a document or write a new piece of code (Brooks, 1995).

3.3. Points to consider

In the context of this paper, the issue of greatest concern with the Gantt chart is the work element to actionable task or “macro-to-micro” interface. A greater number of tracked tasks/activities reduces the project manager’s bias but increases the resulting effect of fluctuation of any of those variables and adds undesirable overhead, which is prone to drive aversion to maintain and faithfully employ the system.

Though not conceived as a day-to-day task management tool, MS Project is sometime employed to try to plan at that level of execution detail. The planning churn created by this is massive, even if distributed via a collaborative planning model where successive levels of management insert and update the tactical level detail.

One alternative to this approach is attempting new visualizations from first principles. Fig 2 depicts an alternate workflow-based planning tool, which tracks projects with a ‘swim-lane’-like visualization and work elements only planned out at the macro level.

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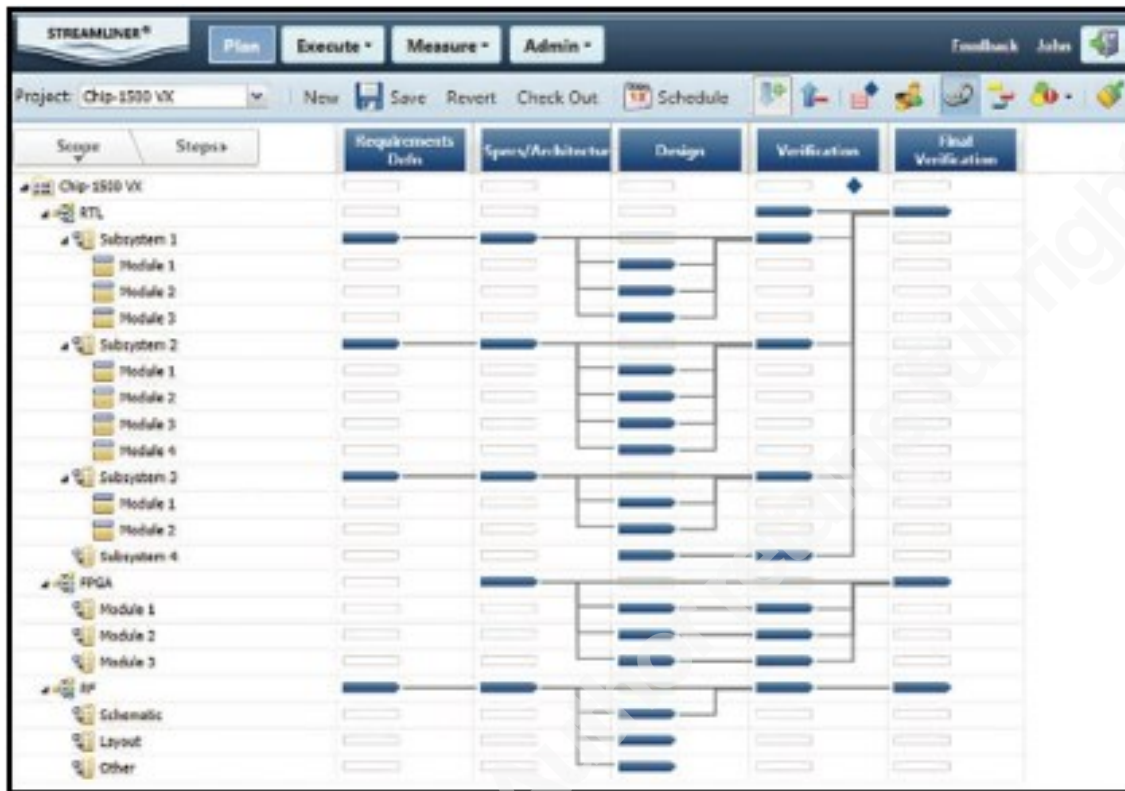


Figure 2 - Realization Technologies' Streamliner workflow-based planning tool

This view has the advantage of showing the components of a project and their interrelationships while avoiding the traditional time-on-X-axis Gantt approach. Though serving a role at the high level, these visualizations also prove ultimately un-scalable to the working level.

It can be said that the process of creating the WBS and subsequently the Gantt chart are in themselves the most valuable part of the process. The act forces the project manager and stakeholder to think through the problem and determine high-level dependencies, milestones, and conflicts while they are still addressable.

"If you spend more than 1% of your time on Gantt charts, you're not a project manager." (Hyde, 2011)

A PM's raison-d'être is to ensure project success. This is often primarily a communication and leadership function. Indeed, effort expended tweaking Gantt charts may take away from time communicating and resolving issues. By focusing on goal achievement rather than individual

work elements and tasks, the plan can remain relevant, while the task-level detail gets handled at a lower level of planning. (Tufte, 2013).

4. Personal Time/Task Management

4.1. Overview

Though there exist a number of personal time/task management philosophies and systems (e.g. Pomodoro, Simpleology), for the sake of this paper one of the more popularly used ones in the technology industry will be highlighted: David Allen's "Getting Things Done" (GTD). GTD was developed as a system to assist an individual to collect, organize and do all the myriad tasks we are faced with. Though expressly not technology focused, the availability of smartphones and simple to use apps has enabled the GTD methodology to be successfully integrated into the personal and professional lives of millions of people. GTD outlines a five-step process: (Allen, 2002)

- Collecting - gathering tasks, inputs, resources,
- Processing - analyzing the inputs, deciding which 'bin' to classify them in (task, project, long-range plans),
- Organizing - placing the processed tasks into a trusted system,
- Doing - accomplishing the work that you can accomplish at a given moment, and
- Reviewing - assessing the results of your effort, revising and improving.

Users of the system are strongly encouraged to get everything 'out of their head' and into the system. This is a powerful concept as a personal time management tool but potentially a goldmine if properly aggregated and correlated across a Project team.

GTD's lexicon differentiates projects (with a small 'p') from tasks. A project is any goal that requires more than one step to accomplish. It introduces the concept of 'actions' as the most discretely reducible step (akin to a low-level WBS decomposition).

The employee's focus is a valuable commodity; the system should be developed to bring the appropriate action to the employee's attention at the right time and place to allow him to do the work. Time spent wondering what to do next is time wasted. Likewise, energy spent trying to remember tasks that should otherwise be tracked in a trusted system (written down, computerized to-do list, etc.) is wasted. By capturing all these in a trusted system, the user frees his mental resources and thereby his attention to focus on the here and now. Focusing on the next physical action to move a project ahead is the most effective way to get work done. Whether this step is to make a phone call, research some information or write an email, complex projects are just streams of actions completed in sequence, as efficiently as possible.

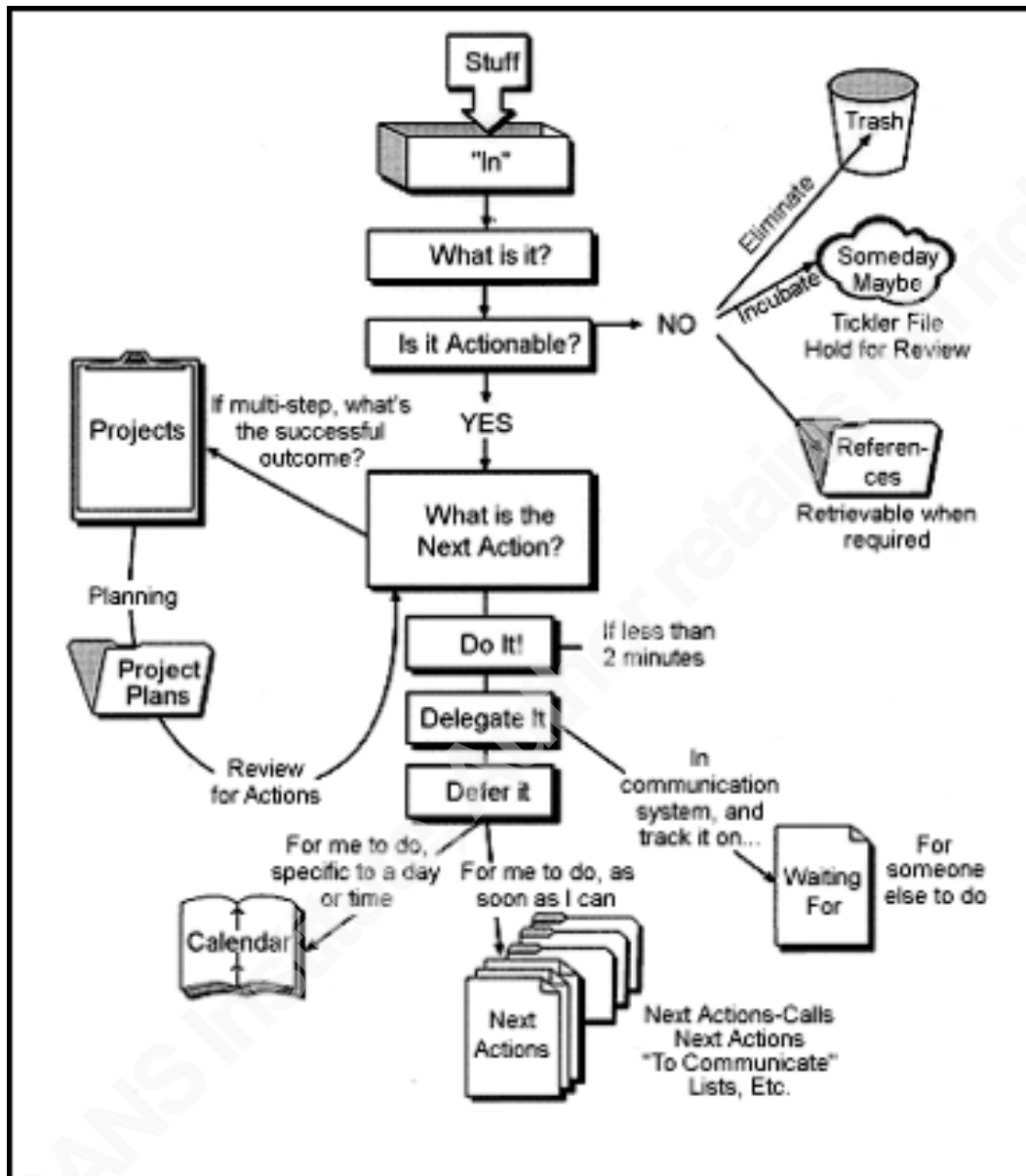


Figure 3 - GTD Workflow. (Allen, 2002)

The concept of 'contexts' is vital to the GTD methodology. Contexts are metadata added to each 'Next Action', which indicate the location or resources required to accomplish the work. Contexts could include @Computer or @Finance_Team (indicating a particular resource required to accomplish a task), or @Home or @Datacenter (indicating a location at which the work needs to occur). This is a powerful trigger for an automated system to bring forward the correct items to

the user's attention. Contexts ensure tasks are only presented at a time and place where they can be completed; this feature allows the user to trust that the system will present the correct work at the correct time and alleviate the time-sucking curiosity of constantly checking and assessing email and to-do lists.

Scheduling weekly (or more frequent) review time ties the whole process together by forcing a review of outstanding work. This allows the user to process and organize any unhandled tasks, review current tasks and reprocess as needed and perform a mid/long range goal-check to ensure you're on track to attain any set goals.

4.2. Linkages to Project Time Management

Often individuals who have formal Project Management training struggle with understanding its relationship with personal task management (Sáez, 2012). They are used to full task decomposition, assigning each task deadlines and resources and often presenting these visually in a Gantt chart as the central communication tool for their plan. This philosophy gets confused when these same individuals attempt task management such as GTD. They may try to formulate a GTD environment with PM tools, or vice versa. Either approach is unlikely to meet much success.

While personal time management techniques exist to allow the individual to approach all the tasks in their lives more effectively, further discussion will highlight the work-related aspects and how personal time management can be leveraged for the benefit of the individual's performance of work Project-related tasks. Though personal and project time management were conceived with different goals, they could be seen as differing primarily in scale. Both approaches start with the end in mind, analyze the problem, formulate a plan, assign resources and track work done.

GTD places significant emphasis on defining "what done looks like". This concept will instantly sound familiar to a PM as an equivalent to a milestone or the completion of a Work Element. Workers (and managers) need very precise and clear goals; each step in the completion of a task must have a definite point where it is considered complete.

5. Bridged Time Management (BTM)

Time management involves both planning and execution. Gantt charting has proven strengths as a planning tool but many shortcomings when used for in-depth execution tracking and management. Personal time management systems (henceforth referred to generally as 'GTD') are an excellent personal tool, but do not in most implementations integrate smoothly with PM, creating an additional burden on the manager and employee to 'translate' PM work elements and milestones/timelines to actionable GTD 'Next Actions'. 'Bridged Time Management', is proposed as a methodology for integrating PM and GTD in a transparent and effective manner which should mutually support the goals of each.

5.1. BTM Requirements

The development of any new process presupposes some level of requirements analysis. The following general parameters shape the development of BTM:

- BTM should support and integrate with both PM and GTD processes,
- BTM should not impose significant additional overhead to PM and GTD processes,
- BTM should not broadly address all the shortfalls of the Gantt chart, but focus on integrating it with any required modifications with GTD,
- BTM should automate as much of the inter-process communication as possible,
- BTM should extend the traditional Gantt visualization, not replace it; and
- BTM should provide reviewable, measurable views and outputs to support both the project manager and individuals' needs.

5.2. BTM Principles

BTM must be built on the basic premise that planned outcomes and planned actions should not be conflated. The former provides vision, guidance and progress tracking. The latter are the actionable items that move the project forward. "Outcomes are the rudder and actions are the

oars.” (Tufte, 2013). A common failure is to combine these two distinct categories and thereby lose the respective value they each necessarily bring to time management.

To be clear, WBS’ and their visual extrapolations, Gantt charts, are deliverable/outcome focused (PMI, 2006). Conversely, task management is action focused. In other words, WBS are the ends, tasks are the means to those ends.

As an example:

- WBS 3.2.1 - End-user license agreement
 - Task 1 - Create EULA stakeholder meeting agenda
 - Task 2 - Schedule EULA stakeholder meeting
 - Task 3 - Conduct EULA stakeholder meeting
 - Task 4 - Draft EULA
 - Task n - ...
- WBS 3.2.n - ...

When developing a novel tool or process, the question of its audience must be considered. Who will be using the system? Who will be primarily inputting data into it, and who will be primarily referring to it for its outputs? Will outputs of the system be used for reporting to senior management, and if so what are their needs? This paper will propose a system that is focused on a PM-led system that is guided by middle management and largely interacted with by the end-user. The system is conceptually flexible enough to allow varying views on the data, depending on the requirement.

5.2.1. Contexts

GTD’s concept of contexts is hugely powerful. BTM needs to be fully enabled to receive, analyze and apply contexts to each individual’s tasks. A few simple examples will demonstrate the principle.

- Both Alice and Bob are working on different tasks related to the same Project. Bob has associated @Alice as a context on a Next Action, as he needs to show her a document. A bi-weekly meeting, unassociated to the Project, brings Bob to Alice’s building on Monday

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afternoon. He should be alerted automatically on Friday to drop in and see Alice. This could be weeks before a 'scheduled start-date' on any time oriented Gantt chart would have otherwise triggered him, and he might have had to reactively do the task, rather than handling it more effectively at the right moment and context, keeping the Project moving.

- Bob is planning holidays in a week. His calendaring system automatically updates the BTM system that triggers an action on any Context to which he is associated (@Bob, @Design_Group, @Work, etc.). Certain colleagues who need absolutely inputs from Bob have their next actions re-prioritized automatically. Bob himself should receive a list of what next actions others need him for, what actions he himself needs to conclude before departing, and what actions he can take home, if necessary (!@Work, @Computer, @Phone, etc.).

5.2.2. Objects

Einstein is paraphrased as having said, "Everything should be made as simple as possible, but no simpler". Similarly, "Tasks should be decomposed to the lowest possible level, and no lower." If every simple task is decomposed to the minutest detail, the system will become overly taxing on the user. BTM Action Packs (BAP) are proposed as pre-defined, but easily editable packages of known work. The concept of reusable 'code' should be familiar to anyone with an object-oriented programming background. Every organization has hundreds of processes and standard operating procedures. If each individual needed to effectively re-generate these within GTD each time a familiar task came up, the overhead would be substantial. Action Packs are a mechanism for codifying series' of Next Actions. These could be the 10 steps of an organizational change management workflow, or the process for testing a new Firewall. Each action pack would be built collaboratively in a wiki-like manner to allow the last person who uses it to save any changes that have occurred as part of the new process. System learning algorithms could be used in software to analyze ongoing non-BAP activities and automatically suggest new BAPs for observed repetitive work. For example, if a person or group is noted as outlining the same process multiple times, the system could prompt them in a manner akin to email address 'auto-fill' in common email software. A simple keyboard shortcut or macro could be employed to initiate a BAP, or one

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could be initiated automatically on behalf of another user's task. If Bob creates a task "Get document approved by the CISO", the system could create a project in the CISO's GTD with the BAP preset for the n -steps of the document approval process.

It is possible that employees who work in very structured roles might be able to work entirely within BAP, though those employees' high level of repetition may obviate the need for them to participate in the BTM in the first place. As an example, a person employed in shipping and receiving who packs and sends boxes all day won't likely receive much value from BAP since he likely has a fairly small number of possible actions which are already organized in a reasonably efficient manner.

5.2.3. Velocity

The concept of velocity is borrowed from the Agile software development methodology. Velocity is a metric that tracks the speed at which work is being done, based on other similar work done recently. While the utility of this metric may differ on the implementation (not all actions are expected to take the same amount of time), combined with BAPs, a velocity assessment can quickly highlight changes in performance of specific routines. The manager could then review these in the form of alerts and decide whether intervention is necessary. As an example, if the project requires the installation of 10 servers, the scheduling for the 7th would be automatically influenced by the time it actually took to install the first 6, perhaps with a weighted average favoring the most recent 3 servers to better reflect current conditions.

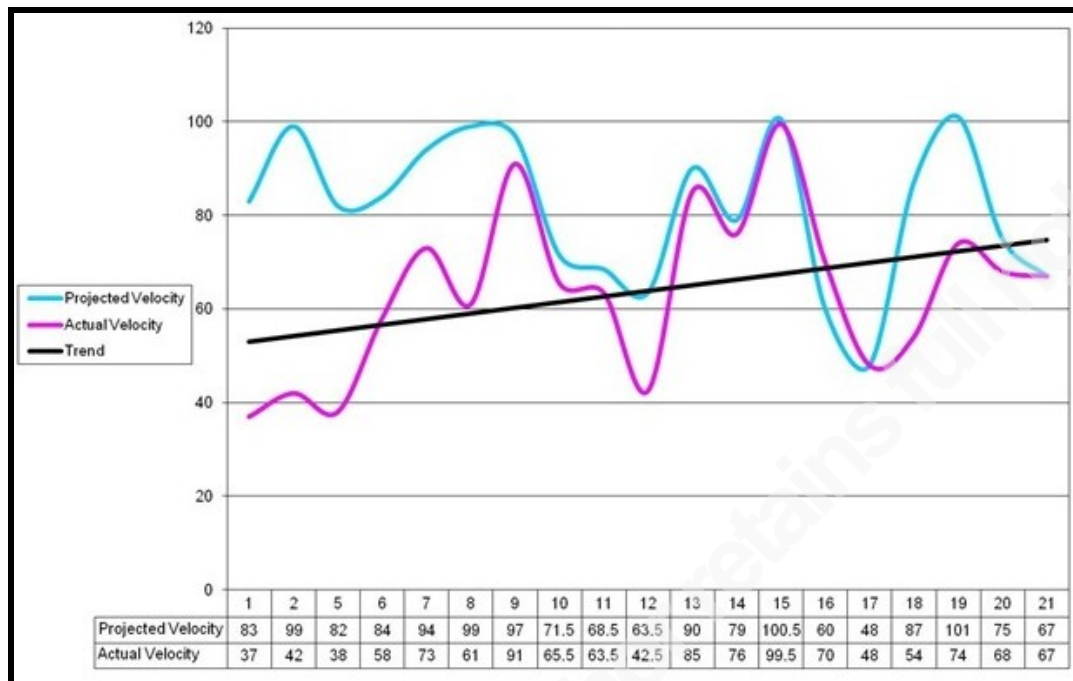


Figure 4 - Example Agile velocity chart (Cheng, 2009)

In a semi-automated BTM system, the velocity metric at the individual and organizational levels would be used to help 'pace' activities and dynamically adjust timelines, deadlines and dependencies.

5.2.4. Visualization and Reporting

The question of how to visualize BTM is really one of audience; a visualization needs to bring forth the information required by the viewer to enable his decision making process, while hiding superfluous detail. Gantt charts may still prove useful for senior management and the project manager and as the updating of tasks and progress will be largely automated, this time-centric view can continue to provide big-picture views on overall risks to the critical path or high level dependencies which require senior-level coordination. These Gantt charts would however benefit from the increased dynamic nature and accuracy brought to them via the BTM techniques described.

The second portion of BTM visualization is automatically generated, customizable multi-variable graphing based on combined inputs from each employee's GTD system. Schedule Performance, for example, can be assessed in real time by management to see if employees are on track to achieve the required deadlines. This view, combined with aggregate velocity charts could provide

crucial decision-making insight for senior management to influence the project. Management could easily get a report of 'stuck tasks'; actions which have not been accomplished in the expected amount of time. Context sensitive visualization could reveal a number of useful planning points: the fact that @Bob is on 15 people's Next Actions list, could imply he is overtasked (or under performing). The opportunities for useful visualization and reporting are limitless when accurate, up to date data and trending is fed into a well conceived visualization and reporting dashboard.

5.2.5. Tying it together

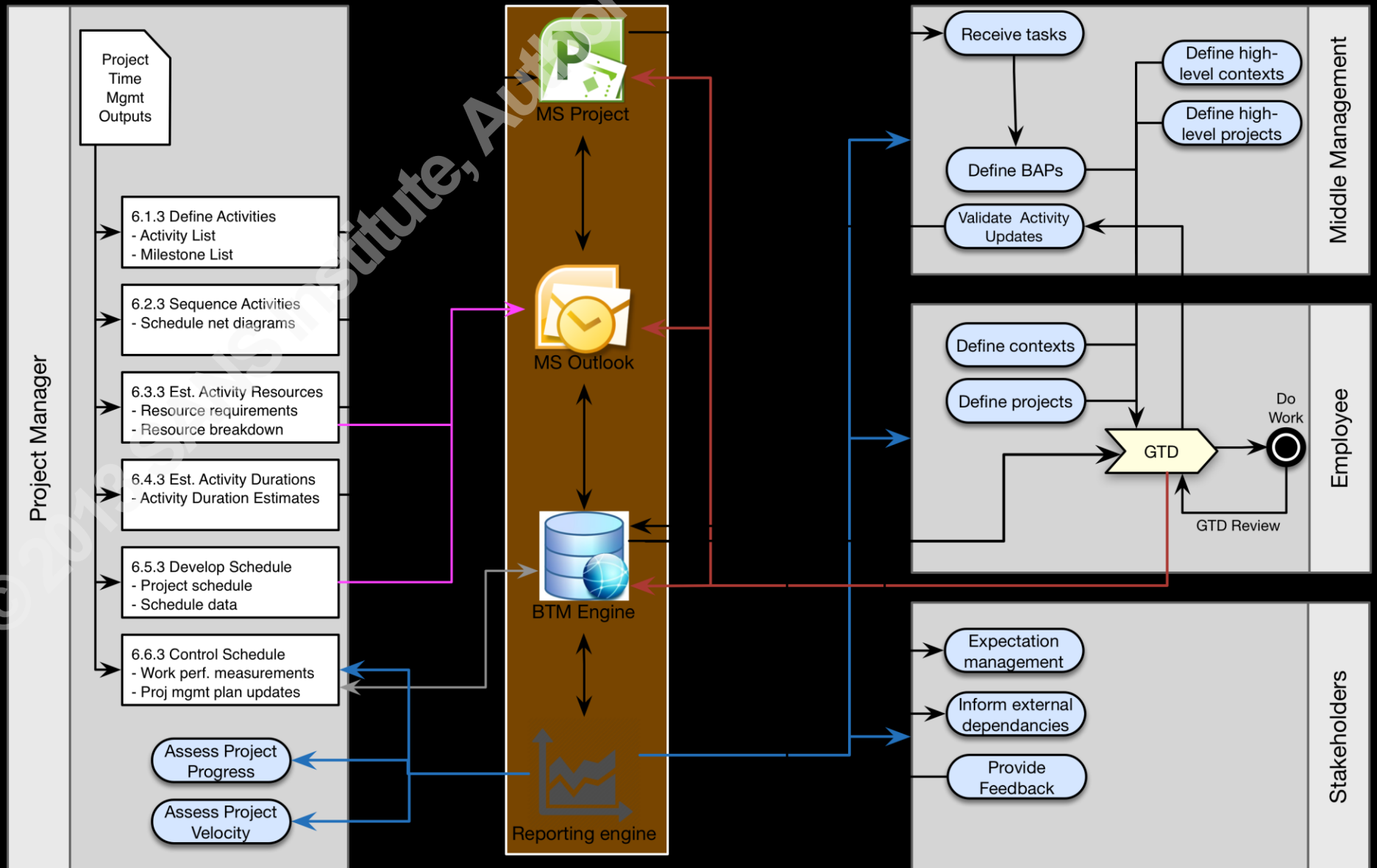
BTM software algorithms could be devised which would fluidly adjust the triggering of a next action, based on feedback from the current velocity of key BAPs. For example, if the last three policies written by the Policy department have taken 3 days more than the norm, the system would trigger Bob to engage them 3 days sooner than it would have otherwise.

Email is often the hub of activity for knowledge workers. Systems have already been developed for close integration of Microsoft Outlook and Google's Gmail (among others) with GTD.

Outlook, in particular, is quite expandable and a plugin supporting Visual Basic routines could be developed to integrate Outlook as a BTM/GTD tool with MS Project as a PM tool. Automated bi-directional data passage is critical to reducing the need to update the Project plan/Gantt chart manually; changes to BTM could trigger real-time changes in the plan (though the project manager may want to review and accept these so he's aware of the impact on his plan).

Bridged Time Management

Workflow



6. Conclusion

Overreliance on the Gantt chart as a planning and execution tool has been shown to be a significant risk, particularly for small/medium-sized projects without dedicated project staff. This paper has demonstrated some of the specific shortcomings of that approach and proposed a future stream of Time Management aimed at integrating macro-level Project management with micro-level task management. This proposed approach, Bridged Time Management; leverages current best practices from several proven time management processes and integrates them to superior effect for the small/medium-sized organization. The automation and feedback algorithms at the heart of BTM could help significantly increase productivity and while providing far more accurate and timely performance reporting to the project manager and all other users and stakeholders.

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