

Gantt chart

A **Gantt chart** is a type of bar chart that illustrates a project schedule. Modern Gantt charts also show the dependency relationships between activities and current schedule status.

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Definition

A Gantt chart is a type of bar chart^{[1][2]} that illustrates a project schedule. This chart lists the tasks to be performed on the vertical axis, and time intervals on the horizontal axis.^{[1][3]} The width of the horizontal bars in the graph show the duration of each activity.^{[3][4]} Gantt charts illustrate the start and finish dates of the terminal elements and summary elements of a project. Terminal elements and summary elements constitute the work breakdown structure of the project. Modern Gantt charts also show the dependency (i.e., precedence network) relationships between activities. Gantt charts can be used to show current schedule status using percent-complete shadings and a vertical "TODAY" line as shown here.

Gantt charts are sometimes equated with bar charts.^{[4][5]}

Gantt charts are usually created initially using an *early start time approach*, where each task is scheduled to start immediately when its prerequisites are complete. This method maximizes the float time available for all tasks.^[1]

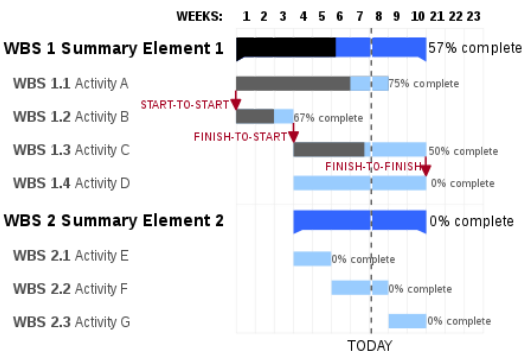
Historical development

Although now regarded as a common charting technique, Gantt charts were considered revolutionary when first introduced.^[6] The first known tool of this type was developed in 1896 by Karol Adamiecki, who called it a *harmonogram*.^[7] Adamiecki did not publish his chart until 1931, however, and only in Polish, which limited both its adoption and recognition of his authorship.

In 1912, Hermann Schürch published what would be considered Gantt charts while discussing a construction project. It appears that Schürch's charts were not notable but rather routine in Germany at the time they were published.^{[8][9][10]} The prior development leading to Schürch's work is unknown.^[11] Unlike later Gantt charts, Schürch's charts did not display interdependencies, leaving them to be inferred by the reader. These were also static representations of a planned schedule.^[12]

The chart is named after Henry Gantt (1861–1919), who designed his chart around the years 1910–1915.^{[13][14]}

One of the first major applications of Gantt charts was by the United States during World War I, at the instigation of General William Crozier.^[15]



A Gantt chart showing three kinds of schedule dependencies (in red) and percent complete indications.

The earliest Gantt charts were drawn on paper and therefore had to be redrawn entirely in order to adjust to schedule changes. For many years, project managers used pieces of paper or blocks for Gantt chart bars so they could be adjusted as needed.^[16] In the 1980s, personal computers allowed widespread creation of complex and elaborate Gantt charts. The first desktop applications were intended mainly for project managers and project schedulers. With the advent of the Internet and increased collaboration over networks at the end of the 1990s, Gantt charts became a common feature of web-based applications, including collaborative groupware. By 2012, almost all Gantt charts were made by software which can easily adjust to schedule changes.^[16]

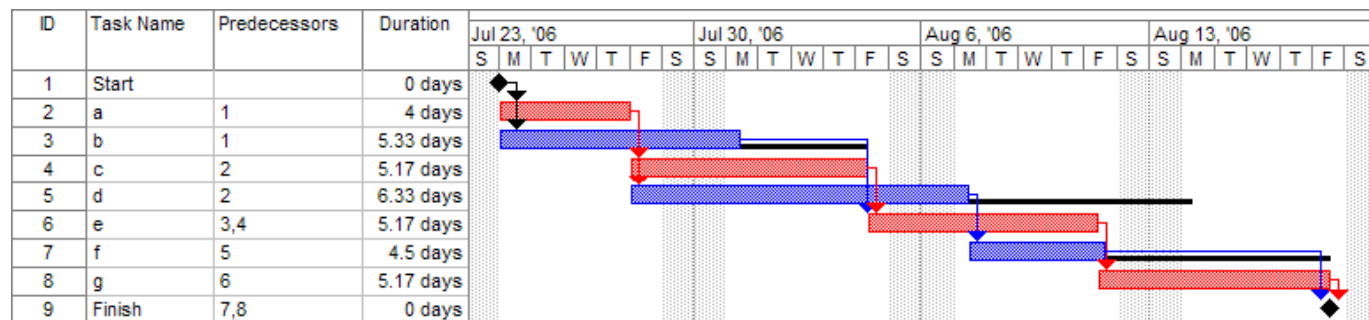
In 1999, Gantt charts were identified as "one of the most widely used management tools for project scheduling and control".^[1]

Example

In the following table there are seven tasks, labeled *a* through *g*. Some tasks can be done concurrently (*a* and *b*) while others cannot be done until their predecessor task is complete (*c* and *d* cannot begin until *a* is complete). Additionally, each task has three time estimates: the optimistic time estimate (*O*), the most likely or normal time estimate (*M*), and the pessimistic time estimate (*P*). The expected time (T_E) is estimated using the beta probability distribution for the time estimates, using the formula $(O + 4M + P) \div 6$.

Activity	Predecessor	Time estimates			Expected time (T_E)
		Opt. (<i>O</i>)	Normal (<i>M</i>)	Pess. (<i>P</i>)	
<i>a</i>	—	2	4	6	4.00
<i>b</i>	—	3	5	9	5.33
<i>c</i>	<i>a</i>	4	5	7	5.17
<i>d</i>	<i>a</i>	4	6	10	6.33
<i>e</i>	<i>b, c</i>	4	5	7	5.17
<i>f</i>	<i>d</i>	3	4	8	4.50
<i>g</i>	<i>e</i>	3	5	8	5.17

Once this step is complete, one can draw a Gantt chart or a network diagram.



A Gantt chart created using Microsoft Project (MSP). Note (1) the critical path is in red, (2) the slack is the black lines connected to non-critical activities, (3) since Saturday and Sunday are not work days and are thus excluded from the schedule, some bars on the Gantt chart are longer if they cut through a weekend.

Progress Gantt charts

In a *progress Gantt chart*, tasks are shaded in proportion to the degree of their completion. In other words, a task that is 60% complete would be 60% shaded, starting from the left. A vertical line is drawn at the time index when the progress Gantt chart is created, and this line can then be compared with shaded tasks. If everything is on schedule, all task portions left of the line will be shaded, and all task portions right of the line will not be shaded. This provides a visual representation of how the project and its tasks are ahead or behind schedule.^[17]

Linked Gantt charts

Linked Gantt charts contain lines indicating the dependencies between tasks. However, linked Gantt charts quickly become cluttered in all but the simplest cases. *Critical path network diagrams* are superior to visually communicate the relationships between tasks.^[18] However, Gantt charts are often preferred over network diagrams because Gantt charts are easily interpreted without training, whereas critical path diagrams require training to interpret.^[5] Gantt chart software typically provides mechanisms to link task dependencies, although this data may or may not be visually represented.^[1] Gantt charts and network diagrams are often used for the same project, both being generated from the same data by a software application.^[1]

See also

- Critical path method*
- Event chain methodology*
- Float (project management)*
- Henry Gantt*
- List of project management software, which includes specific Gantt Chart software.
- Program evaluation and review technique* (PERT)
- Event chain diagram*

Citations

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