

TIME DATA MANAGEMENT

- A handbook



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EXECUTIVE SUMMARY

About the summary

This is a summary of the book Time Data Management – A Handbook. The handbook was developed in the research project TIMEBLY, funded by Vinnova 2021-2024. The handbook is free to download from <https://research.chalmers.se/person/petera>.

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Why TDM?

Many companies have time standards of poor quality. A time base is time data stored in planning systems or databases and is used to plan production, calculate costs, and make various decisions about, for example, investments. The time standards stored in data systems tend to not match the times in reality, on the workshop floor.

There are several reasons for the current situation, such as times being set incorrectly from the beginning or times not being updated when changes occur in production. For example, an investment in a robot can significantly reduce cycle time, but the planning department that handles the time standards in the planning system has not received the updated time change. It is common for companies not to alter a time base once it has been stored in the system.

With digitalization, many companies have begun to realize that their time standards are not good enough to make important decisions; this applies to both operational and strategic decisions. The time standards are used, for example, as the basis for quotation preparations and investment calculations (Figure 1).

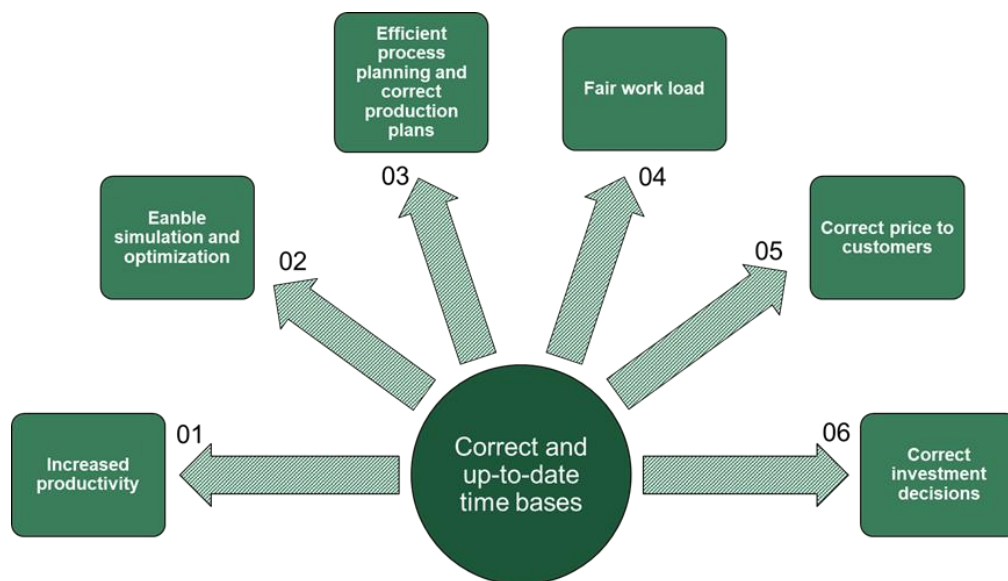


Figure 1: Correct and updated time standards increase productivity, enable simulation and optimization, lead to accurate planning, provide fair workloads, the right price to the customer, and correct investment decisions.

Time and productivity

There are many types of time that an industrial company need to master. There are planned times, actual times, cycle times, setup times, lead times, throughput times, allowance times, and so on. It may sound obvious, but the fact is that few companies have a proper standard for how times are defined and moreover also use that standard. What a time is called in the software the company uses to administer and use the time bases, such as in an ERP system (Enterprise Resource Planning), often becomes a de facto standard. The lack of a suitable standard means that there can be miscommunication or that calculations of key performance indicators are incorrect and not comparable within the same company.

There are many different ways to break down time into various categories. The important point is that each company must come up with a relevant internal standard for its needs. Industrial companies need to demand from suppliers of various data systems that use time standards to include more detailed data with times divided into many more categories than today.

To understand what determines how long time an activity takes, it is important to understand the productivity factors: Method, Performance, and Utilization (MPU). These affect productivity at the activity level and the cycle time for the activity. The Method factor (M) indicates how the work is intended to be performed, what movements need to be made, what the workplace looks like, and what tools or machines should be used. The Performance factor (P) is determined by the speed at which the work is performed relative to a speed or work load standard. The Utilization rate (U) is determined by how much of the work time is devoted to value-adding or supporting activities and how much time needs to be devoted to losses such as waiting and disturbance handling.

Table 2: Sub-factors for Method, Performance, and Utilization and what they are affected by.

Factor	Sub-factor	Is affected by
Method		How the work is designed to be performed without losses.
Performance	Person based	Physical ability and the motivation of the person.
	Skill based	The individual's skill through training.
Utilization	Personal needs	The person's need for a micro-break or rest during working hours.
	System dependent	The design of the system that results in e.g. balance losses.
	Disturbance affected	Losses due to random disturbances.

Determine time

There are many different methods for determining planned times and measuring actual times. Actual times (or outcome times) are times for activities that can be measured while they are being performed. Planned times are set or designed for activities that have not yet been performed and therefore cannot be measured. The correct method must be chosen for the purpose of the analysis, and both planned time and actual time must be determined to achieve the benefits of good time bases. Figure 2 summarizes the most common time determination methods.

Efficient TDM with time blocks

If the work isn't standardized, that's where you need to start. Timing non-standardized work is pointless. To create an effective Time Data Management (TDM) system, principles are needed for how activities should be generalized and grouped at different levels of the activity hierarchy. Systematically dividing and grouping activities is known as operation step division.

Time blocks are combinations of elements or operation steps into larger units. For example, the predetermined time system SAM can be considered a block system based on MTM-1 elements. SAM and other predetermined time systems are used as is by many companies, but since the analyses require a lot of time and specialized expertise, there's a need for simpler block systems. This is

especially true for smaller companies that lack the resources to perform detailed analyses. Even larger companies, which manufacture a wide variety of products and variants, benefit from formulating time blocks to make the analyses more rational to perform.

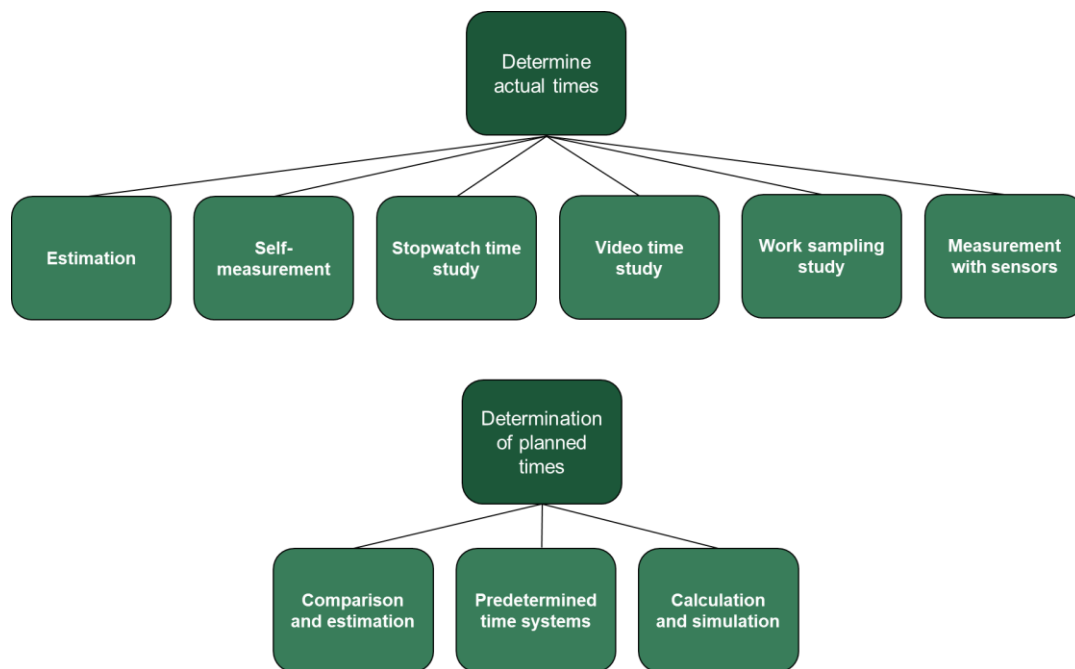


Figure 2: Common methods for determining actual and planned times.

The blocks consist of activities that are timed using some method. The division of operation steps is an important tool for creating a library of activities that cover all variants while being efficiently used. The timing of the operation steps can be carried out using all the methods discussed in the handbook. If the activities are performed today, methods for measuring actual time can be used; otherwise, methods for determining planned times need to be used. Since a complete database of operation steps needs to include both the activities the company performs today and activities that will likely be used in future production, it is reasonable to assume that times from a predetermined time system are always needed. Times from a standardized predetermined time system like SAM offer several other advantages:

- The performance factor is determined by the system and at an agreed level.
- Operation steps can easily be modified by adding or subtracting elements.
- It is easy to explain how the time is set.

The total time for a time block is calculated by summing the time equations from all included operation steps. A time block can be as small as including just one element. A special case is the number of steps, with the variable “number” and a constant time per step. It's often a good idea to have steps as its own time block since it's always a loss, and the number of steps will depend on the layout, which can vary between different stations in the same factory where the same activities are performed. In practice, it may be difficult to standardize a layout that would result in a standardized number of steps, as the premises set limitations.

A significant opportunity for efficiency opened up through the use of variables is to create simplified interfaces for the time blocks (Figure 3). Instead of the user needing to see which operation steps and time equations with constants and variables are included in the time block, it's enough for the user to

see the name of the time block and understand from the name itself or a more detailed description what activities the time block covers. Then, the user only enters the values for the variables included in the time block and receives a final result in the form of time for the specific combination of variables. An experiment conducted within the TIMEBLY project at Volvo Cars showed a significant potential for efficiency. The time for a completely new product on an existing assembly line could be determined in a quarter of the time using a time block interface, compared to the existing method.

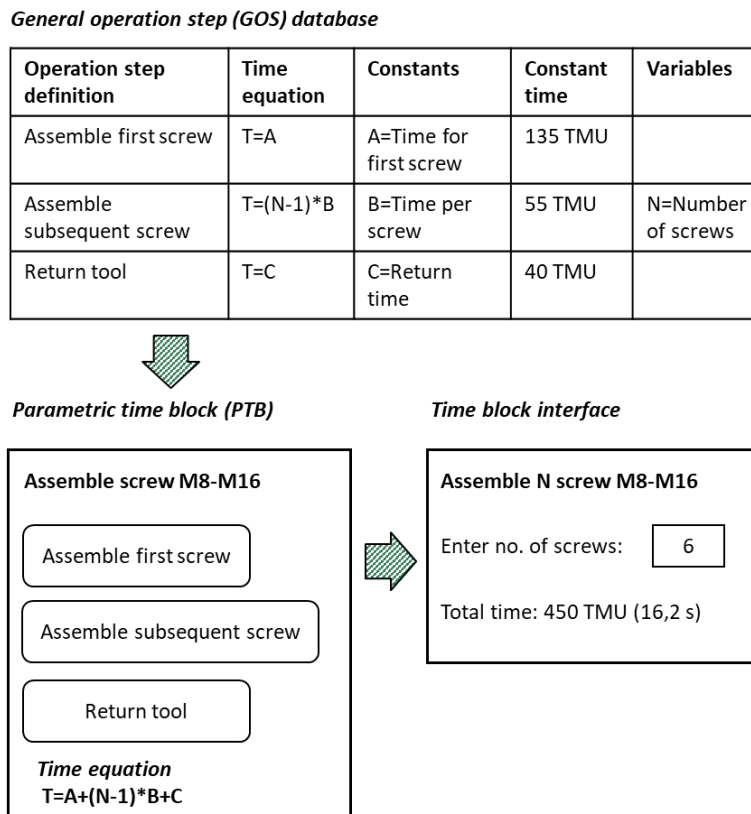


Figure 3: Example of operation steps, time blocks, and time block interface.

What is the cost?

There isn't a single time determination method that's best for all purposes. The different methods require varying efforts in terms of training for the analyst or investment in new technology. It's always a balance between the time or cost of conducting the analysis and the expected results. Predetermined time analysis is necessary to determine planned time for manual work in the process planning phase. It's also the best way to perform a performance assessment by comparing the standard time obtained from the predetermined time analysis against the observed time from a time study. A certified analyst conducts a SAM analysis in about 25 times the studied time, which is much faster than, for example, MTM-1, but still involves a significant investment in work time. One of the biggest challenges in TDM is maintaining the quality of time data over time. Many types of changes and variations affect, or should affect, the time bases. Any change in a product or process that affects how manual work is performed must lead to a change in the standardized method and the planned time. Large companies can hire their own staff with the right TDM expertise, but it's more challenging for smaller companies. Likely, a consultant is brought in to create a time block system, but no one can escape the work of standardization. In the end, it's a matter for the company's managers. If the top management doesn't think the quality of the time standards is important, the TDM system will eventually fail.