

The ETTO Principle - Efficiency-Thoroughness Trade-Off

ETTOing well is the pathway to glory;

ETTOing badly will make you feel sorry!

It is a fundamental characteristic of human performance, whether individual or collective, that the resources needed to do something often, if not always, are too few. The most frequent shortcoming is a lack of time, but other resources such as information, materials, tools, energy, and manpower may also be in short supply. We nevertheless usually manage to meet the requirements to acceptable performance by adjusting how we do things to meet the demands and the current conditions - or in other words to balance demands and resources. This ability to adjust performance to match the conditions can be described as a trade-off between efficiency and thoroughness.¹ The essence of this balance or trade-off between efficiency and thoroughness is described by the ETTO principle, which, in its simplest possible form, can be stated as follows: In their daily activities, at work or at leisure, people (and organisations) routinely make a choice between being effective and being thorough, since it rarely is possible to be both at the same time. If demands to productivity or performance are high, thoroughness is reduced until the productivity goals are met. If demands to safety are high, efficiency is reduced until the safety goals are met.

A formal definition

The ETTO principle refers to the fact that people (and organisations) as part of their activities frequently – or always – have to make a trade-off between the resources (primarily time and effort) they spend on preparing to do something and the resources (primarily time and effort) they spend on doing it. The trade-off may favour thoroughness over efficiency if safety and quality are the dominant concerns, and efficiency over thoroughness if throughput and output are the dominant concerns. It follows from the ETTO principle that it is never possible to maximise efficiency and thoroughness at the same time. Nor can an activity expect to succeed, if there is not a minimum of either.

¹ Simplifying the characterisation of human performance to a trade-off between efficiency and thoroughness is, of course, itself an example of such a trade-off.

Efficiency means that the level of investment or amount of resources used or needed to achieve a stated goal or objective are kept as low as possible. The resources may be expressed in terms of time, materials, money, psychological effort (workload), physical effort (fatigue), manpower (number of people), etc. The appropriate level or amount is determined by the subjective evaluation of what is sufficient to achieve the goal, i.e., good enough to be acceptable by whatever stop rule is applied as well as by external requirements and demands. For individuals, the decision about how much effort to spend is usually not conscious, but rather a result of habit, social norms, and established practice. For organisations, it is more likely to be the result of a direct consideration – although this choice in itself will also be subject to the ETTO principle.

Thoroughness means that an activity is carried out only if the individual or organisation is confident that the necessary and sufficient conditions for it exist so that the activity will achieve its objective and not create any unwanted side-effects. These conditions comprise time, information, materials, energy, competence, tools, etc. More formally, thoroughness means that the pre-conditions for an activity are in place, that the execution conditions can be ensured, and that the outcome(s) will be the intended one(s).

The ETTO fallacy is that people are required to be both efficient and thorough at the same time – or rather to be thorough when with hindsight it was wrong to be efficient!

Work-related ETTO rules

The ETTO rules described here are based on a broad view of the general human factors literature, of studies of work, etc. The set of rules is hopefully representative, but does not assume to be exhaustive.

- In addition to the work related ETTO rules, there are also individual (psychological) ETTO rules and collective (organisational) ETTO rules:
- ‘It looks fine’ – so there is no need to anything, meaning that an action or an effort can safely be skipped.
- ‘It is not really important’ – meaning that there is really no need to do anything now, if only you understand the situation correctly.
- ‘It is normally OK, there is no need to check’ – it may look suspicious, but do not worry, it always works out in the end. A variation of that is ‘I/we have done this millions of times before’ – so trust me/us to do the right thing.

- 'It is good enough for now (or for 'government work')' – meaning that it passes someone's minimal requirements.
- 'It is not my/our responsibility' - so we do not need to concern ourselves with that.
- 'It will be checked, or done, by someone else' later – so we can skip this test or action now and save some time.
- 'It has been checked, or done, by someone else before' – so we can skip this test or action now and save some time.
- A combination of this rule and the preceding is clearly unhealthy, since it opens a path to failure. It happens every now and then, usually because different people are involved at different times.
- '(Doing it) this way is much quicker' – or more resource efficient – even though it does not follow the procedures in every detail.
- 'There is no time (or no resources) to do it now' – so we postpone it for later and continue with something else instead. The obvious risk is, of course, that we forget whatever we postpone.
- 'We must not use too much of X' – so try to find another way of getting it done. (X can be any kind of resource, including time and money.)
- 'I cannot remember how to do it' (and I cannot be bothered to look it up) – but this looks like a reasonable way of going about it.
- 'We always do it in this way here' – so don't be worried that the procedures say something else.
- 'It looks like a Y, so it probably is a Y' – this is a variety of the representativeness heuristic.
- 'It normally works' (or it has worked before) – so it will probably also work now. This eliminates the effort need to consider the situation in detail in order to find out what to do.
- 'We must get this done' (before someone else beats us to it or before time runs out) – therefore we cannot afford to follow the procedures (or rules and regulations) in every detail.
- 'It must be ready in time' – so let's get on with it. (The need to meet a deadline may be that of the company, of the bosses, or of oneself).

- 'There is no time to wait' - a variation of the above, but referring specifically to the conditions under which something can be done. An alternative and likely inadequate solution is used instead of the normal one.
- 'If you don't say anything, I won't either' – in this situation one person has typically 'bent the rules' in order to make life easier for another person or to offer some kind of service. This trade-off involves more than one person, and is therefore social rather than individual.
- 'I am not an expert on this, so I will let you decide.' This is another kind of social ETTO rule, where time and effort is saved by deferring to the knowledge and experience of another person. This rule applies not only to situations at work, but to many other types of relations, not least consultation of various kinds. In view of the momentous events in 2008, it might also be called the financial ETTO rule.

Individual (psychological) ETTO rules

In addition to the work related ETTO rules, people also use ETTO rules to manage their own situation, e.g., in terms of workload or task difficulty. Such rules can be found for situations of information input overload, general ways of thinking and reasoning (cognitive style), as well as the various judgement heuristics.

- Scanning styles – differences in the way in which assumptions are tested, either by conservative focussing where only one aspect is changed at a time or by focus gambling where more than one attribute is changed at a time.
- Levelling versus sharpening – individual variations in the distinctiveness of memories and the tendency to merge similar events.
- Reflection versus impulsivity – differences in the ways in which alternative hypotheses are formed and responses made.
- Learning strategies – a holist gathers information randomly within a framework, while a serialist approaches problem-solving step-wise, proceeding from the known to the unknown.

Collective (organisational) ETTO rules

If we look to the organisation, it is possible to find collective counterparts to the individual ETTO rules. In the systemic view, organisations are complex socio-technical systems that interact with and try to control a partly unpredictable environment.

- One rule is *negative reporting*, which means that only deviations or things that go wrong should be reported. In consequence of that, the absence of a report is interpreted as meaning that everything is well. The rule clearly improves efficiency, but may have consequences for safety.
- Another rule can be called the *prioritising dilemma* or the *visibility-effectiveness problem*. Many organisations realise that it is important for managers at various levels to be visible in the organisation, which means that they should spend time to find out what is going on and become known among the people they manage. On the other hand, managers are often under considerable pressure to be effective, to perform their administrative duties promptly even when deadlines are short. They are therefore required by their bosses to be both efficient in accomplishing their administrative duties, and thorough in the sense that they are good managers – i.e., highly visible. Managers will in practice often focus on efficiency (accomplishing their administrative duties) and trade-off thoroughness, being less visible in the organisation. If nothing untoward happens, he or she will be praised for the efficiency, but if something goes wrong, they will be blamed for their lack of thoroughness.
- *Report and be good*. Yet another example is in the relation between an organisation and a subcontractor or a supplier. Here the safety ethos prioritises openness and reporting of even minor mishaps. Subcontractors and suppliers thus often feel under pressure to meet the organisation's standards for openness and reporting. But at the same time they may have experienced, or believe they will experience, that they will be punished if they have too many things to report, while a competitor that reports less may be rewarded. In ETTO terms it is thorough to report everything and efficient to report enough to sound credible but not so much that one loses the contract.
- *Reduce unnecessary costs*. While this may sound plausible enough at first, the problem lies with the definition of 'unnecessary.' The rule is used to improve efficiency, at the cost of thoroughness.
- *Double-bind* describes a situation where a person receives different and contradictory messages. A common example is the difference between the explicit policy that 'safety is the most important thing for us,' and the implicit policy that production takes precedence when conflicts arise. The double-bind that results from this is used to improve efficiency, at the cost of thoroughness. Another example is the visibility-effectiveness problem described above.

ETTO and TETO

ETTO (Efficiency-Thoroughness Trade-Off) must be balanced by TETO (Thoroughness-Efficiency Trade-Off).

To make a trade-off between efficiency and thoroughness (ETTOing) in order to get through the work-day is normal, necessary, and useful. It is, however, not sufficient to be able to do something or to respond to the actual; it is also necessary to consider if anything unexpected may happen in the future (near term or far term). In other words, efficiency in the present presupposes thoroughness in the past, which paradoxically means that thoroughness in the present is necessary for efficiency in the future.

The ETTO principle therefore requires a symmetric TETO or Thoroughness-Efficiency Trade-Off principle. The practical question is when one should put the emphasis on efficiency and when on thoroughness. For an organisation that question may not be too difficult to answer, since there are clear differences between the day-to-day operations and functions such as supervision, and learning. It is practically a definition of an organisation that these functions can be assigned to different parts or to different roles. For an individual it is more of a problem, since it is impossible literally to do two things at the same time. For an individual, the ETTO-TETO balance therefore becomes an issue of scheduling various activities, and of creating time enough for reflection. Individual intentions to maintain a balance, to be thorough as well as efficient, may nevertheless easily run foul of time pressures, information push, and information input overload and must therefore be supported by the organisational culture.

In Resilience Engineering terms, the ETTO-TETO balance corresponds to need to be able both to respond and to anticipate.

