Easy, or difficult ?

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Like many engineers, I have frequently been frustrated by the expectations of managers, or rather, those responsible for time scales. Frequently they want to know the exact completion time of an as-yet-undefined task, or they have assumed a prohibitively long period for the completion of a relatively simple task (usually prior to arguing for the cancellation of a valuable project)

But, considering the other side of the fence, it must sometimes seem paradoxical that some tasks take man-months, while others are finished in apparently a lunch hour.

There are coherent reasons for this, which I intend to try to explain:

Things which make a job harder:

Unfamiliar territory: Anything totally new to us, even apparently simple things, can contain pitfalls only apparent after mistakes have been made (and time has been spent making them). That can reach as far as requiring multiple iterations of a pcb design.

Unfamiliarity also matter in the processor: if the software writer knows the CUP chosen then the work will go much smoother than if a whole new architecture has to be digested. (Transportable high level code helps here. In theory. Rarely in practice)

Software: The more code that's written fresh, the longer it takes. Unlike circuit design, where a (successful) bright idea can save weeks, when writing code there is no substitute for endless labourious write/program/test cycles.

Re-using modules of code from earlier (similar) projects will help, as will writing the code in a high level language (assuming no critical timing loops or signal processing are required). And despite the fact that almost every engineer dabbles in writing software (or has done) a dedicated software professional will do the job better, and faster, than any enthusiast

Financial pressure: There is a difference between competent design (which has a lowest cost consistent with good practice by default) and an absolute shaved down bare bones design. By cutting back everything to a minimum, the opportunity for flaws to manifest increases, and the amount of testing required actually increases.

There is a low of diminishing returns when attempting to optimise (or rather minimise) a circuit. The first penny is easy to save. The last one will take months.

"Science": If something needs a piece of mathematical understanding, or the invention of something out of the ordinary, it is no surprise that it takes longer. The less admitted aspect of this is that there is no guarantee that a usable solution will ever be found, just a better chance per hour spent.

Haste: Ironically, trying to hurry a job causes errors, which in turn cause extra work

Things which make a job easier:

Familiarity: An engineer working in an area he is used to, at frequencies he is comfortable with, will work much faster than someone working on the edge of their abilities (even though that's much more interesting and exciting for the engineer, and looks better on his CV.)

Space: The more room on the pcb, the quicker a usable layout can be drafted, and the less need for possibly risky bits of layout, so the greater the chance that it will work first time

Specification: A more complete spec results in less redesign cycles and less wasted effort in misunderstandings. On the other hand, this must be balanced against the gains that can result from a less stringent spec, which gives the engineer more options and requires less complexity

Re-use of design: A radio that incorporates 80% of an existing, proven design will obviously contain less risk, less work and less effort than a totally new design.
But it won't be entirely without risk, as even an experienced designer can be caught out sometimes

Re-use of parts: Once the engineer gets to know a PA part, a synth, a micro or similar, the subsequent designs will build on existing experience.
Hopefully the same *mistakes* aren't re-used !

Use radio modules: A carrier board using an already proven radio module is (comparatively) very easy to design and test. (If it wasn't, I'd be out of a job!)

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