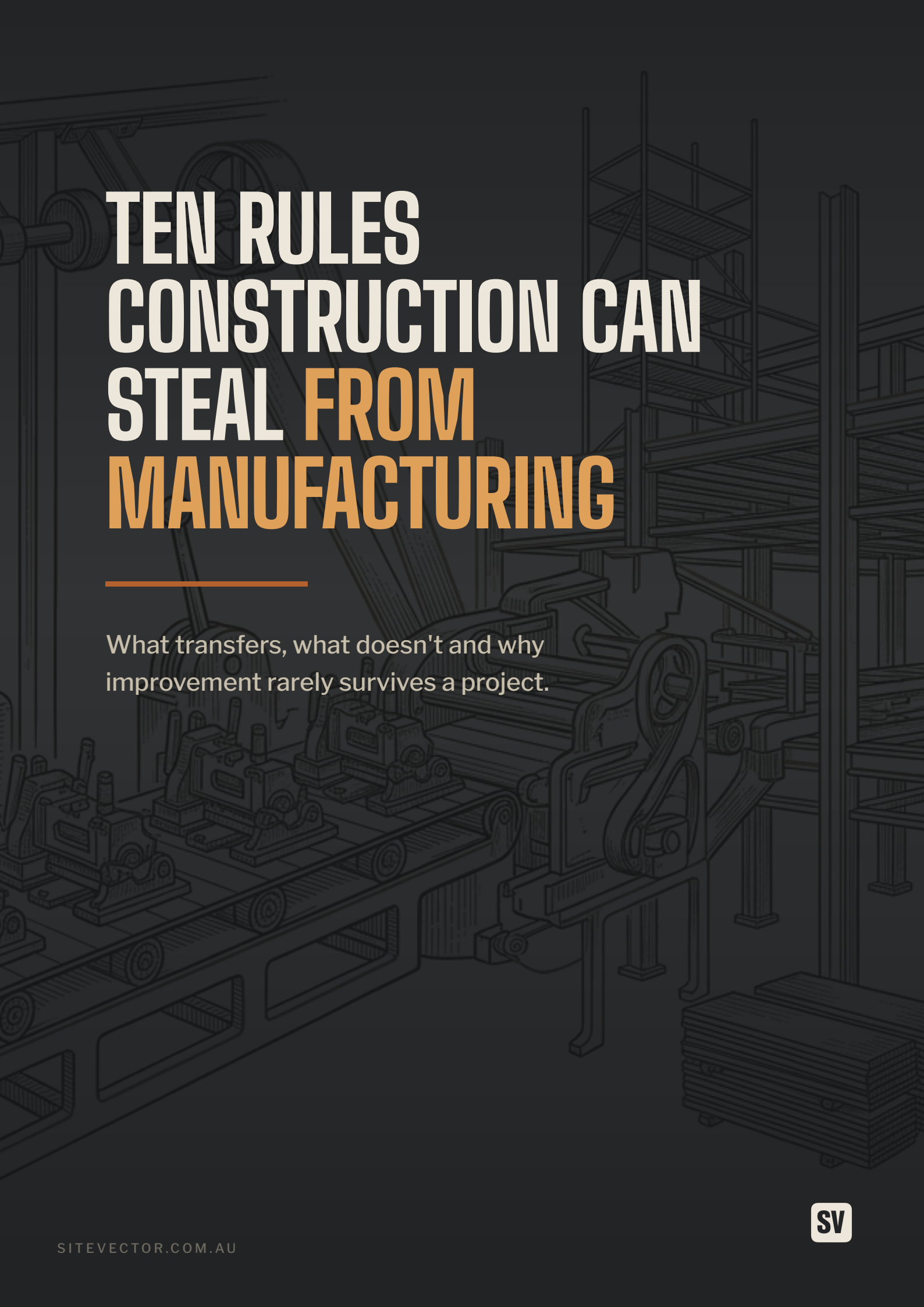
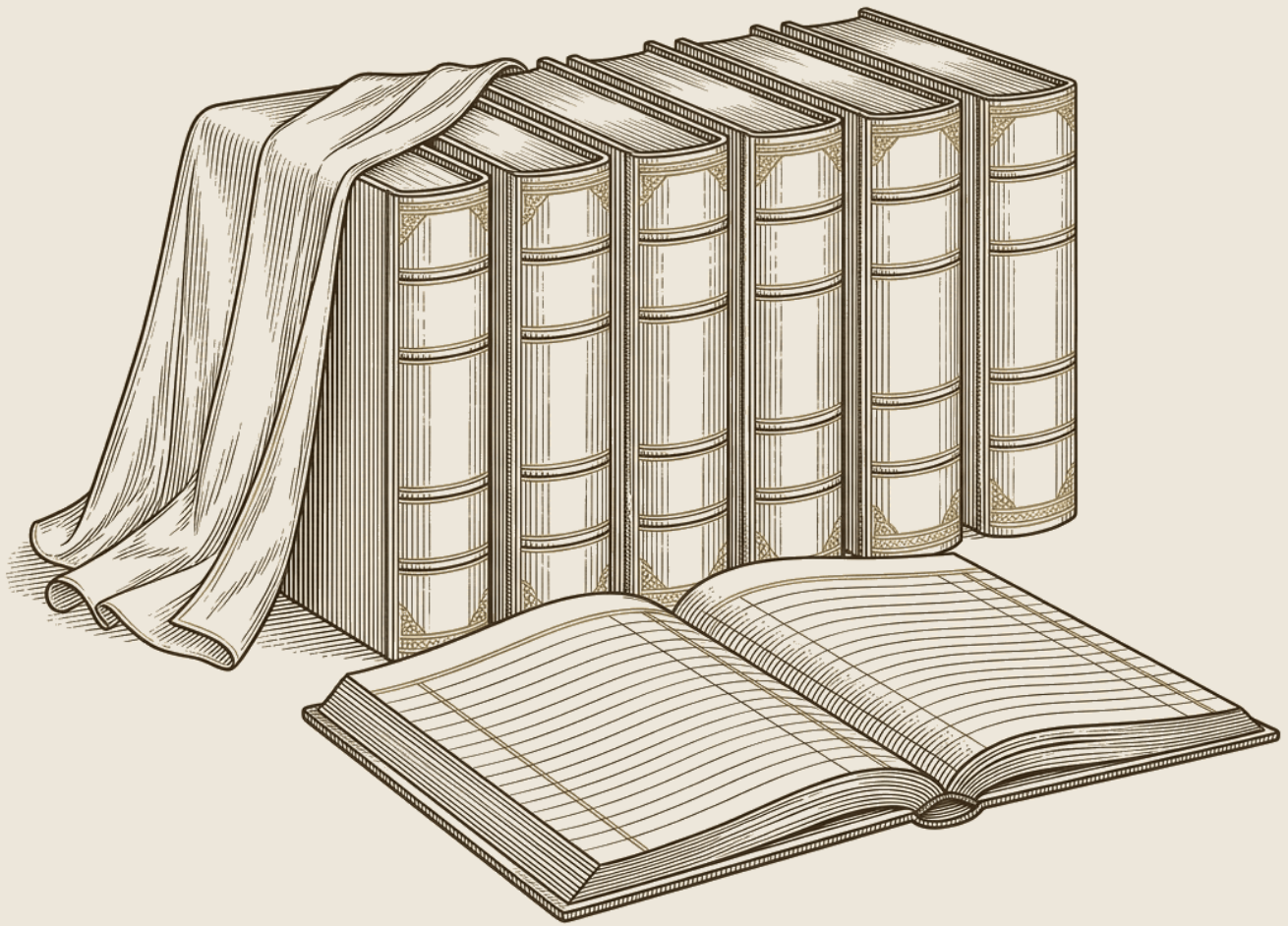




TEN RULES CONSTRUCTION CAN STEAL FROM MANUFACTURING

What transfers, what doesn't and why
improvement rarely survives a project.



THE SAME LESSON, LEARNED AGAIN

Construction has been running lean programmes for about thirty years. They get implemented properly, they work, then the project finishes and a few years later another team starts the same work from scratch.

This is not for lack of effort or intelligence. Plenty of good people have run genuinely good improvement programmes on construction projects. Many of them worked. The problem is what happens next. The project reaches practical completion, the team disperses across four other jobs, the site sheds come down and everything that was learned goes with the people who learned it. The next project starts from roughly where the last one started.

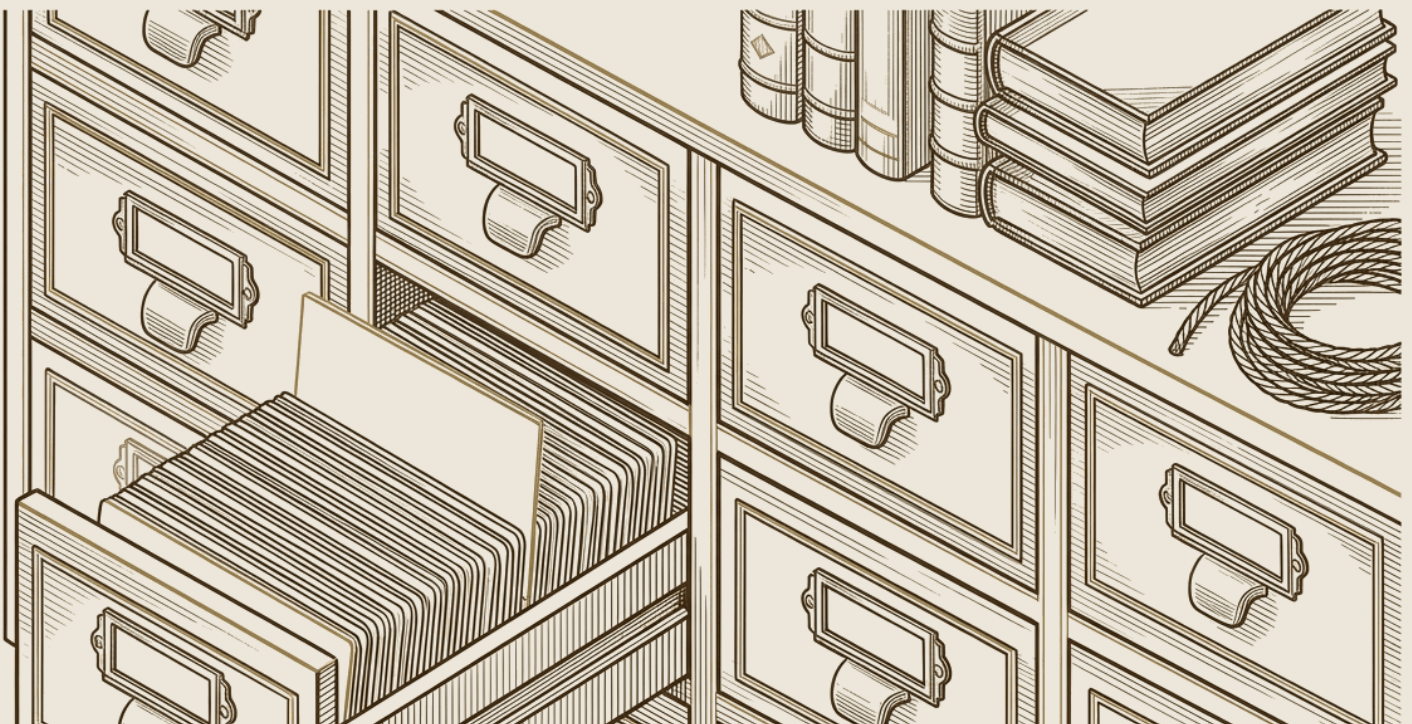
Research on Australian projects has put the direct cost of rework at an average of 6.4% of contract value, with indirect costs adding a further 5.9% on top. That work dates from 2005 and nothing since has replaced it as the Australian benchmark, which is itself telling.

Manufacturing does not have this problem. The reason is not that manufacturers are cleverer. It is that a factory runs the same process tomorrow that it ran today. The line is still there. The measurements are still there. An improvement made in March is still in place in November. Anyone can see whether it held.

Construction's response to this has usually been to point out that every project is different, so the comparison does not hold. That is half true. The half that is false is the important one. The building is unique. The processes are not. A delivery arrives, a trade hands over to another trade, an area is released, an inspection happens. Those events repeat hundreds of times within a single project and thousands across a portfolio. They are as repetitive as anything on a factory floor. They are simply never recorded in a way that lets anybody see it.

What follows is ten rules that transfer from manufacturing to construction without much translation. Most of them are not new. Most of what follows traces back to the Toyota Production System, set out by Taiichi Ohno in 1988. The ideas are older than almost every construction technology currently being sold as innovation. Several will be familiar to anyone who has been near a lean programme. They are collected here because they work and because the tenth one is the reason the other nine keep getting lost.

After the ten there is a longer look at the seventh, which is the one construction has skipped almost entirely and which is the difference between improvement that compounds and improvement that evaporates.



RULES ONE TO THREE

01

MAKE THE WORK VISIBLE BEFORE YOU TRY TO IMPROVE IT

Factories put the state of the line where everyone can see it. That is not primarily for management. The board exists so the people doing the work can see whether the work is going well.

Most sites know exactly what happened today and almost nothing about what happened in March. Visibility has two halves and construction is good at one of them. The current state is usually legible to anyone walking the job. The past state is usually gone.

02

STANDARDISE BEFORE YOU OPTIMISE

You cannot improve a process that is performed differently every time, because you cannot tell whether the change or the variation caused the result. Standard work comes first. Improvement is measured against it.

Every project reinvents its own forms, its own reason codes and its own reporting formats, usually in the first fortnight, usually by whoever has the strongest opinion. Improving a process that changes shape between jobs is guesswork wearing a hard hat.

03

GO AND LOOK AT THE ACTUAL PLACE

Decisions made in a meeting room, about a problem nobody in the room has stood in front of, tend to be wrong in ways that are obvious to anyone who has.

Construction is better at this than almost any other industry. People walk the job. The failure is the mirror image. Everything gets seen and almost nothing gets written down, so the observation dies with the walk.

RULES FOUR TO SIX

04

SMALL BATCHES BEAT BIG ONES

Large batches hide defects and delay feedback. If you make a thousand of something before checking, you find out about the fault a thousand times. Small batches surface problems while they are still cheap.

Releasing an entire floor to a trade at once is a large batch. A detail that is wrong in the first room is wrong in all forty. Nobody finds out until the last one. Releasing in smaller zones costs a little coordination and saves a great deal of rework.

05

ANYONE CAN STOP THE LINE

The person closest to the work has the authority to halt it, without asking permission and without it counting against them. The whole system depends on problems being surfaced early by the people who see them first.

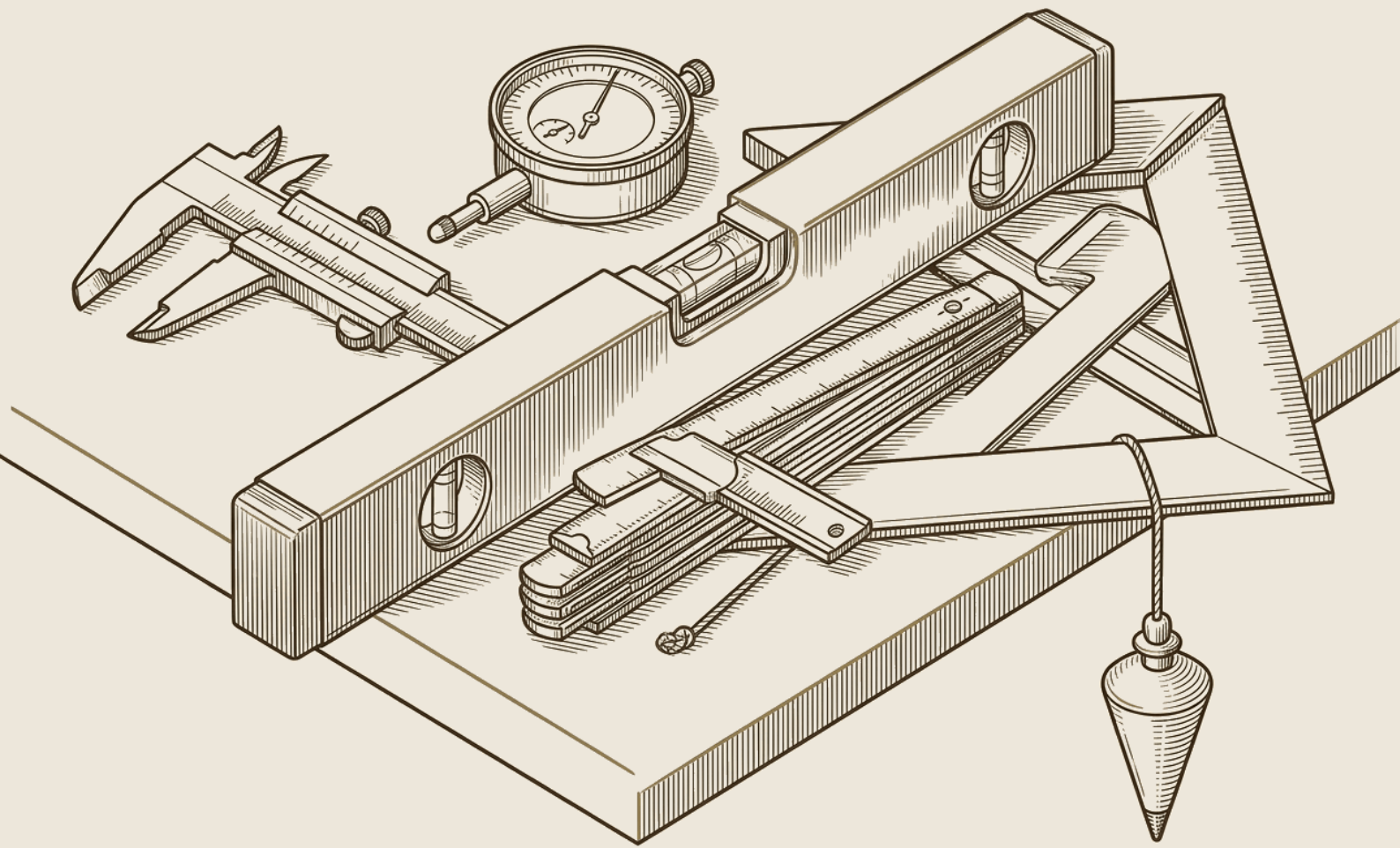
Construction has this for safety and almost nowhere else. A crew that can see the preceding trade has not finished properly will usually build on top of it anyway, because stopping is expensive and complaining is unpopular. The defect gets buried, literally.

06

PULL WORK BY READINESS, NOT BY DATE

Work starts when the step before it is genuinely finished and the step after it is ready to receive it. The schedule describes intent. Readiness decides what actually starts.

Programmes push work by date whether or not the area is available. That produces the most familiar sight in construction, a trade mobilised to a site that is not ready for them, standing around, then demobilised and rescheduled at cost.



RULES SEVEN **TO EIGHT**

07 **REDUCE VARIATION, NOT JUST WASTE**

Lean asks what in this process adds no value. Six sigma asks how much this process varies and why. They are different questions and the second one is the one that makes improvement stick.

Two projects can report the same average and have been completely different experiences. An average conceals the thing you most need to know, which is whether the number is reliable. This rule gets a longer treatment further on, because it is the one construction has largely skipped.

08 **THE HANDOVER IS WHERE THE LOSS IS**

Study almost any process and the delay turns out to sit between the steps rather than inside them. The steps have owners who are measured. The gaps have neither.

Most lost time on a construction project is not a trade working slowly. It is the wait between one trade finishing and the next starting, the area not being released, the inspection not being booked, the question not being answered. Nobody owns the gap, so nobody measures it, so it never improves.

RULES NINE AND TEN

09

COUNT THE PLAN, NOT JUST THE OUTPUT

Volume produced tells you what happened. Reliability of commitment tells you whether the system is under control. A line that hits its number by heroics every week is not a line that is working.

The construction version is simple enough to be uncomfortable. Of the things the team said would be finished this week, how many were finished. Counted honestly for a month, that single number will tell you more about a project than most reporting packs manage in a year, largely because it cannot be argued with after the fact.

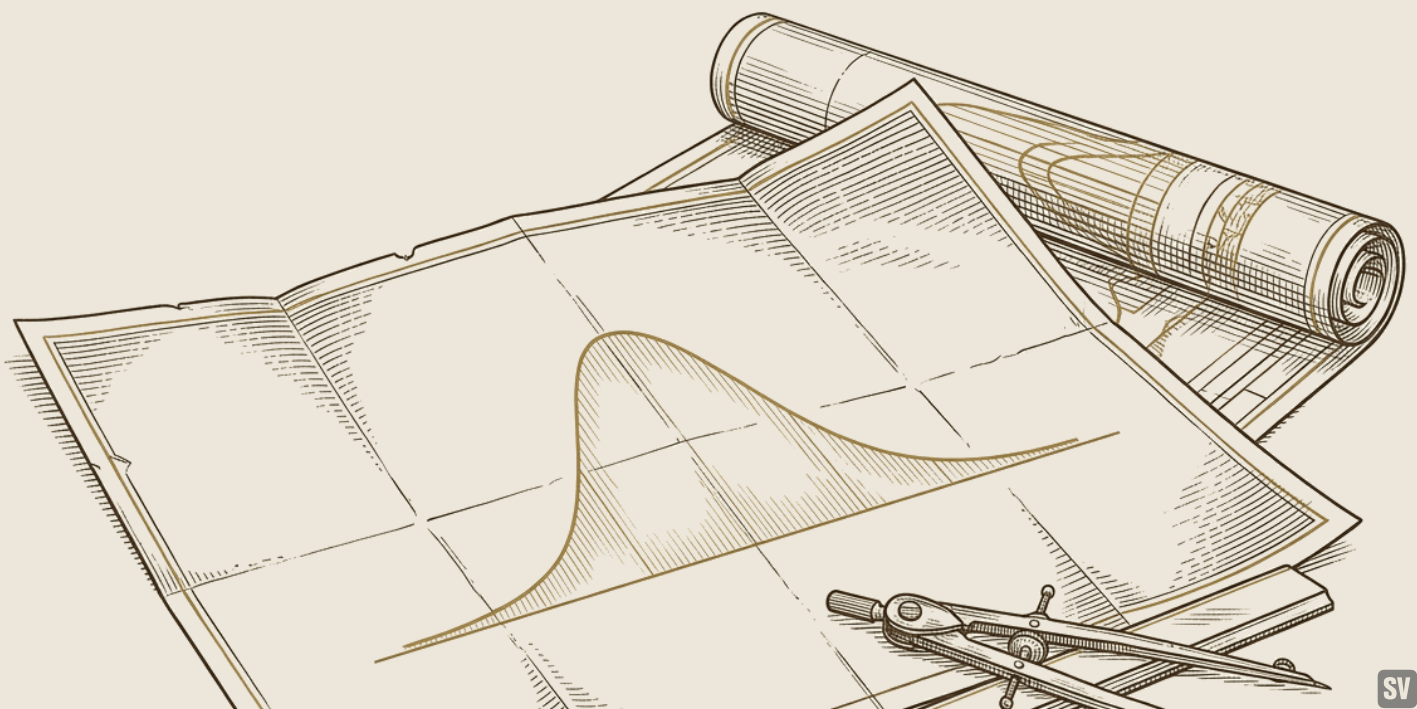
10

AN IMPROVEMENT NOBODY RECORDED DID NOT HAPPEN

Standard work is written down so it can be taught, challenged and improved by someone who was not there when it was invented. An improvement held only in a person's head is not an improvement to the system. It is a skill.

This is the rule that explains why the other nine keep getting lost. Construction improvements are overwhelmingly held in people. People move projects. The learning does not transfer because it was never in a form that could transfer.

Nine of these will be recognisable to anyone who has read about lean. The seventh is the one that tends to get left out. It is the reason the rest do not accumulate.



REDUCE VARIATION, NOT JUST WASTE

Lean and six sigma get bundled together so often that they are frequently assumed to be the same thing. They are not. The difference matters more in construction than almost anywhere.

Lean is about flow and waste. It asks what in this process is not adding value and removes it. It is intuitive, it is satisfying and construction has taken to it enthusiastically, because anyone who has spent a week on site can list ten things that are obviously wasteful.

Six sigma is about variation. It asks how much this process varies, why and whether the variation comes from something specific or from the process itself. It is much less intuitive, it requires counting and construction has almost entirely ignored it.

An average tells you what usually happens. The spread tells you what you can rely on.

Consider delivery turnaround, because it is easy to picture. Suppose the average across a project is forty minutes. That number is nearly useless on its own. If most deliveries take twenty five minutes and a handful take three hours, you have a specific problem with a specific cause. It is probably findable and fixable. If every delivery takes somewhere between thirty and fifty minutes, you have a stable process. Improving it means changing how the process works rather than hunting for a culprit.

Those are two completely different situations requiring two completely different responses. They produce the same average. Acting on the average alone, you would either re-engineer a process that was working, or accept as unavoidable something that had one identifiable cause sitting behind it.

That distinction, between variation with a specific cause and variation inherent in the process, is the single most useful idea six sigma offers. It is unavailable to anyone who is not counting.

WHY IT HAS NOT TRANSFERRED

The usual objection is that variation analysis needs repetition. Construction projects are one-offs. Every site is different, every building is different, so there is nothing to compare.

This confuses the project with the process. The building is unique. The events are not. Within one project a delivery arrives several hundred times. A trade hands an area to another trade dozens of times. A commitment is made and either met or missed every single day. Across a portfolio those numbers run into the thousands.

The unit of repetition is not the project. It is the event. And there are more than enough events to see a pattern, provided they are recorded the same way each time.

That proviso is where it collapses. Recording the same way each time requires the categories to be fixed rather than invented per project, the record to be made at the time rather than reconstructed at month end and the data to survive the project closing down. Construction reliably fails all three, not through carelessness but because nothing in the normal run of a job requires otherwise.

Lean tells you what to change. Six sigma tells you whether it worked and whether it held.

A lean programme without the measurement half feels productive and often is, for a while. Waste gets removed, flow improves, people can see it. What nobody can show, at the end, is which changes made the difference and by how much. So when the project finishes there is nothing to hand on except opinion. The next project treats it as opinion, which is fair enough.

This is not an argument for control charts on every site. It is an argument that the categories should be fixed, the record should be made as the work happens and it should outlast the job. That is a habit and a structure rather than a programme. It is considerably cheaper than the alternative.

FOR ANY OF IT **TO COMPOUND**

A factory improves the same line for twenty years. Construction disbands the team at practical completion and hands the building to somebody else. That is not a flaw to be fixed. It is what the industry is. Any answer that requires it to stop being project based is not an answer.

So the question is narrower than it first appears. It is not how construction becomes manufacturing, since it will not. It is what would have to be true for a lesson learned on one project to be available on the next.

Three things. None of them are technology.

- **The same categories on every project.** Not your categories on your job and someone else's on theirs. If the reasons a task did not get finished are described differently on each site, nothing can ever be compared and every project is a fresh start by construction.
- **Recorded as the work happens.** A record assembled at month end from memory and messages is a reconstruction. Reconstructions are shaped by what suits the person doing the reconstructing. This is not dishonesty, it is how memory works.
- **Kept after the job ends.** Most site data is functionally deleted at practical completion. It exists somewhere, in an archive nobody will open, in a format nobody can query. The next project cannot learn from a record it cannot read.

Do those three and improvement starts to accumulate rather than reset. Skip any one of them and the industry keeps starting lean from scratch every few years, which it will otherwise continue to do indefinitely and which it has been doing for about thirty.

THIRTY YEARS IS A LONG TIME TO KEEP LEARNING THE SAME LESSON.

ABOUT SITEVECTOR

SiteVector records deliveries, task outcomes and daily programme health on site as the work happens, using the same structure on every project. It seals each day into a record anyone can verify.

It exists because of the three conditions on the previous page. Whether a project uses it or not, those conditions are the ones that matter.

Free for 60 days on a live project, no card required.

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Love, P. and Edwards, D. (2005) Calculating total rework costs in Australian construction projects, Civil Engineering and Environmental Systems 22(1). Ohno, T. (1988) Toyota Production System.

