

Developing Maintenance Strategy for a Sheet of Paper

Abstract:

Developing Maintenance Strategy for a Sheet of Paper: How do you work-out the right life-cycle maintenance strategies? Does one strategy apply throughout an asset's life? What influences the choices and decisions as to what maintenance to do and when it should be done? How much money and resources do you expend in the maintenance of an asset? To keep the concepts behind these important questions on maintenance strategy selection simple they are applied to a sheet of paper.

Keywords: maintenance strategy, life-cycle asset management, qualitative risk analysis

Grab a new sheet of blank letter quality paper. What will it become? What value will it hold for you? Is it to be a page in the first draft of a report – in which case it will go in the bin after the redraft? Will it be a sheet in the final draft and go to others for review and consideration – in which case it must be protected until finished with it? What if it was to be your last Will and Testament to your dear family; if so it must be kept safe against time's ravishing, and impossible-to-know adverse events? How you chose to protect this sheet, the maintenance strategies you use on it, depend on both the worth of its use and the cost of its loss.

If the sheet of paper is a draft destined to be bin fodder you need but ensure it runs freely through the printer and it can be read until the re-draft is done. Beyond that it has no value. Unless it was fuel for a fire (then it becomes a menace) you do nothing extra to preserve it except to put it in a file for the sake of tidiness, convenience and temporary security. But if the blank sheet of paper is to be a page in the final draft of an important report, you cannot treat it the same way as a sheet destined for scrap. During its life the final draft is highly valuable. It will be handled by many people and travel to many locations and must be protected from harm. What protection must be put into place so the sheet from a final draft is kept safe until the report is finished with?

What dangers and risks must you protect a precious final draft page from? What hazards will confront it? How can you determine what they are? The easiest way is to conduct a qualitative risk analysis and ask others of their experiences and observations. This approach gets you information learnt from history like – paper burns, keep it dry, keep it clean, and don't let it get crushed. This is all very useful advice and clearly important to know about. But what of the hazards no one knows about that have been luckily avoided – the 'black swan' events¹?

We need to learn what the limitations of a paper sheet are if we want to protect it for a long time. What stresses in which situations will make the paper fail? It means doing laboratory trials and simulations to discover what added risks there could be. Knowing what leads to failure lets us extrapolate the laboratory learning into real life and put into place actions to prevent any loss. There are some simple 'bench-top trials' that you can do to see what fails a sheet of paper.

Grab the ends of the sheet in your hands and pull the sheet hard. When I tried this on an 80gsm weight sheet of A4 paper it did not rip, even under great effort. I snapped the sheet several times and still it did not fail. The paper was strong. In the next trial I sliced a cut a millimetre or two deep with a knife midway on a long edge and repeated the 'pull-and-snap stress test'. Pulling and snapping the cut sheet did not cause it to fail. One small cut seemed okay. But what if there were many small cuts? I added four more similar cuts 25mm apart along the same edge and

¹ CALDWELL, Malcolm., 'Outliers – the story of success', Allen Lane, 2008 (See Post Script note)
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repeated the pulling and snapping test. The paper was fine and the extra cuts had no effect. Shallow cuts on an edge do not fail a sheet of A4 paper. But what if they were deeper cuts?

I extended the first cut to 25 mm deep then pulled and snapped the sheet again. It did not fail on pulling, but on the first snap it ripped in half. Would the same occur if the edge was jaggedly hand-ripped? I repeated the series of tests and instead of cutting the edges I tore them with my fingers. There are no pulling failures from the small tears, but two snaps of the 25mm deep tear ripped the sheet in half. Now there was real evidence of a situation that could fail a sheet – a deep cut or tear on the paper's edge weakens it and a hard jerk could rip the sheet through.

What else fails a sheet of paper? We know water softens paper but how much is necessary to cause the sheet to fail? In this test I wet my thumb and pointer and lightly pinched the centre of a long edge. The wetness stretched about 10mm from the edge into the sheet. Pulling and snapping did not fail the sheet but a tear appeared in the centre of the wet patch and ran to the dry boundary. I added two wet pinches at 30mm both sides of the first and repeated the 'stress test'. The paper remained complete but rips formed in all three wet sections.

Imagining someone placing a cup of coffee or glass of water on the sheet I put the wet base of a 75mm mug in the middle of a new paper sheet. Once it was wet through I pulled and snapped the sheet. On pulling firmly a tear appeared in the centre of the wetness and grew at right-angles to the pull and the whole sheet ripped in half. In the final test the underside of the wet mug was sat on a new sheet so its outer diameter touched the mid-point of a long side. The sheet ripped readily from the wet edge on a mild pull and then tore completely. Such tests produce vital information when deciding maintenance strategy for a sheet of paper. Moisture on a sheet of paper is a great danger. Large wet areas on paper mean disaster is close. With small wet patches the sheet is probably safe; provided they don't combine into a large wet area.

Danger from dampness and edge damage to a sheet of paper is real, but the risk is all speculation. The sheet has to first get wet or be deeply ripped before there is a peril; and that may never happen. What maintenance strategies do you chose in situations of uncertainty? Will you spend money and resources to protect the sheet just in-case of possible damage?

A comprehensive maintenance strategy for a final draft report is to ensure it will live its entire useful life wrapped in a water-proof, sealed jacket inside a strong folder and only be taken out of its protection when it is actually needed; then immediately returned to its moisture-safe and strong haven. On the protective jacket ought to be warning signage advising all to keep the paper safe from moisture, to use only good handling practices, and return it to the jacket when not in use. During transportation the report is best laid flat inside a water-proof cover within a stiff casing to prevent crushing and tearing of the paper.

If instead the destiny of this sheet of paper is to be your last Will and Testament, is the short-term protection for a final draft sufficient for a Will with potentially decades of life? Is a report maintenance strategy suited to a long-term Will scenario? Maybe it is, but that can only be confirmed once the effects of time and many unknown and unknowable opportunities for failure are factored into the decision-making.

What can happen to a Will over the next 10, 20 maybe even 60 years that is unlikely to happen to a final report over the next few months? Who can know for sure – maybe nothing at all – but if something happens to destroy your last Will, and you had done nothing to prevent it, you will have been a poor custodian of your children's' and grandchildren's future.

The chances of destroying a Will are many and over decades there will be numerous opportunities for them to happen. Of course nothing may happen and all your precautions would

have been unnecessary. But you cannot know that today and you must plan and prepare for decades of unknowable future. The maintenance strategies you take-on, even though they may prove to be totally unnecessary, depends on the size of your loss should disaster happen.

It's interesting to realise that it is most important to you that nothing goes wrong to your Will. You want the Will to always be available to your family. First you want security against its loss, and then you think about the cost of providing that security. You are happiest knowing that your desires will be passed to your family regardless of what unknown events may happen.

An excellent maintenance strategy must address all possible events that could happen over the decades, even when it is uncertain that they will actually occur. If you think a maintenance strategy for a Will should not address 'acts of God' you will never put your Will in a strongly built safe. If you do not consider who handles the Will, and how they should handle it, you will not require proof that the people caring for your dearest wishes are able to ensure its security over the long years ahead. You will rely too much on good fortune and hope, a strategy, which over the passing decades has ever smaller chance of success.

Paper is destroyed or made unusable by age, chemicals, fire, water, sharp implements, intentional human acts, careless human acts, and Acts of God. All these are possible at sometime. Do you assume that they all could occur and protect against them all, or do you do only what is likely to happen and nothing more? From your decisions to that question come your maintenance strategies and the associated costs you must carry. Being sorry after the sheet is destroyed is a useless defence.

When a sheet of paper is to go in the bin next week you do the least necessary to protect it for a week – good filing practices, kept clear of water, in a location protected from fire. If the sheet of paper is important for a year you add protective devices and practices that ensure its safety for the required period. When the sheet of paper is irreplaceable you do everything humanly and technologically possible for its survival. What maintenance and care you chose to do must include consideration of how an item's loss impacts your future needs.

You could skimp on all suggested protection and mostly get away with it. You don't have to do anything at all. You can choose to replace a sheet 'if and when' it failed. So much of the decision on maintenance strategy selection depends on your own private level of risk aversion. This truth is the sheet's greatest danger, and we don't even recognise it as we make our choices

First you must know the importance of a business asset before you can contemplate its proper and appropriate life-cycle asset management and maintenance strategies. You must use a business process free of personal risk bias that values the true loss of an asset to the business' future. If you don't know the real value of an asset to the lifetime success of your business (which is totally different to an asset's book-worth) you never 'see' the right maintenance and asset management strategies to apply. First calculate the very worst loss you can suffer and then select those life-cycle asset management processes and maintenance strategies that remove the risks of that loss during the item's lifetime. Those who are risk adverse minimise the chance of all foreseeable bad events affecting the wellbeing of what they steward, even though they may not happen. This practice will lead you to a secure, happy future where maintenance is an investment in creating long-lasting business health and wellbeing.

Best regards,

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Post Script: After completing this article the final draft document experienced a ‘black swan’ event. The name ‘black swan’ event reflects the expectations held by Europeans, before they found Australia, that all swans are white. In Australia swans are black. The moral to the story is that you cannot say a thing will not occur simply because it has not yet happened.

The ‘black swan’ event was a sheet of the final draft falling onto my office’s carpeted floor, where I ran over it with the office chair wheels while sitting in the chair as I bent down to pick it up. The wheels crushed a track through the paper. The sheet was not destroyed but I could not keep it as a final draft. I had no protection in place to stop chair wheels crushing the paper. What additional ‘maintenance strategy’ would you recommend be included after this incident?