Creating Small Programs To Do One Thing Well

Karthik Suresh

ABSTRACT

This paper looks back the Unix concept of creating small programs that do one thing well and considers what that approach could teach us when designing modern management and organisational systems.

1. The concept of small programs

The history of Unix is a history of innovation within constraints. It showed that you could have a powerful and usable operating system that ran on inexpensive hardware and didn't take a huge amount of human time and effort to use. It could be simple, elegant and easy to use. The main constraint was physical — in terms of the amount of memory available, which limited how big programs could be. This led to a preference for having a number of small programs rather than one big one. The other key idea was Douglas McIlroy's invention of pipes. He wrote "We should have some ways of coupling programs like garden hoses — screw in another segment when it becomes necessary to massage data in another way."

He concludes with a zen-like statement, "This is the way of IO also."

If you listen to interviews with Ken Thompson these two concepts — small programs and the ability to connect them together — transformed their approach to programming on Unix systems. They built the ability to create pipelines in a day and then went onto the task of converting all the programs they had so that the output of one could be used as the input for another, with the program acting just as a filter. Suddenly you could combine simple, small tools in unexpected and creative combinations to create capability that you would have taken a long time to put together from scratch.

This is such a novel idea that even now, decades later, much of the world is unaware that such an approach can possibly exist or work.

2. Why is thinking small so hard?

Why is it that we're always asked to think big, to have great ambition and that everything old is bad and we need the new to do better? It feels a bit like an idea that has arisen from other ideas — and the flaws in the latter are built into the former but we don't know how to think in any other way.

I'm not a trained economist but a quote from Stephen Landsburg always comes to mind when I think about economics. He wrote, "Economics is the study of incentives. All else is commentary." So let's think about the basis of capitalist economics and see if the incentives make sense.

I feel like the history of capitalism started like this. One day Adam Smith looked at how pins were made. As a quick digression, when we moved into our house, I spent days removing layers of carpets. The top layers were stuck down with staples, the next with round nails and then, lower still, you had cruder nails, with squared sides, as if they had been created by a machine hammering them down. You can see the history of your house in how things have been fixed in place. Anyway, Adam Smith looked at how pins were made and had a brainwave. One person, working with a hammer and a fire could make so many pins a day. Machines could make a lot more every day. So, instead of paying labour, you should invest in machinery and then retrain your labour force or hire new people that work with the machinery.

Capitalism then, is very simply about putting money into machines rather than paying people for their time. But, as that makes the people who don't get paid very unhappy, capitalists realised that jobs had to be created and so, hand-in-hand with investment in capital came a need to create jobs, which in turn would come by getting more people to buy more stuff which then would need more people to staff machines and create new ones. But then because machines get more efficient, they keep destroying jobs and so you have to keep expanding the market or the economy to create new jobs.

This does not sound like a natural state of being and it isn't. It's a purely artificial situation that comes from the observation that you should invest in big machines that do more and more because that's more efficient.

The incentive then, for people who have capital, is to create systems that let them use that capital with no limits. That means that they should be able to do things — make nails, mine coal, build houses, create software and so on, with as little responsibility as possible. The classic example of this is a factory that takes in clean water from a river, uses it to do whatever it does and then pours its polluted water back into the river, where it flows down and can no longer be used by anyone else. The factory is happy because it's using capital effectively but society and the environment as a whole are worse off.

Some countries deal with this through regulation but there are many places in the world where the owners of capital are powerful enough to do this and get away with it, and of course that was the case in many developed countries as well not that long ago.

The point is that big is not better. It's only better for some people — the ones that have what is needed to become big.

3. Why small is better

If economics is the study of incentives and the incentive behind capitalism is to get rich, what incentive is there to be small? It's probably less to do with incentives and more to do with what is natural. The way to think about it is to think about waste.

I heard recently that the idea of waste is a purely human thing, You don't see it in nature. There isn't a single thing in the natural world that is the equivalent of plastic or a rubber tyre. Natural things are born, live, die and form the inputs and outputs to other things. There is no animal, other than man, that kills for sport or for belief. No animal that changes the world to fit it rather than adapt to fit into the world.

But the irony is that man is also the only animal that is capable of recognising the difference — that can change the way it thinks. If we just thought differently, everything would change. The world we live in right now is born of choice — not one that is a natural state of being.

About the author

Karthik Suresh is a Management Consultant who helps customers with energy, utility, sustainability, research, innovation and knowledge management projects. His experience includes working with large and small organisations to select and implement strategic decision systems, improve and develop management capability and deploy risk management, IT, communications and information systems projects.

Please feel free to connect on LinkedIn or read more at www.karthik-suresh.com

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