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EP 124 | S-Curves and the Adoption Cycle

Rob Campbell (0:00)

Coming up on the podcast, I'm joined by Grayson Witcher, portfolio manager of our U.S. equity strategy. Last year, as part of our top-down scenarios forum, Grayson took the time to study S-curves, which, as the name implies, describes the rate of adoption or penetration of a given technology or product over time—much like the shape of the letter 's,' gaining slowly at first, then hitting an inflection point and rising rapidly before levelling off at full adoption.

Throughout our conversation, Grayson explains what we can learn from the S-curves of technologies both old and new: cars, refrigerators, landlines, Kindles, USB ports, and biologic drugs—and they all looked a bit different. And while many new technologies may fall victim to the hype cycle, Grayson ultimately focuses on the most important takeaways for long-term investors: which S-curves have the greatest chances of longevity, and the need to be humble by considering a wide variety of scenarios for how S-curves may unfold. Hope you enjoy.

Disclaimer (01:18):

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Rob Campbell (01:35):

Portfolio Manager Grayson Witcher is here with me today—hey Grayson!

Grayson Witcher (01:39):

Hey Rob, how are you?

Rob Campbell (01:40):

I'm doing great. Our colleague Justin Anderson was on the podcast probably towards the beginning of the year—I think it was episode 101 actually—in which he talked about a framework for identifying what he called the "holy compounders," or companies that can generate very high returns over long periods of time.

One of the first parts in that framework was an assessment of the total addressable market (or the TAM) for a given company's product to services and how realistic that might be. And so, Grayson, you're here today to talk about something that I think is related to that—you recently looked into the concepts of S-curves. So let's start there: what is an S-curve? Why'd you get interested in it? And am I right that it's related to this concept of TAM?

Grayson Witcher (02:21):

Yes, S-curves are something I was doing some reading on over the last couple years, mostly because I saw concepts like Justin was talking about, talking about TAM. A lot of new companies, especially [tech] type companies, have really been pushing this idea of TAM (total addressable market) because a lot of them are early in the stages of growth, so they're a new concept and aren't really selling much of their product yet, but they're trying to sell you on the future where everybody's going to use their product.

And so they talk about what the future will look like in 10 or 20 years—and that's their total addressable market. Some of these concepts have been around a little bit longer and that's what I was interested in, that perhaps some of these aren't quite as new and the growth isn't quite as big as some of these companies talk about. Thinking about things like YouTube for example, that would follow this S-curve, but most people use YouTube now, and so perhaps the growth of a platform like that isn't quite as big as it was 10 or 15 years ago.

So thinking about, okay, where do these different technologies fall into an S-curve. And an S-curve—just to make sure we're on the same page, S-curve got the name because it looks like an S that's been pulled out horizontally. So it starts on the bottom and rises quickly in the middle section and then it flattens back out at the top. It shows you penetration for a product. And so when you think about something like Spotify or music [streaming] for example, if you're going to stream music, you can think about a product like that where if you look back, I don't know, 15 years ago, almost no one was going to be streaming music. They'd be downloading it through Apple or even buying CDs or buying vinyl.

No one would be streaming music. And then all of a sudden they introduce this product and you get a few of the early adopters. They're often the first into technology, even if it's not totally polished; these early adopters are going to be keen to try something else out. They really like trying out new technology. Maybe it's something they can brag about—that they're first ones to be streaming music, or driving an electric car, or whatever it is. And then you get the masses follow[ing] after that.

And so that's where you move from the early adopters to the general masses where the technology's polished enough where people can use it. Probably a lot of people listening to podcasts are going to be in that camp, where they said, "Okay, Spotify has gotten good enough now, several years ago, where I'm going to try it and subscribe to it and listen to my music that way and stop downloading music and stop buying CDs and the product works great."

And then once all those people join, the growth slows down, the penetration slows down. We're probably closer to that stage with something like streaming music, where in North America probably about 60% of people stream music. So yeah, it's getting to the higher section of things. You're probably never going to get to 100% of people want to stream music, but you might get to a higher number like that. And so that's the S-curve. You get that kind of penetration of slow growth, fast growth, slow growth, and then you get the early adopters and the masses and then full adoption in the end. So there's a couple of different ways to think about it.

Rob Campbell (05:17):

Just given the nature of the current environment that we're in and this idea that software is eating the world, technological advancements seem to be happening very, very quickly—and we've obviously seen companies that have just exploded in market cap on the successful adoption and penetration of their products—is it fair to say that S-curves are steeper today than they've ever been? Or is that just too narrow a mindset?

Grayson Witcher (05:39):

I think that might be true in some ways. Certainly if you go back, there have been technologies from a long time ago where the S-curve was pretty steep. I'm thinking about things like television, for example, would be one when it came out in the 1950s, I guess, where that ramped up really quickly. I mean it was a product that was pretty revolutionary. You go from if you want to see live action, basically, you'd have to go to a theatre to watch a kind of motion picture in the theatre, or you'd have to go see something live—people acting in a play—or something like that. This was a massive shift. And so I think you see some technologies where they move quite quick[ly], like TV where in a period of a decade, you went from 10% penetration to 90%, so really steep up the S-curve. But a lot of them are quite a bit slower before, and so I think it's probably a fair statement that you're seeing a lot faster ramp.

Another example would be telephones. So that was one that, again, revolutionary when you think about the landline telephone 80 years ago—something like that where very few people would have a landline telephone. And so that slowly ramped up over time. But now when you see the latest iterations of a telephone, things like the cell phone in the 90s [for example] that really took off. That went from 0% or less than 10% in the early 90s to 90% over 20 years. And smartphones were kind of like that but almost faster. So, I think you're seeing those ramp a little bit faster.

It's hard to know exactly why. It could be that modern production is allowing for these things. You can make so many smartphones—Apple or Samsung can make millions of smartphones at a time right now, and so that technology can reach penetration a little bit faster. So, it could be things like that, or it could just be news of some of these inventions, I guess, spreads a little bit faster now with the internet.

Rob Campbell (07:26):

Distribution too, I would imagine. Just the ability to distribute virtually versus getting a product in stores for example.

Grayson Witcher (07:32):

That's right.

Rob Campbell (07:33):

This is probably a fundamental question and I can imagine what the answer is, but why do you care about S-curves? Why does it matter to you as an investor?

Grayson Witcher (07:40):

These are important. We're trying to find great companies. So these are companies that have a strong competitive advantage, can often lead to higher growth and for that company to generate strong returns. As a result of that competitive advantage, they can generate returns of capital that are higher. So, you put a dollar in, you can get 20% return on that instead of 10% or 30% return instead of 10%. And so that's really important. That's something we've always looked for—is higher return on capital and strong competitive advantages. And so I think that these companies have that often and more importantly, their competitive advantage is going to be stronger in the future than it is today. And so I think that's often what we're looking for. We're not just trying to find the strongest companies from a year ago or presently because that's, in general, not the best way to make money for our clients.

We're trying to find those companies that have a strengthening competitive advantage or the management team is getting stronger over time because those ones are going to be [an] even better business five or 10 years from now than they are today. And as you know Rob, we're long-term investors, so we're going to be holding these investments for the next 10 years+, ideally. So, 10 years from now when we look back, we want to have this company that's stronger in 2032 than it is in 2022.

And so that's why we're looking at these companies—because we think there's great opportunities with them. The other reason this is important and why we should talk about this is the market might be a little optimistic—(at least that was the hypothesis going in)—perhaps a little bit too excited about some of these companies than it should be. And it's just, perhaps, a lazy mental shortcut.

You have a company like Google that's been growing at roughly 20% a year for many years, it's just quite easy to make that shortcut and say, "Yeah, it's probably going to keep growing 20% a year. Seems like they've got a lot of growth opportunities. Let's just keep assuming that for now and maybe at some point in the future the growth will slow down, but that's not in the foreseeable future."

I think a lot of people kind of take this mental shortcut and we were trying to make sure that was the correct thing to do. And so we wanted to look at these companies and say, "Hey, is this true that five years from now they'll still be growing at that pace, or will the growth slow down in the next two or three years, or the next five or 60 years?" And if that's the case, we need to adjust our discounted cash flow models. As you know, many years in the future we're explicitly forecasting 15 years and then we forecast a continuing value. We want to understand those cash flows over the next 15 years to make sure the value is what we think it is.

Rob Campbell (10:08):

There's something you said earlier that I wanted to push on a little bit, which is this idea that competitive advantages five or 10 years out might be stronger. That seems really hard to do as a company sort of rolls up the steeper part of the S-curve and the penetration is getting deeper. Presumably, that incents competition, which makes it harder for that company to really take advantage of the rest of the S-curve from there. Is that the right way of thinking about it? And maybe, just connecting it to your second point in just the ways in which S-curves could go wrong, if you could share a little bit more on that in terms of where, as investors, we need to think a little bit more carefully as to how those S-curves might develop.

Grayson Witcher (10:45):

That's capitalism for you: you get an attractive market, there's going to be a lot of investors or innovators who are going to flock to that market and try and take advantage of that big opportunity. That's why we focus a lot on competitive advantage. Not only do we want to see this large growth opportunity, but we want to make sure that they can protect that with some sort of barriers to entry. That's a big component of how we think about S-curves and growth and future competitive advantages. It could a company like Google, for example, where they have a great search product that most people are aware of. They can maintain that competitive advantage of having just better results by the nature of their network effect. And so basically, the more people that use their search, the more they can refine the results to get better search results and then [as] you get better search results, you get more people using it. So it's a bit of a network effect.

As well, there's a bit of a black box to Google—you don't know exactly how their algorithm works. You might have general ideas from reading about how they've talked about it over time, but an outsider doesn't know all the details about their search algorithm—that's a bit of a mystery to others. And so if you and I were trying to create a new search algorithm to copy Google to compete with them, we may not be able to do that because we wouldn't know all the details and we wouldn't have all the data that they have to kind of tweak our algorithm.

And so that's something we really look for in these businesses: not just the large opportunity to grow, but also the ability to protect those cashflow streams over the next five or 10 years.

Rob Campbell (12:15):

Building on that, can you talk about—we've got the classic successful development where you take advantage of the entire market opportunity, but one that I thought about is, what if it just takes longer? What if that "S" gets sort of pulled out over time? And what that might mean as investors?

Grayson Witcher (12:31):

They can all look a little bit different and it's no guarantee that because you come up with a good product, it's going to run up that S-curve in a certain amount of time and be successful. So, some are much quicker than others in getting up that S-curve. One example of one that perhaps was a little bit slower to ramp up the S-curve is the personal computer. You look back to the early 80s I guess it was, when Apple and Steve Jobs were kind of really touting the personal computer—shifting from computers being so big that they would be the size of a car or a room in a house (which obviously is not functional for an individual)—to kind of this new revolution of a personal computer that you could use in your house and really improve quality of life and the number of things you could do and the speed of which you could do a lot of things.

But when you look at computers, [while] they're quite quick in many ways to moving up the S-curve…[it] probably took 20+ years even to get to [a] third of the market having a computer from when the first commercial introduction was. So that's not ultra fast when you compare it to things like TVs or smartphones or even smart speakers—the Alexas of the Google Homes—those kind of things. A lot of those are now getting up to over 50% of the market in five years or 10 years. And so computers took a much longer time to get there and things get dragged out because the cost is not quite there and perhaps people don't see the immediate benefit to some of these devices.

Grayson Witcher (13:59):

A lot of times you don't see the benefit or the outcome for yourself—and so you may not feel like you need a computer [for example], which was the case for a lot of people, or maybe they couldn't afford a computer in those early stages. So it [was] just a slower ramp than a lot of [other] technologies. Comparing that to a smart speaker, they're pretty cheap. They're getting given away for a hundred bucks. They're even given away by a lot of the companies at Google to capture data. And so a lot of those ramped up much faster. And so that is one of the ways that S-curves can vary over time.

Rob Campbell (14:29):

What about another one? So, less horizontally and more vertically? Also, probably in the camp of "optimistic forecast at the outset," but where it's just a lower saturation point—you don't get the full 100% of the market, it tops out at a certain point.

Grayson Witcher (14:43):

One example of that would be a reader like a Kindle. If you think about [it], many of you probably have a Kindle to read books on, or have had one at some point. There was a lot of optimism with that when they first came out. When you think about them, there's a lot of benefits to them, right? It's fairly light, it's easy to hold, you can store—

Rob Campbell (15:01):

—You don't need these things [Rob gestures to bookshelves behind him].

Grayson Witcher (15:02):

—20 books on it. If you go on vacation, you don't have to have a whole suitcase full of books to lie on the beach when you're on vacation. You can immediately get the book; it just downloads right from the internet, so you don't have to even have it delivered to your house or go to the bookstore to get it. So, there's many positives to the e-reader that would make you believe, "who's going to buy a paper book anymore? They'd be crazy to do that." For some reason it didn't pan out.

When you look at the e-book reader, they saturated in maybe the low twenties or the mid-twenties percent of people would have an e-reader now like a Kindle. When you looked at the early phase of the S-curve, you could draw the picture of it getting from 10% right up to 80-90% and that would be quite reasonable and would follow the path of a lot of other technologies—smartphones or tablets or other things that are similar to it. But for some reason it just stopped at a certain point and flattened out and kind of left off in the twenties percent of people using it.

So yeah, that's a good example of just of a lower ceiling. And that's important, right? Because if you were forecasting in your model that they'd get to 80% penetration in the U.S. and only got to 20% for a quarter of the people using it you thought were going to use it, your valuation for the company is going to be drastically off. And so that was important for us to really understand.

Rob Campbell (16:21):

Okay, you mentioned tablets—maybe some displacement there perhaps with respect to e-readers, a commentary on how many people actually read books [laughs].

Another scenario I thought about was this idea that the S-curve can reverse. You sort of reach a certain level of penetration, but then something happens and you fall right back down. Is that pretty common?

Grayson Witcher (16:43):

That is fairly common. And when you think about [it], depends on your time horizon. But for most products over their full life cycle, there's probably two S-curves: you ride the S-curve up to full penetration and then you kind of ride it back down. And often [it's] a mirror image of the first part of it as you ride it back down. Usually there's a new technology that's replaced that. So, you think about even a landline telephone—everyone would've had a landline telephone 20 years ago. Now, far fewer people have that. People have cell phones. You ramp up on the S-curve for the cell phone or your smartphone and corresponding to that, you have the ramp down on your landline as many people think, "you don't need both of them."

Another example would be back to streaming. I gave the example of streaming earlier (of music). You saw the early part of an S-curve for music downloads mostly with Apple back in mid-2000 (2004) to 2010 or 2012, where they kind of released a product that was quite compelling for most people.

Before that, there was really only kind of illegal sites like Napster where people were downloading music and those sites took off—in part because they're free, but also in part because they had great technology and people realized that, "Hey, I can get music in 20 seconds. I don't have to walk the store, I don't have to get a CD and get my CD player out. I can just listen on my computer and I can get [that] music—any music I want—really quickly." So Apple stole that idea [with] iTunes [from] some of those early sites and introduced a compelling download case.

So you saw the S-curve start to ramp up for downloads from that period of 2004 to 2011 or 2012. But, as you're talking about Rob, it reversed course. And you kind of saw the early demise of that alternative as streaming came along.

Downloads quickly turned back around and started to decline [in] 2012-13-14 as sites like Spotify came out where you could stream music and people thought that was just a better solution. If you combine the two products and kind of aggregate the amount of music used, you still get that S-curve, except that with Spotify, that's the growth part of the S-curve in the end and downloads are kind of the shrinking part of the S-curve.

So that's one example of where an S-curve quickly dies—probably quicker than you might have expected given the dominance of Apple iTunes in the early days of the iPhone and the iPod. But better technologies [have] come out. That's the amazing thing about technology—is it's always changing. And you get these better technologies [that] come out, so there's no guarantee that you're going to hold onto that market share forever.

Rob Campbell (19:13):

Can I pick up on that in the sense that some of these ideas that we've talked about, well, I suppose everything is evolutionary, but some of them strike me as being more revolutionary in nature versus just improvements or slight adaptations of what's come before. Are there distinctions between those types of S-curves? And as an investor, does it matter whether something's truly revolutionary versus an improvement or picking up on what's come before it?

Grayson Witcher (19:37):

We think so. Things that are revolutionary are really going to change the world. When you look back over the past hundred years, you could think of examples like the automobile, for example, versus a train or a horse. So, much better of a solution than riding a horse from point A to point B or taking a train. Obviously trains—they're so expensive, you can't ride a train from your house to work. Large number of people have to use them. And so you think about automobile is just a revolutionary product, or radio could be another one where you just had no way to share audio messages over long distances before. I don't know, even a refrigerator for example, instead of an ice box or a cellar or something like that. That's just so much better of a solution that it really just takes over quite quickly.

So those are revolutionary and those are important to monitor.

And some of those have a pretty long life, versus things that are more evolutionary, [which] can also grow quite quickly, but it might be the case where it can be a quicker replacement cycle. So you think about things like the television being revolutionary, that's massive. You go from nothing, going to the theatre to watch a motion picture, to having it in your house. That's a huge revolution. But [while] shifting from standard definition to high-definition TV is certainly a massive improvement, [it's] perhaps not as revolutionary. Or switching from 1080p to 4K. Again, [it's] a much better experience, but perhaps not as revolutionary.

I think the implication for those is that you just have to be a little bit more careful with some of these more evolutionary products because I think they can be replaced a little bit faster. [Is] a medium like a television in a broader sense going to be replaced anytime soon? Probably not. There's probably going to be some sort of way to watch an image in your house for the next 50 years. That wouldn't be surprising to me. But is that image going to be on a 4K TV or an 8K TV or a hologram? I'm not really sure exactly.

So, I think it's important for us to think about when we're trying to forecast some of these markets, to think about how long that technology will last and how quickly it'll be replaced by something new.

Rob Campbell (21:47):

What are your conclusions from having looked at S-curves and how they've played out historically in managing the U.S. equity portfolio? What are some of the takeaways that you've had from that?

Grayson Witcher (21:58):

These are attractive growth markets and so we want to take advantage of these. These are amazing new technologies in many cases that are being adopted by large percentages of the population for a reason. They're improving people's quality of life, they're making life easier for people. They're allowing you to do things faster than you could have done before. Many things are like that. Refrigerators, cars, the internet, there's lots of these solutions that really have changed people's lives over time. And so as long-term investors, we want to take advantage of these themes. If we think about some of these big themes that could be happening over the next five or 10 years, it's important for us to understand them and to find ways to make money; invest in companies that are going to benefit from these themes to improve the returns that we achieve for our clients. That's one advantage of looking at why this is important.

Another is thinking about ones that have longer lifespans versus shorter lifespans. We want to invest in some of these themes that are real long-term themes; we think the odds are a bit higher when you're investing in 20, 30-year themes. You don't have to pick the exact right time to invest in them, you just have to find companies that can benefit from those themes over a longer time period.

Looking forward, it could be things like EVs (electric vehicles), so that seems like a theme that's likely to pan out over the next 20 or 30 years. There'll still be gasoline-powered cars on the roads 20 years from now in all likelihood; we feel quite confident that there'll be more electric cars 10 years from now or 20 years from now than there are today. You can find investment opportunities that benefit from a theme like that over a longer time period and feel like the odds are more in your favour for things like that.

It could also be things like a shift to green energy. So, it could be things like, “are there going to be more solar panels 10 or 20 years from now?” or “Is there going to be more wind power in 10 or 20 years?” So, these kind of things are probably important to differentiate those long-term themes that we can find ways to benefit off of for our clients [rather] than trying to predict shorter term, less thematic stuff like, the next USB connection going to be in your computer—"is it going to be USB-C or D or E?” You can perhaps make money on those kind of things and someone's going to come up with a great product that allows you to transfer data faster between your computer and your camera or whatever other device you're attached to it. But those are kind of harder to predict and are faster changing. And so perhaps that may not be the type of investment that we are as focused on.

Rob Campbell (24:31):

It strikes me that there's a risk-reward element to this as well, in the sense that okay, if you've got an extremely steep S-curve, as an investor, you could probably make a lot of money at the very early stages, but that probably comes with a degree of risk just given how that could evolve. Whereas, if I'm understanding you right, you're saying that if you can find these long-term themes but where the S-curve doesn't get there right away, it just sort of develops over time slowly. Maybe electrical vehicles is a good example—next year, 90% of the cars on the road aren't going to be EVs in one shot.

Am I understanding that right in terms of investment implications? Just finding these longer term themes that will take a while to play out as being some of the more profitable opportunities?

Grayson Witcher (25:13):

We think so. So, ones that are elongated, like you said, are ones that probably fit our philosophy and process better. And the fact that we're long-term investors, we're not trying to find that next quick hit and kind of find something that's going to make a ton of money in the next kind of two years. We're trying to invest over the next decade-plus for our clients and try and find companies that compound wealth over that period. So even if it's a bit of a slower growth than some other technology, we think on a risk-adjusted basis it's probably a better place to be. And so there is that angle where we're trying to find ones that are elongated. So it could be things like electric vehicles or another example would be you're seeing in medicine a shift from more white pills to things like biologics. We've invested in companies like that because we think that's a longer-term theme where you're still going to make a lot of white pills, but there's going to be more biologic drugs and you're seeing a lot of innovation in biologics.

So, over the next 10 or 15 years you could see many more biologic drugs coming out. And so we want to be involved in companies that benefit from that. One example of a company would be Danaher, which is involved in biological production is one of their businesses. And so yeah, finding those businesses that can benefit from those long-term themes is quite important.

There's another way to kind of benefit from that is just also trying to understand what the market's pricing in. So, it's thinking about this "Hype Cycle," some people have called it, where you get this real excitement early on about a product. So, expectations probably go from very low to very high over a few years where people find out about this technology, they get really excited about it—

Rob Campbell (26:49):

—But adoption is still really low at that point.

Grayson Witcher (26:51):

—that's right, adoption's still really low, but excitement's high and perhaps you're seeing more money flow into this. So, it could be in the public markets or private markets, but there's not a lot of places to deploy capital, but a lot of excitement. And so you can often see the valuations for these type of companies kind of go through the roof because people are trying to take advantage of them when there just isn't a big market opportunity yet.

And so that might be a case where we shy away from really early stage ideas like that and we wait for the real bubble and optimism to not necessarily pop, but the optimism to kind of decrease over time, and then wait for the true S-curve to start to ramp up where expectations are a little bit lower, but we can see the odds of success are a little bit higher because the technology's kind of more proven out and we can see the runway is a little bit more clear in our mind. And we think that the risk-adjusted returns are a little bit more attractive at that point. So that could be another way to benefit from these technologies.

Rob Campbell (27:50):

There's one other conclusion that I wonder if you'd agree with, which is just that things can go in many different directions, meaning that whether it's optimism or like you said, when that's popping, just a narrowing of expectations in terms of how things could evolve. I just wonder as you work with the rest of the analyst team at Mawer, is that an aspect of what you're talking through—is just, hey, the scenarios might be actually wider than we first thought?

Grayson Witcher (28:19):

One of the conclusions is, we try and use our learnings from S-curves, our work on S-curves and the different outcomes that you can get from either S-curves being elongated or having a shallower ceiling or even reversing, to make sure that we're thinking broad enough in terms of the outcomes for our different scenarios.

So, when we think about the scenarios that we're using to value companies, we want to think broadly enough and not be too tight and too convicted in our outcomes for what's going to happen to these companies. And the work on S-curves we think has helped us think a little bit more broadly. And you might want to price in the S-curve where you've only hit 30% saturation instead of 80% saturation or maybe the S-curve reverts and goes back down.

So, I think it's important for us to incorporate many different scenarios that could pan out.

Rob Campbell (29:13):

Grayson, you adopted a mustache with COVID. What's your estimate for how far into the next decade the mustache is going to go? [laughing]

Grayson Witcher (29:22):

We're fairly early on the S-curve for the mustache. I think the odds of you having a mustache three or four years from now, Rob, are quite high. You might be a late adopter. I think I'm probably more of an early adopter on that trend. We'll find out.

Rob Campbell (29:35):

Yes, late adopter, undersized, all the above for sure.

Anyway, thanks Grayson. Appreciate you coming on the podcast and for sharing all those thoughts.

Grayson Witcher (29:42):

Thanks Rob. I really enjoyed it.