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Lesson 2: Interpeting Smart Charts the right way

Transcript

Let's get stuck into Lesson 2. This is about interpreting your Smart Charts.

Now I did mention before that I deliberately chose to go through interpretation of the charts before we go through how to calculate them because when you understand how to use them, the calculations start making a lot more sense and you really do appreciate what you are putting together.

During this lesson we are looking at how to interpret your Smart Chart signals and we are going to do that by following an example which you are not going to believe, but it's a real live example and just happens to have every signal that you would expect to have in a Smart Chart in this one set of data, so I was so pleased to find it.

The second thing we will look at in lesson 2 is a summary of what the signals are and the specific rules to work out whether or not you have that signal in your own KPI.

And we will talk about how and when to recalculate your KPI baseline. In other words, if you have a signal and you now see that your original Central Line and Natural Process Limits are no longer appropriate how you are going to recalculate them and what data you should use to recalculate them.

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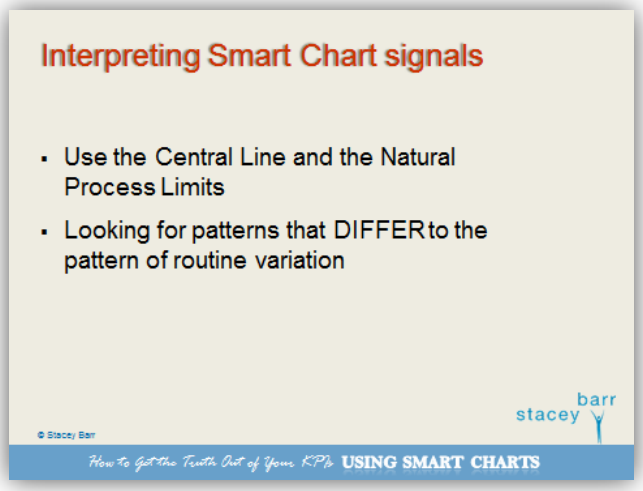
Interpreting Smart Chart signals

Now when you are interpreting your Smart Chart signals, what you are doing is using the Central Line and the Natural Process Limits as your baseline for comparison.



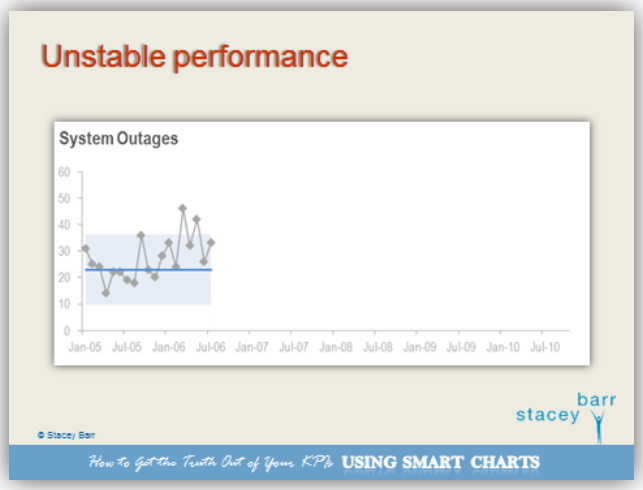
You are not comparing one point to another point!

You are no longer looking at 'How is this month compared to last month?" In fact, you won't be doing any point to point comparisons in the actual values of your performance measures.

What you will be doing is comparing those values to the Central Line and/or to the Natural Process Limits. What we are looking for in a Smart Chart is when your performance measure values start behaving differently or following a pattern that differs to that pattern of routine variation that is described by your process limits. That's it in a nutshell. Let's see how this works in practice.

Unstable performance

Here I have a KPI that is measuring System Outages.



In other words, it's a particular system – it could be an IT system, it could be an electricity system, it could be anything where at times it stops and shuts down and has an outage. Obviously outages are not good so we do not want System Outages to increase.

This particular set of data for System Outages has a couple of features about it which is quite interesting. The first feature is just how much up and down

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variation there is in that first year and a half worth of data there. You can see some of the wild, unpredictable swings.

Now, usually we would look at that and say 'Well that means that performance is quite unstable.' If performance is unstable with lots of wild swings and wide variations – sometimes small and sometimes big – there's a few reasons why that can happen.

The first reason if you have that kind of instability in your KPI, that wild variation, is that that KPI is measuring **a business process that you don't have enough control over**. In other words, that business process may be not bound by a set of procedures that people follow. People might just do whatever they thing is the right thing to do on the day. They might make things up as they go along and that can definitely cause a lot of variability in the results.

Another reason that you could have this kind of unstable or chaotic pattern in your KPI is when it's **a KPI that people are tampering with**, which means that every month they are looking at it and if it's down that month or up in this case, somebody rushes out and tries to change something.

They try to fix it and they come back next month and they see what it's doing now and if it's not too bad it must have worked. And then the month after that it goes up and again and they go 'Oh no, we've got to go fix it. What's wrong? There's another problem!'

Constantly fixing things based on point to point comparisons is what's called tampering. What tampering does is it makes a process more complex. You are always changing things. When you are always changing things complexity goes up and when complexity goes up variation goes up. You get more swings and more of that wild variation.

The third thing that can cause that kind of up and down variability in your KPIs is when you have **changes in your Measure Definition**. So from month to month you are not following exactly the same formula to calculate your KPI or there is a lack of reliability in the data that you are using. That can definitely cause it as well.

Now the fourth reason that you could see wild swings or unstable chaotic looking performance in your KPI is when that set of **data actually contains several different signals**. Now this particular System Outages KPI does look a bit uncontrolled but technically there is a signal in this set of data. Technically. Let's take a look at what that signal is.

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Long run

One of the signals to look for in a Smart Chart is called a long run and what that means is it's a longish run of measure values on one side of the Central Line, the same side of the Central Line.

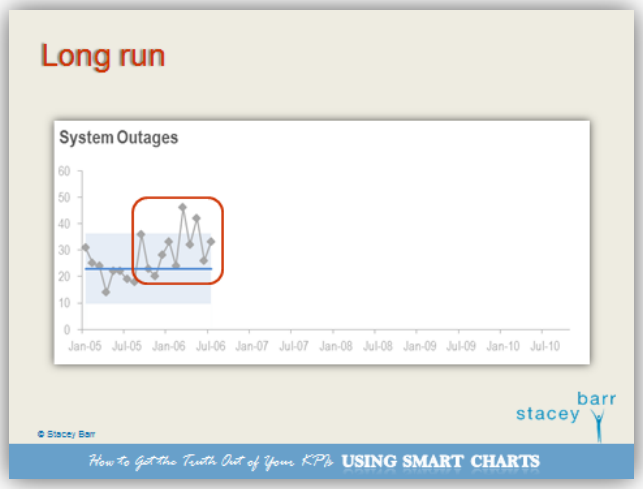
Now technically best practice has been that you want to see **at least eight measure values in a row on the same side of the Central Line**.

Now in my experience I have seen some people go as low as saying that six in a row is enough. Now I've always used seven and I'll delve into that a little bit more tomorrow in lesson 3. I think it's a decision about risk, the probability that you respond to something that actually is just routine variation. That's the risk that you are trying to manage. But seven is generally what I try and go with. Experts in this field like Donald Wheeler, author of *Understanding Variation* would say at least eight.

But the **other patterns are also ten out of twelve in a row, or twelve out of fourteen in a row**. They are also long run signals. The reason for these numbers generally comes down to the probability that the pattern is still part of routine variation. In other words, is not a signal. And when that probability comes down to 1 in a 100 you know it's a signal worth looking at. You know it's a pattern worth investigating because the odds of it being a part of routine variation are just so slim.

> ***Long run:*** *8 points in a row on the same side of the Central Line, or 10 out of 12 points in a row, or 12 out of 14 points in a row.*

Take a look at this. We have a run of points that satisfies that signal rule. I think in this case we've got eleven, so out of those eleven points ten of them are on the same side of the Central Line. Technically we have a signal here.



So System Outages did actually shift up. Lots of different things can cause a long run in your KPIs. A particular event or change to the process could happen that causes almost an instantaneous effect.

Often that's what a long run means – something happened at a point in time and now the process is performing at a different level. In other words, the KPI is not showing a different level of performance.

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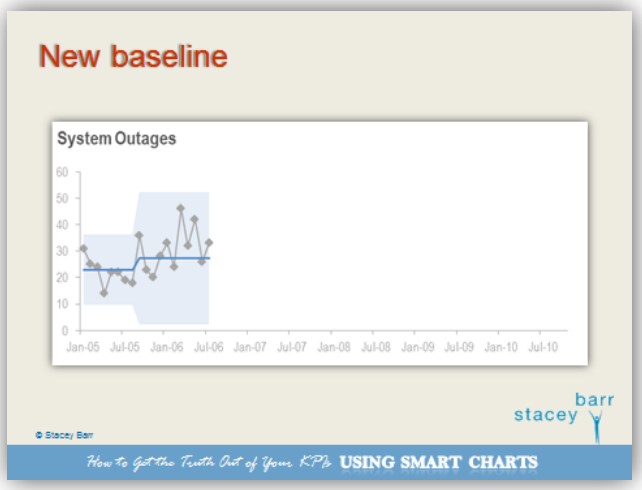
Now for System Outages maybe there was a sudden downsizing in maintenance staff and we just didn't have enough people to manage the little problems that would cause outages. Maybe it was a period in time when the weather suddenly got very bad. That's a lot of months for the weather to be really bad but the weather could have been bad for a few months with a lot of rain, maybe even flooding, and that could have caused a whole spate of problems that continued for quite a few months.

Now, a particular assignable cause like that is one thing to look for but you also want to look for issues to do with your data. Always check your data. Your data could sometimes be the reason for this. Now sometimes these long runs are deliberate, you designed it and intended for it to happen, and sometimes they are not deliberate. Usually when they head in a bad direction they are not deliberate. You don't deliberately try to make performance worse. For this System Outages example this is a bad result and not something they really want more of.

New baseline

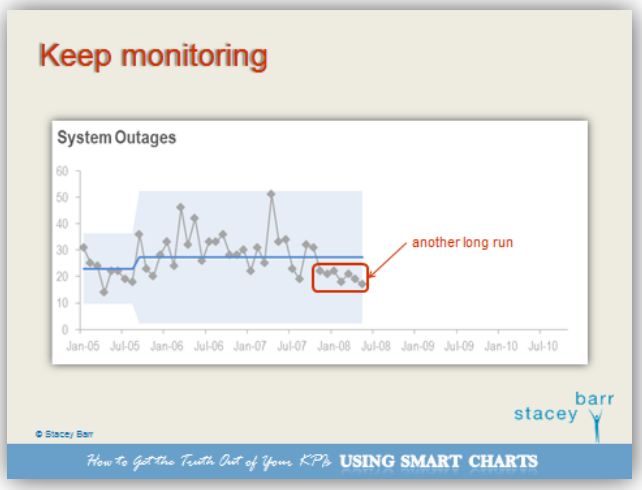
When you have a long run like this you need a new baseline. So what you do is you recalculate your Central Line and you recalculate your Natural Process Limits. We are going to delve more deeply into exactly how to do the recalculations in lesson 3 but suffice to say that new Central Line and that new set of Natural Process Limits came from the first five points in that long run. So those first five points are here.



Keep monitoring

When you recalculate your new Central Line and your Natural Process Limits you just keep monitoring.

Month to month, you just keep adding the data of your performance measure to the Smart Chart and you continue to



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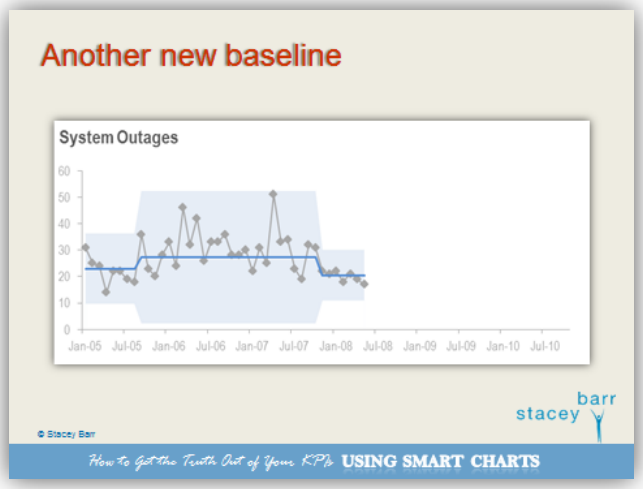
do that until you see another signal.

Now you might be looking at this and being a bit suspicious and yes, there probably is another signal in there and if you picked this one at the end – these seven points in a row on the other side of the Central Line this time – you would be correct. That's another long run, technically.

Another new baseline

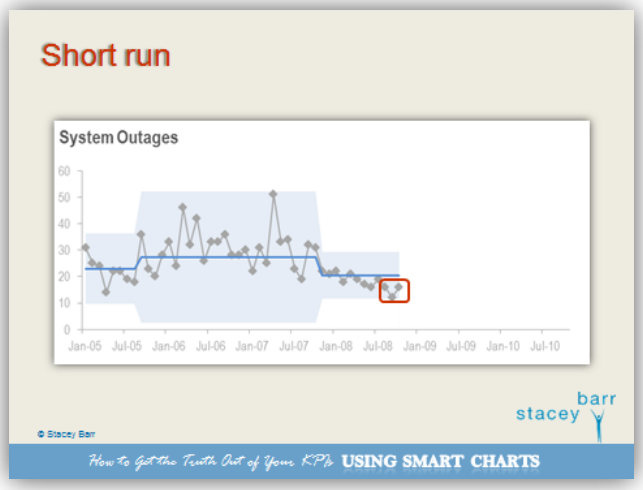
Of course you would want to know what caused that but we definitely need to also recalculate our baseline.

We need a new baseline now and that looks like this. And again, we keep monitoring. We keep looking for future signals in our KPI.



Short run

There's another signal here. Now, technically you could say we've got seven points in a row on the lower side of that Central Line again but there's another signal in here also that's a double whammy and it does convince us that things have changed.



It's called a short run and the short run is those three points at the end of the time series. Now, from the data it probably doesn't look so convincing in this image because of the size of these diamonds that have obscured the location of these points in that band of routine variation, but there actually is a situation here

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where we have three points in a row where these points are closer to the Natural Process Limit than they are to the Central Line.

Those last three points I have highlighted there are actually **closer to the bottom of that band of routine variation than they are to the Central Line**. So **three out of four points** is all you need to call that signal.

> ***Short run near the limits:*** *3 out of 4 points that are closer to a Natural Process Limit than they are to the Central Line*

So even without these preceding points being below the Central Line, if all we had were these final three points those three points are convincing enough to say there has been a signal. It's very likely that performance has shifted again.

So it's not always comfortable to keep waiting until you have seven or eight points in a row on one side of the Central Line. You don't need to when you get a short run like this because the shift is so big you only need those three out of four points to convince you there is something there.

Usually this is caused by an event or a change to the process that has a large and instantaneous effect. In this case this short run could be that somebody has found a significant cause of outages and they've eradicated that cause really quickly. An obvious fix. And that fix had a dramatic effect.

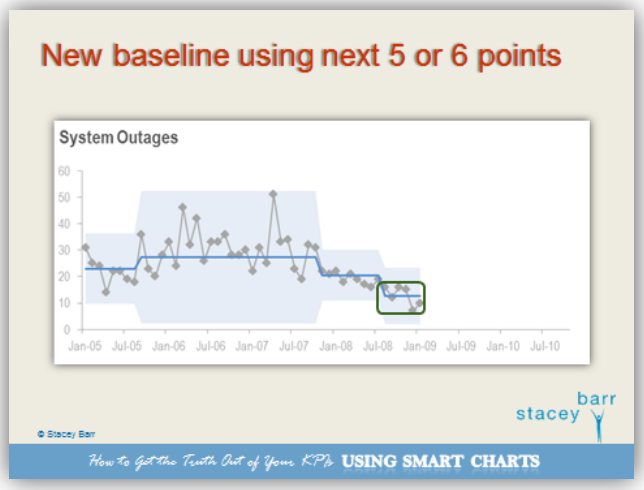
Maybe there was an error in the way that the system was programmed to managed load where there is a lot of people using the system, or maybe there was an inefficiency in how that load management program was set up and somebody found it and fixed it and it had an immediately significant effect.

Again, these short runs can be deliberate. Sometimes they are not deliberate. Financial crisis can cause a very non-deliberate short run in a KPI for something like revenue, for example. Again, these short runs can sometimes signify that performance has gotten better but sometimes they can signify that it's gotten worse. Luckily for these guys it was a good result.

New baseline using next 5 or 6 points

Now, we need another baseline but the way to calculate this baseline is a little different.

In this case we still need our five or six points but we can't use just those three points in the short run



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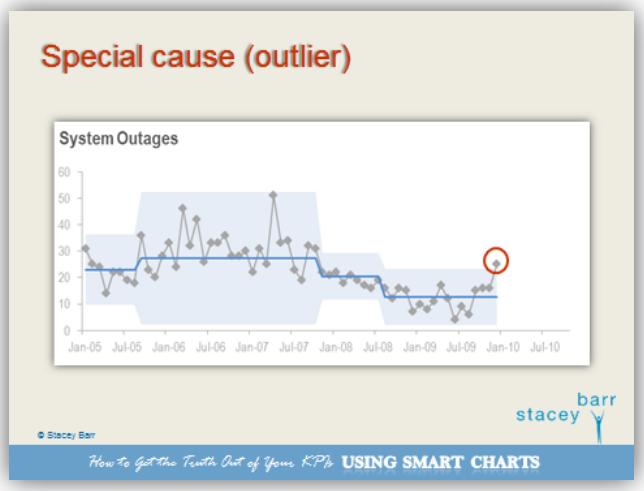
because that's not enough so we need to wait until we've got a few more points and then we can recalculate the baseline. So again, wait until you've got another two or three values of your performance measure and then compute a new Central Line using those values and new Natural Process Limits. So you'll have your three points from your short run plus the next two or three points that come after that. That's what you'll be using.

With that new baseline you keep monitoring.

Special cause (outlier)

We have our final signal type here. So far we've said you have to look out for chaos or instability, secondly long runs, thirdly short runs and now we've got a fourth signal to look out for. It is **a point falling outside of the Natural Process Limits**; a point falling out your band of routine variation.



Just like all the other signals the probability of this being just a normal part of routine variation is less than 1 in 100, so very slim odds and you therefore want to check it out.

> ***Special cause:*** *a point falling outside the Natural Process Limits.*

Generally when you have a single point fall out of your limits like that it is a rare event that has caused it. It has an assignable cause or reason and often it just has a once-off effect.

So there might be, for example, more load on the system over the Christmas holidays but again, if you saw something like that you would see it every Christmas holidays. It could be a breakdown that caused this, but the breakdown was fixed really quickly.

It could actually be sometimes that this special cause or outlier is part of a new signal unfolding. So make sure that you keep monitoring and if you get a few more points following this one, you'll probably need another two or three points that were about the same size as this first special cause and you'd have another short run, but a short run in the opposite direction to the one we saw before.

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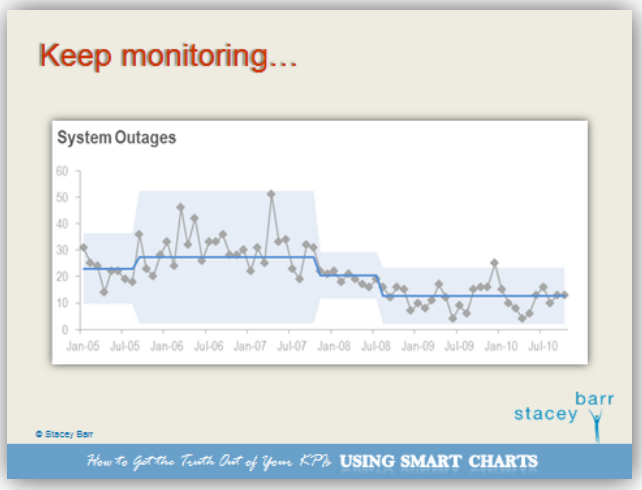
You might have discovered that was just an outlier, a random event that happened, because the following month the System Outages start behaving again back like they were beforehand which is averaging around that new Central Line that's probably sitting at about 12 or 13 on that scale. But no more signals have eventuated.



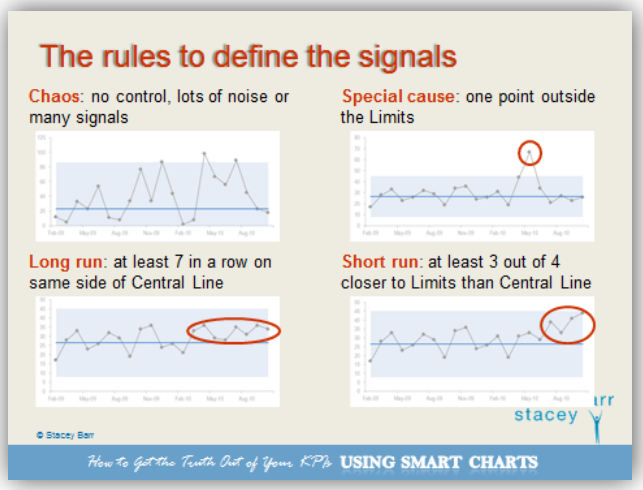
There you see it: a Smart Chart telling the story of the performance of System Outages.

Things were a little chaotic during 2005 until probably the end of 2007. Then during 2008 those things seemed to be shifting in a good direction. Around the second half of 2008 we see a new level of performance, another improvement that has become a lot more predictable and reliable. In other words, the width of the routine variation and those Natural Process Limits is a bit narrower and that means performance is more reliable and more predictable. And of course because the Central Line has come down so far – it was up above 20 and then went up almost to 30 and it's come back down to about 12 System Outages on average per month – performance has definitely gotten a lot better and it's a lot more stable now.

You do not have to explain any of those variations from month to month now. You only have to look for a true signal that varies away from this new baseline; this new baseline of an average of 13 outages per month, but ranging between 2 and 23 outages per month. You only need to explain patterns that are true signals.

The rules to define the signals

Let's have a look at a summary of what those signals are.



So the first one is chaos. No control, lots of noise or many signals. They can be the three main causes of a chaotic pattern. And you can see the chaos in this particular example. You've got points varying up and down but sometimes they go wildly up and come back down and go wildly

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down and then wildly back up again.

You can't really say there is much predictability there. You don't want to try and look for an improvement to process like this. You've first got to **get that process standardised and under control** which often means you need to maybe introduce some procedures that people follow regularly rather than being very adhoc about what they do.

Maybe you don't even have any kind of process described at all. Maybe it's just 'Here's a task that needs to get done. We need to create an invoice or a bill for our customers. Just do it any way you feel like it.' So people are creating different templates for the bills, they're putting different types of information on them, some people are checking the values and some people aren't, some people are adding in taxes and some people are forgetting. There's no process for how to do it so it's happening very randomly and so what we would expect is to see a picture like this in the measure of percentage of bills that are paid on time. You would expect wild fluctuations because there is just such a wild approach to how the bills are put together.

Another type of signal is the special cause. That was the last one that we saw – the single point falling outside the Natural Process Limits. Again, that's something that will have a reason and you should find out what the reason is but you often don't need to take any action. You just need to acknowledge 'Yes, okay, that's happened. We're back to normal now.' To do anything about it would be a waste of effort. Usually those causes are outside of your control anyway. They are caused by the economy or the environment or the actions of some other organisation.

The long run is probably going to be one of the more common patterns that you see in your KPIs and again it's at least seven points in a row on the same side of the Central Line. Best practice is, like I mentioned before, considered to be at least eight and you don't have to have exactly seven in a row or eight in a row. You could have 10 out of 12 points in a row – in other words, in a run of 12 points only two of them are on the opposite side of the Central Line. Or likewise 12 out of 14.

Now when you see a pattern like that in your KPI you want to find out what caused it and the thing to do is look back at what was happening around the start of that long run. In the example here that long run started around April in 2010 and you would want to know 'What were we doing around March/April 2010 that could have caused something to shift performance like that?' It could have been deliberate, it could have been a process improvement initiative or a strategic initiative that you put in place and you are seeing the effect of it there. Or it could be something that you didn't even know had happened. It's good to know either way though.

Incidentally, when you do a recalculation of a new baseline for a long run like that, do you realise that if that long run was caused by a strategic initiative or deliberate project that you put in place to improve performance **the difference between the new Central Line and the old Central Line is a measure of the impact of that strategic initiative**?

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A lot of people say to me 'I'd like to be able to measure the effect that my strategic initiative has. How can I do that?' Well this is exactly how you can do that. If you can isolate the effect of that initiative in your Smart Chart then the difference between the Central Line before and the Central Line after you initiated it is the measure of the impact of your initiative. I love that. It's so simple.

Now, our final signal to look for is called the short run and it is at least three out of four points that are closer to the one of the Natural Process Limits than they are to the Central Line.

In the example here you can see that there are four points and out of those four points three of them are definitely closer to the upper Natural Process Limit than they are to the Central Line and that's all we need to be convinced that there's a shift happening and we need to find out what is causing it. We don't recalculate the baseline until we've got a couple more points to give us our minimum of five or six but at least we can see that something is happening there.

Now there is a pattern that I used to talk a lot about and for those of you who have worked with me before through the PuMP® Blueprint you will recognise that something is missing from this list of signals and it's what was called the Trend.

Now **the trend** is a signal where you have seven or more points in a row consecutively decreasing or consecutively increasing. So, different to the long run. In the long run they don't have to be consecutively going up or consecutively going down, they just have to be consecutively on one side of the Central Line. But with the trend each point has to be higher than the point before it or lower than the point before it, if you've got a declining trend. So the trends can be a signal going upwards or going down.

Now, when I talked to Donald Wheeler about this, who I will remind you is the author of *Understanding Variation* and has really been my teacher in the whole space of Smart Charts and XMR charts, he said that trend is **not really a necessary signal** because usually a long run or a short run will pick it up first, particularly the short run will pick it up earlier than the trend would. For the trend you need seven or eight points but the short run will likely be part of that trend and therefore you will get it in fewer points.

So that leaves us with these four main patterns or signals that you want to be able to look for in your Smart Charts.

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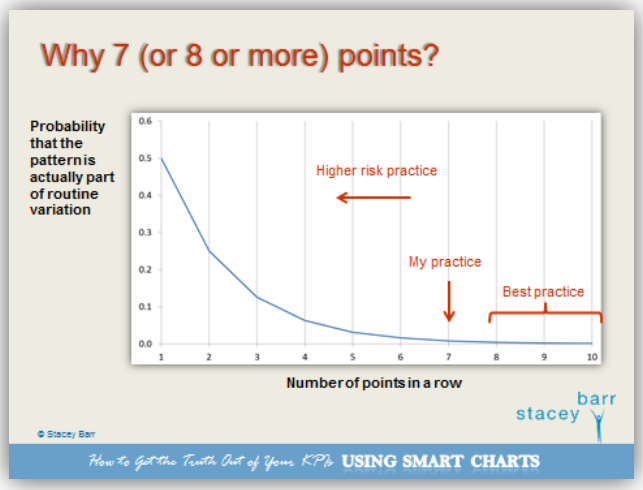
Why 7 (or 8 or more) points?

Why seven or why eight or more points?



It's all got to do with, like I mentioned before, probability. Let me explain this to you.

The probability that a point is either above the Central Line or the probability that the point is below the Central Line is essentially 50%.

If you have a KPI that is behaving normally, randomly within a pattern of routine variation then each month the probability that it's either above the Central Line or below the Central Line is 50%. It's got a 50% chance of being above and a 50% chance of being below. So, that's why we can't use a single point to decide whether performance has gotten better or worse because if this month just happens to be bigger than last month or bigger than the Central Line it's a 50% chance that it's going to be there anyway so it's not really enough of a probability to say that anything is really different.

Now two points in a row that are on the same side as the Central Line is 50% times 50% because each point has that 50% chance of being on the same side of the Central Line and when you want to calculate the probability of two points being on one side you multiply their individual probabilities. So 50% and 50% is 25%, or a probability of 0.25.

If we keep applying that logic what we end up with is the probability of three points being on the same side of the Central Line as being 12.5% or a probability of 0.125. Four points in a row, five points in a row – you can see that we are getting a very dramatic reduction in the probability of five or six or seven points in a row being on the same side of the Central Line.

Can you see how close to zero we are getting when we start looking at seven or eight or nine or ten points in a row? What that is saying is that the chance of that many points being on the same side of the Central Line is random. The chance that is just part of the normal routine variation is so tiny that it's almost improbable. In other words, it's got to be a signal. So that's where these numbers seven, eight, nine and ten come from. It's where this curve starts getting so close to zero that we just can't ignore the almost fact that there's something going on causing that, that there really is a signal.

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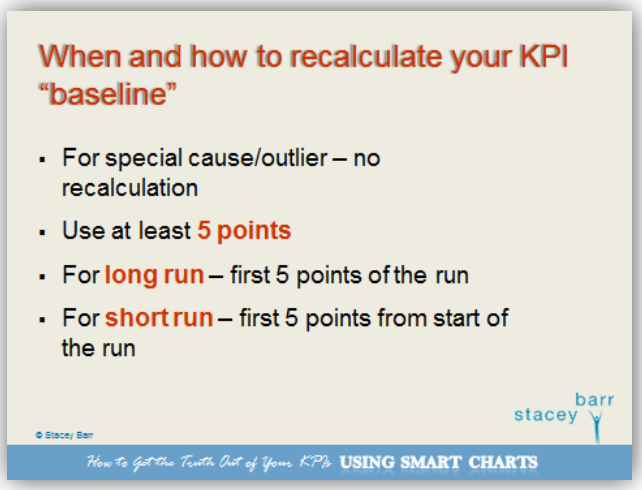
Back again, to the other end of it, where we've only got one or two points. We really don't have enough evidence yet to say that there really is a signal so stop doing point to point comparisons is really the main point of this graph.

According to Donald Wheeler and his appraisal of the literature around all these sorts of charts, best practice for determining a long run is eight or nine or ten points in a row. My practice has traditionally been around seven because for me I think it's about risk management. It's about being aware of the size of the risk in your decision about whether something is a signal or not a signal, so I am comfortable with seven. But what I have seen is people using as few as six or even five points and I think that's a high risk practice and I do not recommend that to you. I would say you need to go with a minimum of seven.

When and how to recalculate your KPI "baseline"

When you get that special cause signal or the outlier signal you do no recalculations at all. You just keep trucking along with the Central Line and the Natural Process Limits that you have been using.



Remember that you need at least five points to get a reasonable handle on what that Central Line and Natural Process Limits should be. So use at least five points when you do the recalculation.

So for the long run that means you use the first five points at the start of that long run. You don't have to use all seven or eight of them.

For a short run it mean using the first five points from the start of the short run, but of course that means you need all of the points from the short run which might be three or four points plus another one or two after the short run to do that recalculation.

Wrap up and questions

Now, in our next lesson we are going to take a look under the hood and see exactly how these calculations are done but first I'll check your questions.

Veronica says:

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"It makes sense."

I'm glad, that's excellent.

Atchara says:

"How do you convince the hero fire-fighters to wait for seven months before doing something?"

That's perfect! The hero fire-fighters, that's exactly what they are! They want to jump in and react to any kind of little blip they see in their chart. Well a way to convince them to wait seven months is to take them through some of the examples that we have just looked at before with Cheryl's fluoride KPI. If you take a set of your data and do the same kind of thing where you show what it looks like when you do a point to point comparison, how you would compare and some of those other analyses – the trend line, the moving average etc – and a Smart Chart you really do bring home the point that what they are trying to jump on with a point to point comparison is not actually a fire at all. They think it's a fire but it's not a fire.

The fires are only there when you get enough data to convince them there is. And really show them that next month it may very well come down again, that there really was nothing to worry about because it's just part of the routine variation. But it is, like I started out with today, what we are talking about here is changing people's behaviours. In other words, don't try to put out a fire that's not really a fire. To change people's behaviours they need to have different beliefs or attitudes about it. If they still want to jump on a point to point comparison like it's a fire it means their attitude or their beliefs haven't been changed yet. To change their beliefs we have to change their awareness so always start back at the awareness level.

John, your question is:

"What determines the periods between the points?"

I think what you are asking John is 'How do you know whether to measure it monthly or weekly or quarterly?' I'm going to assume that's the case and answer that question unless you come back with a clarification John. What chooses the period that you measure at, the frequency that you measure at, is really the nature of your performance measure. So I'll illustrate this with a few examples because really there isn't a formula that I'm aware of to determine this accurately.

So a performance measure like System Outages where we are getting a dozen outages on average per month would not be appropriate to measure weekly because in a week you are probably only getting 2 or 3 outages and there's not enough going on for you to really be able to draw conclusions from your data. So for outages where we are getting about a dozen or more a month that is now a reasonable frequency to measure at monthly.

But if in the future System Outages becomes so rare that we really only get a dozen every quarter we might shift to measuring that quarterly. When they get so rare that

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you're probably only getting about a dozen a year you could measure it annually or you could actually treat it as something that's more like a rare event and you could use completely different method to measure it. You would be measuring the time between outages and that would become the new KPI. You are no longer interested in the number of outages, you are now interested in the time elapsed between outages and that's the value you are plotting. And we'd need a different chart for that but we will cover that issue in lesson 4 in more depth.

If you are measuring something that really doesn't change very frequently like employee engagement, it's not something that can really shift in a week or a month or a quarter, that may be something that you do monitor every six months or every year. So hopefully John that kind of illustrates that you've really got to look at the particular KPI you have, the nature of that KPI and possibly even trial it in a few different ways in order to determine what the best frequency is to choose. It's like any form of data analysis, you've really got to know your data and get familiar with your data so that you can make wiser decisions about how frequently to measure it and about what a signal really means for that particular performance measure or KPI. I was always taught that before you do any kind of analysis of your data you should do some exploratory analysis of it.

I should talk about this – **exploratory analysis versus explanatory analysis**. A Smart Chart is a form of explanatory analysis. It is the kind of analysis you can draw a practical conclusion from. Exploratory analysis is about getting to know your data. It's analysis like histograms – how variable is the data? It's analysis like putting the data into a time series chart and seeing what does it look like over time. You've not drawing conclusions from it, you are just getting to know it.

No more questions seem to be coming through for now so I will give you a heads up about what is going to happen when we next get together in lesson 3 and if any more questions come through in the time that I do that we'll address them and then wrap up for this lesson.

In our next lesson we are going to take a look under the hood of Smart Charts and see exactly how the calculations are done. I am going to walk you through the calculations using a live demonstration and really, at the same time, through that live demonstration I'm going to be building the template that you will be using for your own KPIs. So you'll download that template, plug in your data and you'll be away. Now the instructions that go with the demonstration are documented in your workbook for lesson 3. So it's all written down there nice and easy. The instructions are tested, people have used them in the past and they've worked. In fact every time I have taught these steps for creating Smart Charts, no one has ever made a big mistake. They all get it. So you can approach the steps with confidence.

Before you take lesson 3 you might want to have your own KPI data ready in a spreadsheet to follow along with me. Now don't worry if it's not the template spreadsheet, it can just be any old spreadsheet and it's probably not a bad idea if you like to learn by doing then you can simply follow along. I will be plugging in a set of

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data and going through each of the steps and putting it together in a Smart Chart which you could mimic in an empty spreadsheet which just has your KPI data in it. It's not necessary for you to do that. If you would much rather sit through lesson 3 for the first time and just simply watch it and learn by observing you are more than welcome to do that. The option is just there for you to follow along with your own KPI data if you feel like it.

Mala, you have your hand up so I'm wondering if you have a question and would like me to un-mute you to ask. Let me un-mute you and we'll see if you still have your question.

Mala: How do I do the service delivery? What should be the frequency for service delivery?

Stacey: Can you tell me a bit more about your service delivery measure? What is the measure and how are you calculating it?

Mala: Right now it is quarterly.

Stacey: And how do you calculate each quarterly value of your service delivery measure?

Mala: How many service orders have been implemented. How many have been created for that month and how many were delivered.

Stacey: How many are created on a monthly basis? How many service orders are there that are created say monthly?

Mala: A minimum of 200 service orders are created every month.

Stacey: Well you definitely don't need to wait quarterly to measure that. You've got plenty where you could measure them, possibly even weekly with having about 200 a month means you are getting about 50 or so per week and you could absolutely measure that one weekly, and that's something I would suggest you try Mala to see if weekly works for that particular KPI. But again, you need to look and see if weekly is okay. If it looks too noisy or too messy then maybe go to monthly but I would go back and try it weekly.

Mala: And we have a condition there that how many service orders are delivered as per the customer's requirement and how many have exceeded the RFS date.

Stacey: Okay, that measure I would convert to a percentage and I would look at the percentage of service orders that were delivered in a month or a week compared to the customer's requirements. So the measure would be the percentage of service ordered delivered that meet customer date requirement.

Mala: And we have the KPI set for five working days, that is the KPI for service delivery.

Stacey: So does that mean that you would be interested in measuring the percentage of service orders that were delivered within five days?

Mala: Five working days, yes.

Stacey: Well that would be a good measure. So that would be a good one to try weekly also I

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think.

Mala: Weekly.

Stacey: Does that help Mala?

Mala: Yes. Thank you Stacey.

Stacey: Excellent. It will be interesting to touch base with you again during the rest of the course to see how the Smart Charts work for those measures, so thank you very much Mala.

Mala: Because this is not happening. I want to see where there is a fault or something.

Stacey: Absolutely, and you are on the right course. That's exactly what Smart Charts will do. Alright Mala, I'll put you back on mute and we'll wrap up for today. Thank you very much for your question.

End of transcript.