Stacey Barr Pty Ltd
the Performance Measure Specialist
ABN 57 129 953 635
PO Box 422 Samford
Queensland 4520 Australia
Phone: 1800 883 458
info@staceybarr.com
www.staceybarr.com

Lesson 4: Using Smart Charts for different KPIs

Transcript

Welcome back for Lesson 4 in our series Using Smart Charts.

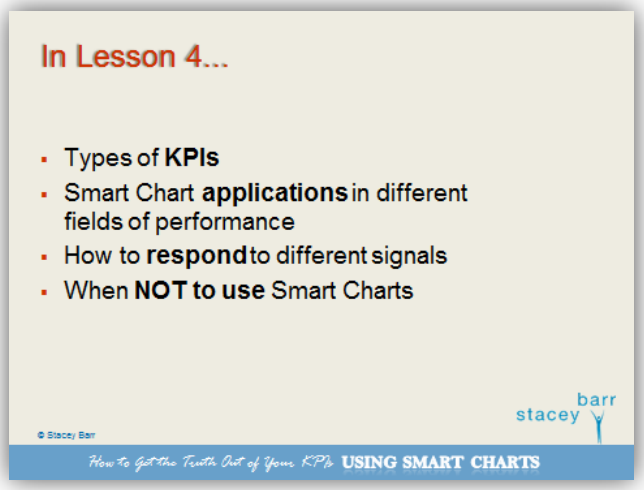
Lesson 4 is all about how we can apply Smart Charts to a very wide range of KPIs.

We are going to spend some time going through those types of KPIs.

So what sort of measures can you use a Smart Chart for?

While we do that we'll also be exploring at the same time how Smart Charts can be applied in so many different fields of performance, from HR to finance to maintenance and operations.

As we look at a series of examples of those different KPIs in different fields of performance we'll also explore some of the issues with how we respond to different types of signals in our KPIs.



And a very big part of Lesson 4 is when not to use Smart Charts. But probably a more accurate thing to say is what you need to do to some KPIs before it's appropriate to use a Smart Chart for them.

Stacey Barr Pty Ltd
the Performance Measure Specialist
ABN 57 129 953 635
PO Box 422 Samford
Queensland 4520 Australia
Phone: 1800 883 458
info@staceybarr.com
www.staceybarr.com

Percentages

We'll start with a very common type of KPI which is the percentage.

Percentages are used very widely in different areas and fields of performance. Staff Turnover is an example of a percentage and that is where you are looking at the number of staff who have left your organisation or business in a given month, relative to your establishment or number of staff that you have.

There are slightly different ways for working out exactly how many staff you have for that particular period, whether it's the opening balance of your staff numbers or some other kind of computation. Sometimes you're only counting a part time staff as a fraction in that. There are different ways of doing it but essentially it is a percentage: what percentage of our staff did we lose in the last month? And of course you would be calculating that month-by-month.

On time delivery is another really common measure that is expressed as a percentage. What percentage of orders did we deliver on time? It doesn't have to be delivery either; it could be on time performance in a number of different things. In the railways we did a lot of on time running measures where we were measuring the percentage of trains that ran on time relative to the schedule. So with that sort of percentage you are really looking at of all the deliveries and train services that we ran: what percentage of those did we deliver in a way that met a pre-defined timeframe or definition of on-time?

Service Orders Completed Within Five Days is another on-time delivery as well. That's another percentage that fits within that on-time scope. Billable hours – the percentage of a consultant's time - for example, the percentage of hours - that they are working that are billable to a client. That's a really useful measure in a lot of consulting practices but you could also apply that back to any sort of organisation by thinking about productive hours: so what percentage of hours that people worked did not require rework; what percentage of their time were they actually constructively working in a forward direction on the projects that they are working on as opposed to fixing something or doing something that doesn't necessarily contribute to their particular goals?

So there are lots of ways of defining particular KPIs around this percentage formula. I'm going to show you an example of a percentage KPI in a Smart Chart but I would

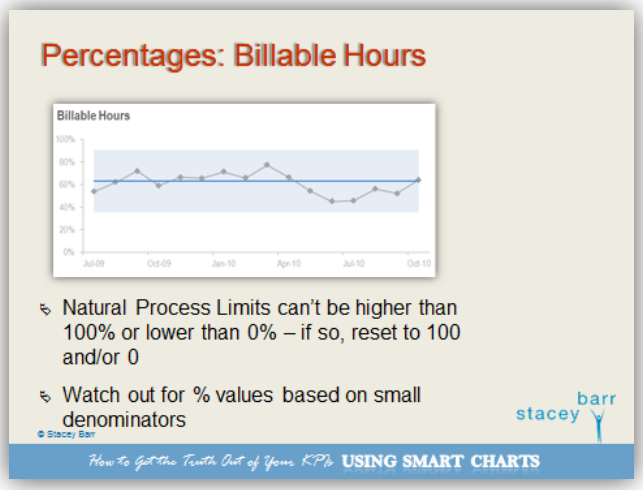
Stacey Barr Pty Ltd
the Performance Measure Specialist
ABN 57 129 953 635
PO Box 422 Samford
Queensland 4520 Australia
Phone: 1800 883 458
info@staceybarr.com
www.staceybarr.com

love for you to share any percentage KPIs or measures that you are familiar with that are used in your organisation or company.

Straight away I can tell that Elke probably your On-time and In-full Delivery Performance may very well be a percentage as well. You could confirm that for us if you like… Your Safety Stock Violations, I'm not sure if that's a percentage as well or if that's something a bit different. For any of you, if you have a KPI or a measure that you are familiar with that's a percentage share it for us in the comments.

Percentages: Billable Hours

While you are doing that, the example that I have for you is the Billable Hours measure: What percentage of a consultant's time is able to be billed back to a client?



Now with this particular Smart Chart of the Billable Hours there are a couple of things to note.

One is that when you are working **with percentages Natural Process Limits usually – almost always – can't be logically higher than 100% or logically lower than 0%.**

So you can't have more than 100% of trains running on time. You can't have more than 100% of a consultant's working hours billed to a client. It doesn't make logical sense. It's a physical impossibility. So the upper Natural Process Limit, if your data for some reason calculates it at above 100%, it's okay to reset that back down to 100%.

Likewise with 0%, you can't have a negative percentage generally. You can't have a negative number of hours that are billable to a client. So again, if for whatever reason your calculations turn out to produce a negative value for the lower Natural Process Limit, it's okay to set that to zero as well to make it make sense.

The other thing to watch out for when you are measuring percentages is **percentage values that are based on very small denominators**.

So if, for example, we have a consultant who had a lot of their annual recreation leave in a particular month and they only worked for a day they've got a very small number of hours that they worked and they may have billed that entire day to a client. For example, they may have given up a day of their recreation leave in order to attend a

Stacey Barr Pty Ltd
the Performance Measure Specialist
ABN 57 129 953 635
PO Box 422 Samford
Queensland 4520 Australia
Phone: 1800 883 458
info@staceybarr.com
www.staceybarr.com

client workshop or to facilitate a workshop for them. So in that month suddenly 100% of their time is billable, but it's not really a true indication of what the consultant's billable hours rate is for that month, because it's based on such a small denominator – only maybe an eight hour day. So watch out for that, they can be quite misleading.

If you do consistently have a lot of small denominators you might be measuring too frequently. Just say you are measuring the percentage of projects completed on time then you might complete two or three projects a month. Maybe you only complete one or two projects a month – measuring your percentage projects completed on time on a monthly basis would be too frequent. It's probably better to measure something like that on a quarterly basis so you have enough data to give meaningful representations of the on time project completion rate.

Now with this particular KPI you can see that we don't really have any technical signals in our Smart Chart. You would be looking at the last six points in that time series and be thinking "Hmm, it looks like it's decreasing." But really, statistically- and Smart Chart- speaking there is no signal there. You might want to watch over it though. When I start seeing a run of five or so points doing something I don't draw a conclusion but I pay a bit of keen attention to that over the next coming time periods to see what the next few time period data is doing.

So the percentages that you seem to be familiar with in your organisation… Elke is confirming her On-time and In-full is definitely a percentage but the safety stock is not, it's an absolute number. We're going to come to counts and absolute number shortly. Anita says that a percentage KPI she is familiar with is Percentage of Customer Cheques That Are Greater Than $5. Melinda says Visitor Satisfaction, so that's probably something like the percentage of visitors who are satisfied. John says percentages are used for IT system's uptime – the Percentage of Time That IT Systems Are Up and Running, or available. Great, so there are some really good examples of percentage KPIs and performance measures there.

Totals or sums

The next type of KPI that is fine to use in a Smart Chart is the total or the sum and good examples of that are when you are adding up all of the revenue that you earned in a particular month so you have a total revenue measure.

Our example from Cheryl's organisation, their measure of Fluoride Hours Above Maximum is also an example of a sum. We

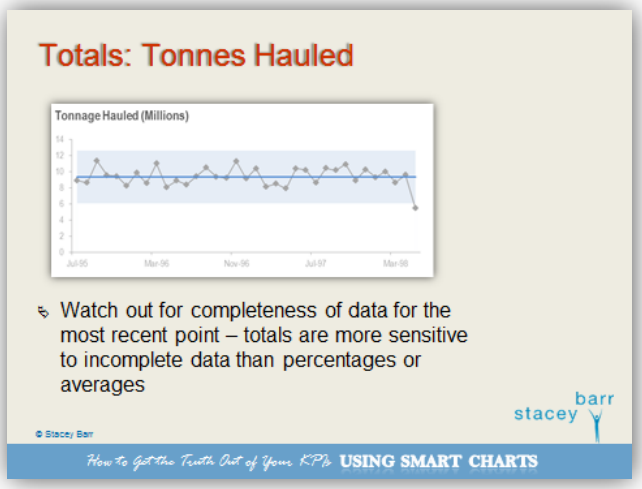
Stacey Barr Pty Ltd
the Performance Measure Specialist
ABN 57 129 953 635
PO Box 422 Samford
Queensland 4520 Australia
Phone: 1800 883 458
info@staceybarr.com
www.staceybarr.com

are summing up all of the hours that fluoride levels were above the maximum desires level. Profit is an example of a total or a sum and so is Tonnes Hauled. That was a common measure used in the railways too, particularly for the freight trains and the coal trains. We'd be looking at how much coal did we haul on our trains in any given month.

Again, if you are familiar with any KPIs or measures in your business or organisation where it's based on a total or a sum where you are adding up – and it's different to counting. Counts are a different measure again, but for when you are totalling or adding something feel free to share some examples of those KPIs as well.

Totals: Tonnes Hauled

While you are doing that I'll show you an example which happens to be the Tonnes Hauled.



This is from the railways and it's millions of tonnes hauled – that's why the numbers on the vertical axis are so small. You don't just haul 10 tonnes of coal; you haul in any given month 10 million tonnes of coal.

With totals, where you are measuring totals or sums, something to watch out for is the **completeness of data**, particularly for the most recent point, the latest value you have added to your Smart Chart.

The reason for that is that totals or sums tend to be a lot more sensitive to missing data, data that isn't complete or data that hasn't been completely collated and included in the report. You can see the effect of that in this measure. You can see that last point in the time series is quite low. The most likely explanation for that is that it's not actually a special cause, it's not like there were strikes or anything that means that the trains weren't running and only so much of the coal got hauled that month. It's much more likely that it's because we haven't collated all of the data yet for that month.

Totals and sums are much more sensitive to that problem than are percentages or averages. You can get inaccurate percentages or averages if you don't have the data there, but with totals and sums really pay attention to that. If you see any quirky looking things happening at the end of the time series that would be the first thing I start looking for.

Stacey Barr Pty Ltd
the Performance Measure Specialist
ABN 57 129 953 635
PO Box 422 Samford
Queensland 4520 Australia
Phone: 1800 883 458
info@staceybarr.com
www.staceybarr.com

How are you guys going with sharing some examples of totals or sum measures? I'm not seeing any come through as yet so you might still be thinking. I think it's unlikely that you don't have any sorts of measures like that in your organisations. Maybe they're just not coming to mind.

Anita says,

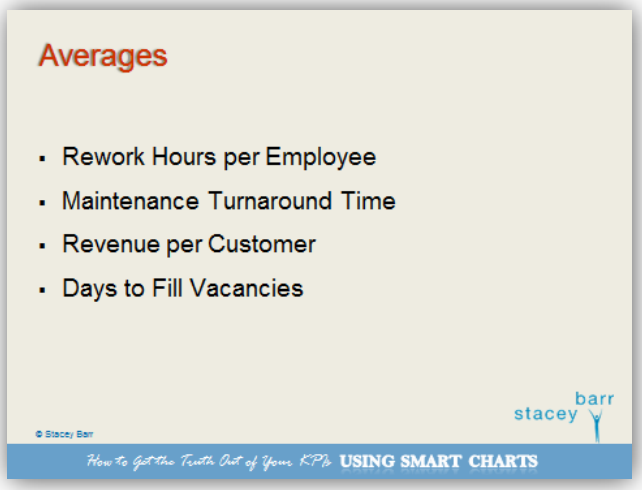
> *"The total Number of Customers counts for the month."*

It's a total in the sense that you are adding up the total number of, but it's not a total or sum in the sense where you are adding up weights like in the tonnage hauled, for example, or adding up dollars or some kind of variable like that. That is **the key difference between a total or sum and a count** and you'll see that when we come to the counts. We need to treat counts sometimes quite specifically different, and thanks Anita – you say you get it. Thanks for that feedback.

John you have also suggested one there, Total Claims Paid per Month, and that's probably a good example as well. You would be adding up the amount of money paid out in claims on a month-to-month basis. There you are adding up dollars so that is a good example of a total or a sum.

Averages

Averages are our next kind of KPI or performance measure and they suit Smart Charts as well.



Averages are a very, very common type of measure used in any sort of business or organisation.

One example is the average number of Rework Hours per Employee. So you would calculate that by being able to keep some kind of records of what people are working on and being able to classify which parts of their work would be considered rework or fixing problems and then you would work out how many hours each employee had done in a particular month of rework and divide that by the number of employees and then you get an average rework hours per employee.

Another example of an average would be something like a Turnaround Time measure. You could consider that you've got equipment that needs to have maintenance done on it fairly regularly so you might be curious to look at the average turnaround time for a

Stacey Barr Pty Ltd
the Performance Measure Specialist
ABN 57 129 953 635
PO Box 422 Samford
Queensland 4520 Australia
Phone: 1800 883 458
info@staceybarr.com
www.staceybarr.com

particular type of equipment or for all of the equipment: on average, how long does it take for a piece of equipment to be sent off, have it maintained and then get it back ready to be commissioned or put to use again?

Revenue per Customer is a good example of an average: what is the average revenue we earned per customer on a monthly or quarterly or weekly basis?

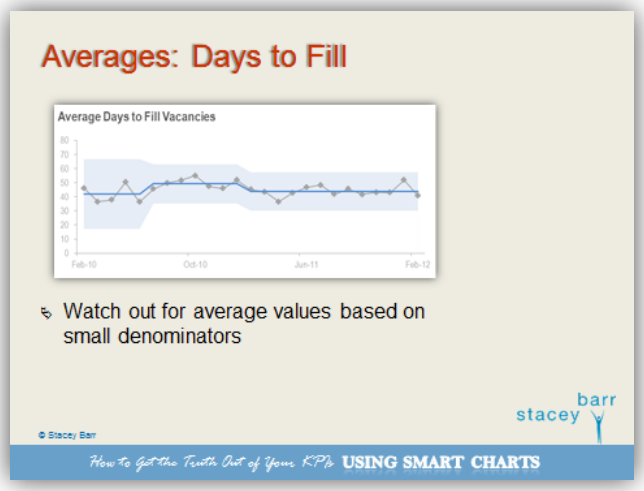
Days to Fill Vacancies: what is the average time it takes in days for us to fill a vacant position in our organisation, so that's a HR measure there?

Averages are pretty common, so have a think about types of measures or KPIs in your business or organisation that are averages, and if you are happy, please share them.

Melinda did share another one before for our totals or sums type of measure and that was Commercial Net Contribution. So another financial measure.

Averages: Days to Fill

While you think up your average based KPIs or measures and share them I will give you an example: Average Days to Fill Vacancies.



Like I mentioned, this is the time that it takes in days to fill a vacant position in a particular organisation.

Now just like with percentages, things to look out for are **averages that are based on very small denominators or very small counts**.

If we filled 15 or 25 vacancies last month – and you would need to be a pretty big organisation to have that many – then you are probably going to be pretty safe in having an average days calculation for that many vacancies filled. But if you only filled one or two vacancies then just like the percentage, averaging can really throw it out and skew it and make it look quite wrong. So take a look at the number of things that you are calculating an average over, just to be sure.

John says,

> *"Average Number of Days to Process Claims."*

That's a great example of an average KPI.

Stacey Barr Pty Ltd
the Performance Measure Specialist
ABN 57 129 953 635
PO Box 422 Samford
Queensland 4520 Australia
Phone: 1800 883 458
info@staceybarr.com
www.staceybarr.com

Anita has a question,

> *"Percentages and averages are basically the same on Smart Charts?"*

They are basically the same in that they are a ratio of a sort. They are both very appropriate to use on Smart Charts. The difference between an average and a percentage is generally what is on the numerator, or the top. So with a percentage you are putting a count on the top and dividing it by another count, or a count of the total number of opportunities or orders or customers. But what's on the top is the same 'animal' as what's on the bottom. So if you are calculating a percentage of customers who are satisfied then on the top you are counting customers and on the bottom you are counting customers. It's just that on the top you are counting a sub-group of customers, those who are satisfied and then dividing by all.

With an average, what is on the top numerator is usually something quite different. It might be a dollar measure or a time measure and then you are dividing by a number of something, like a number of people or a number of transactions to get your average. So the numerator and the denominator don't necessarily match, they're not the same 'animal' in an average.

Melinda says,

> *"Sick days by FTE."*

That's a good example of an average, the number of sick days taken by full time equivalent.

Anita says,

> *"Percentage goes from zero to 100 and average is whatever the scale is."*

Yes Anita, that is exactly right, and that's because with an average what is on the top doesn't necessarily match what is on the bottom. They are not the same animal so it doesn't make sense to have that scale of zero to 100%.

Ratios and more complex calculations

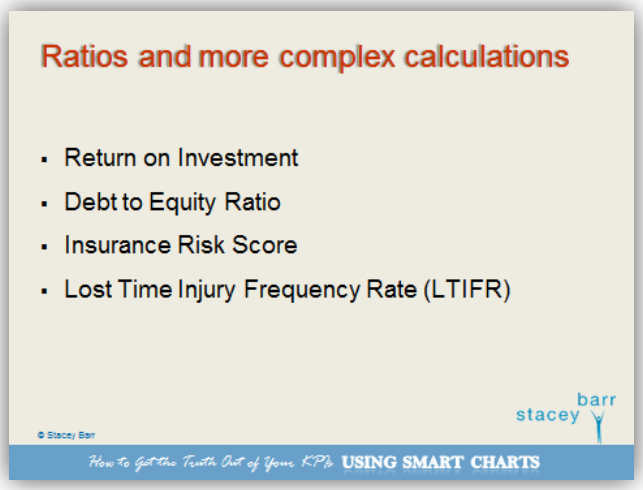
Our next type of measure or KPI, again like a percentage or an average, is ratios.

These ratios tend to be much more complex calculations, so they are not really just an 'add something up and divide it by something else'.

Usually there is some kind of formula involved. Return on Investment is a type of ratio that is a little bit more complex. Usually to calculate the return you could be doing all sorts of things to combine financial results together or to compute some other kind of measure of return, and then divide it by the total investment. And investment itself

Stacey Barr Pty Ltd
the Performance Measure Specialist
ABN 57 129 953 635
PO Box 422 Samford
Queensland 4520 Australia
Phone: 1800 883 458
info@staceybarr.com
www.staceybarr.com

could also be a complex calculation. It might just be dollars but it might be actual money spent plus people's time converted into a dollar factor. So it makes that Return on Investment (or ROI as it's often known) a more complex type of ratio.

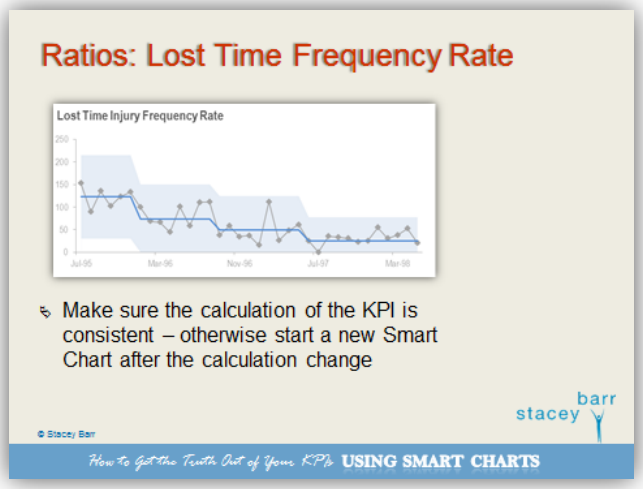


Debt to Equity Ratio, Insurance Risk Score, Lost Time Injury Frequency Rate – they're all examples of slightly more complex calculations or ratios.

If you have any examples of complex ratios that are KPIs or performance measures in your business feel welcome to share them and while you do that we'll take a closer look at the fourth one there, the Lost Time Injury Frequency Rate.

Ratios: Lost Time Injury Frequency Rate

It's a fairly common one and I wouldn't be surprised if some of you didn't list that as one you measure in your organisation.



It's fine to put these in Smart Charts as well. The main concern with complex calculations like these is that you **keep the calculation consistent over time**.

Sometimes we can have these little changes in the formula for how these complex ratios are put together that the people who are the technical experts in the KPI would know about, but that the users of the KPI may not know about at all. They absolutely may not be aware.

Now I've shared this example before with the energy company who had a measure of reliability. That reliability was a really complex index as well and I think it might have been called SAIDI, which is a fairly well known type of measure across the energy

Stacey Barr Pty Ltd
the Performance Measure Specialist
ABN 57 129 953 635
PO Box 422 Samford
Queensland 4520 Australia
Phone: 1800 883 458
info@staceybarr.com
www.staceybarr.com

sector. SAIDI I think stands for System Average Interruption Duration Index. Even the name is complex but the calculation was quite complex and this management team were looking at their measure of SAIDI and they saw that there had been a downward shift. Their Smart Chart showed them a long run that persisted for quite some time and became the new level that SAIDI sat at. Thankfully we had a technical expert in the room at the time that we looked at that.

Everyone is talking about 'What caused that?' and the technical expert said 'Oh we changed the definition of the measure then.' **When that happens you have a new measure so you really shouldn't have the two different calculations on the same Smart Chart**. Absolutely don't have them on there without having a comment or annotation that is very obviously pointing to that drop and saying 'This is due only to a definition change'. But my preference would be to just start anew with the new calculation and treat it as a new measure, which it is, and just monitor the Smart Chart from that point forward.

It's interesting, don't you think, how when you look at some historical data for a measure like this – Lost Time Injury Frequency Rate – how you really see the story of performance over time. It's one of the things I love about these charts.

Over recent months with this particular measure you don't see any signals at all but having the rest of that chart really does put those recent months into context. You can see a steady improvement over time in this Lost Time Injury Frequency Rate. And it would be wonderful to be able to say 'Well back in January 1996 this is what we did and here's the impact. You can see it in the chart. Then later on, probably about August 1996, we made some more changes and here's the impact of those changes. Then about a year later here's what we did then to try and improve lost time injuries and here's the impact that it had.'

You might even say 'And we attempted to do something in December 1997 but we can see that we had no impact from that.' So sometimes part of the story is what is *not* in the chart, not just what *is* in the chart. So you can well have tested a method for improving safety but discover that your Smart Chart is showing that it really had no effect. That is definitely a very valuable part of the story too. I'm not sure if these people set targets of the improvements that they got over time, I don't have any information about that, but that would be interesting too. I wonder if those shifts were target-driven?

Anita has a really interesting comment here,

> *"Your chart works great for lost time or accidents. People argue on where to set targets on accidents. The Smart Chart range works well with the Central Line based on performance."*

Yes, it's a good thing and we are going to talk a lot more about targets in Lesson 5 because that Central Line really is key to how we decide what performance level we currently have and therefore what level of target we should be setting. So stay tuned for that, I think that's a really valuable conversation.

Stacey Barr Pty Ltd
the Performance Measure Specialist
ABN 57 129 953 635
PO Box 422 Samford
Queensland 4520 Australia
Phone: 1800 883 458
info@staceybarr.com
www.staceybarr.com

I haven't seen any more comments come through from any of you about any complex ratio that you are measuring in your organisation. I will keep an eye out though as we continue on to the next type of performance measure.

Attribute Measures

It's called an attribute measure.

Sometimes people call these 'qualitative measures' and they'll say to me 'How do you measure qualitative things like attitudes or satisfaction or engagement?'

Well generally, the way that you measure those sorts of things is with an attribute measure.

It's something where you have taken a qualitative concept and just put a numeric scale to it.

So an Average Customer Satisfaction Rating is a measure that has been constructed by turning a qualitative concept as someone's feelings of satisfaction, for example, into a numeric scale say from 1 to 10, where 1 is completely dissatisfied and 10 is completely satisfied.

It's the same sort of thing with problems. If you have a process where the process is focused on solving problems, maybe a helpdesk with an IT team for example, then you might have a Problem Complexity Level or Score, where each problem that gets logged with the helpdesk is assigned a complexity rating or it could be a severity or urgency rating, but some sort of qualitative concept is then turned into a number. And then you are able to monitor over time: are the calls that are coming into the helpdesk becoming more or less urgent or more or less complex or more or less severe?

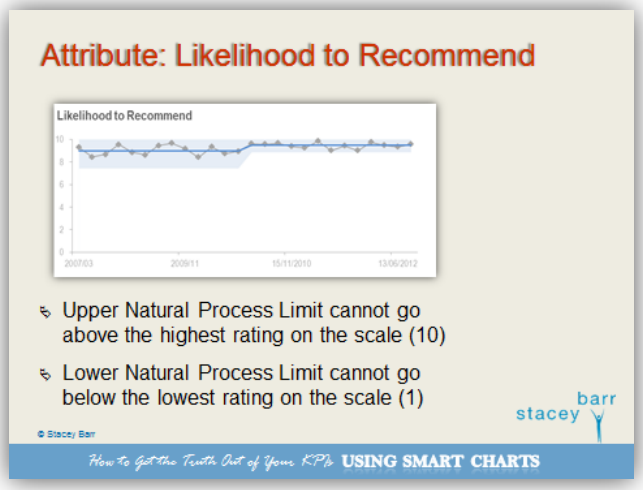
Employee Engagement Rating: again if you look at that you've got no idea how that is measured. But Gallop, for example, have an employee engagement score tool that helps them construct an attribute measure for how engaged employees feel in their work.

Attribute: Likelihood to Recommend

A Likelihood to Recommend Rating is very similar to a Customer Satisfaction Rating. It's where customers are asked 'Now that you have experienced this product or

Stacey Barr Pty Ltd
the Performance Measure Specialist
ABN 57 129 953 635
PO Box 422 Samford
Queensland 4520 Australia
Phone: 1800 883 458
info@staceybarr.com
www.staceybarr.com

service, on a scale of 1 to 10 how likely are you to recommend this to a friend or colleague?' That also becomes an attribute measure as well.



Attribute measures are very powerful ways to easily quantify qualitative concepts so that you can at least get a gauge or sense of how they are changing over time.

As far as a Smart Chart goes you treat them like any other measure but a little bit like the percentage measure where we have a logical maximum and a logical minimum of 100% and 0%.

The attribute measures can be the same – you've got your scale and your natural range of possible, logical values and anything outside of that is not going to work. Generally, if your upper Natural Process Limit calculation works out that it's above 10, for example, where 10 is the highest value on your scale you reset that upper Natural Process Limit to 10 because you don't have a rating higher than 10. Your values for your measure cannot go higher than 10. That happened with this one.

Incidentally, this particular measure is from feedback from participants to my Performance Measure Blueprint Workshop. One of the four questions I ask on the feedback survey at the end of the course is 'How likely are you to recommend this course to a friend or colleague?' and these are the ratings that people have given, on average, for each workshop.

There was a change that I made and you can probably see the upward shift back here which was towards the end of 2010. I made a change to the workshop that turned out to be an improvement and I saw an upward shift in the Likelihood to Recommend. But also the other measure I take from the survey, which is the Overall Value, that had an upward shift as well: a long run above the Central Line. Even before that shift happened you can see that the Natural Process Limit would really actually be higher than 10 the way that it would have calculated, but you can see that I've limited it to 10 as the maximum.

Likewise happens at the other end of the scale. You really can't have your lower Natural Process Limit go below your lowest rating, and in this case the lowest rating on the scale that I give people is 1. Therefore if for some reason no one wanted to recommend my workshop anymore they would all be rating 1 and I would be resetting my lower limit at 1. Thankfully I don't have that problem!

Anita says,

Stacey Barr Pty Ltd
the Performance Measure Specialist
ABN 57 129 953 635
PO Box 422 Samford
Queensland 4520 Australia
Phone: 1800 883 458
info@staceybarr.com
www.staceybarr.com

"Good job practising what you preach."

I love this stuff so I live it, as well as encourage other people to live it as well. It is useful. It really does help. In this example, that change that happened in late 2010, that was a deliberate change that I made to the workshop to see if it would pick the energy up towards the end of the workshop. And you won't believe what the change was: it was the introduction of Smart Charts into session seven in the workshop! I started teaching Smart Charts and I can't believe how ironic it is, but that was the reason for the upward shift that you can see in the graph there. I know that it worked and I've got evidence that it worked so I keep teaching it.

Attribute measures, did I ask you guys if you have any examples? It would be great if you want to share some examples of any sort of attribute measure. The most common ones are related to Customer Satisfaction.

Anita says,

"Mystery Shopper Scores."

Perfect example. Mystery shoppers are probably providing some kind of score on something and feeding that data back. And it is data that can only take one of a set of discrete values. And those values are converted possibly into a percentage or into an average. Great example.

John says,

"Customer Satisfaction Ratings for external customers and for staff."

Great, they are really good examples.

Elke, you measure Employee Engagement.

So that's definitely an attribute measure as well.

"Likelihood to Recommend an Exhibition."

Melinda, that's good. It's good to see that you are measuring attribute measures other than just the typical Customer Satisfaction, which we still need to do but it's a great measure to help us measure things that to others look like they are really tough.

Counts

The next type of measure we are going to look at are counts, probably the simplest of all measures: where we are simply counting something that is happening; an event, a system outage (which could be a blackout in the electrical system or it could be a radio broadcast has gone silent so they've got a broadcast outage).

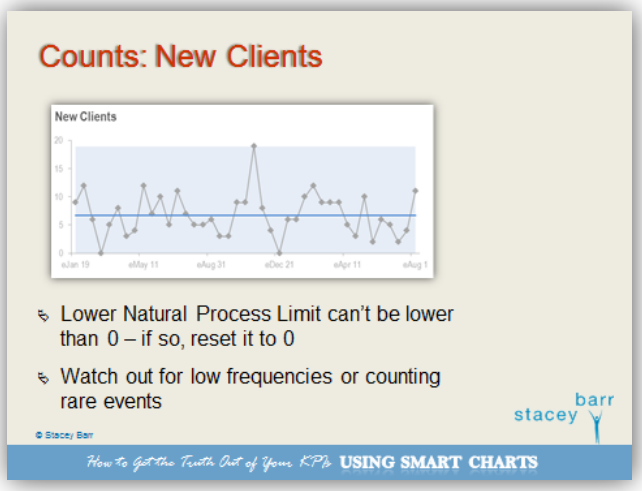
Stacey Barr Pty Ltd
the Performance Measure Specialist
ABN 57 129 953 635
PO Box 422 Samford
Queensland 4520 Australia
Phone: 1800 883 458
info@staceybarr.com
www.staceybarr.com

They are events really and you are just counting how many there are. You are not in this case interested in how long they last for. That would become a total or a sum measure, or if you were to average it out, it would obviously become an average measure. All we are doing here is counting events. How many outages did we have? How many customer complaints came in? How many new clients did we get? How many accidents or incidents did we have in the workplace? Basic counts.

So feel free to share examples of count measures that you have. We know that Anita is counting the number of customers per month. John, you did say before that you were measuring the total claims paid per month which would be the total claim value or dollars paid out per month. But that could easily become a count measure too, where you are just looking at the total number of claims that were made in a particular month or claims that you did decide to pay on, but all you are counting is the number of claims not the total payments. Share your examples of count measures if you feel included.

Counts: New Clients

We will look at the example of New Clients. This performance measure is from a boutique gymnasium and they are counting the number of new client they are getting. Not monthly but this is fortnightly. You don't have to limit your measures to monthly or weekly or quarterly – in this case it's every two weeks.



When you are counting things as your measure, something to be very careful about is, again, **you can't have a negative count**. So you really can't have a lower Natural Process Limit that is below zero. If you have it, reset it to zero. You can see from this example of New Clients that if we had used

Stacey Barr Pty Ltd
the Performance Measure Specialist
ABN 57 129 953 635
PO Box 422 Samford
Queensland 4520 Australia
Phone: 1800 883 458
info@staceybarr.com
www.staceybarr.com

the actual calculated Natural Process Limit it would definitely be in the negative, so it doesn't make sense. Set it to zero as a minimum.

The other thing to look out for with count data is low frequencies or where you are **counting very rare events**. Now this is no problem for the gym because they are getting a decent number of counts per fortnight to make it a viable thing to measure on a fortnightly basis, but some events happen really infrequently and we are going to take a look very specifically at those and what you can do to make them sensible to measure and sensible to monitor in a Smart Chart.

Something else came to mind about counts: sometimes counts are not useful to measure - you may well be aware of this – because **if you see an increase in the number of counts it might *not* be just because you are getting an improvement or deterioration in performance**. It could simply be that you just have a lot more opportunity for things to happen.

For example, if you were simply to count the number of workplace accidents that you had and you saw an increase in that count you couldn't put it down to the fact that the workplace was getting less safe because it could be that over a few months you've had a lot more people coming in to work in your processes, whether they are new employees or temporary employees and that effectively increases the opportunity for accidents to happen.

Another reason for why workplace accident counts might increase is that people are starting to work on much riskier projects. So you need to know that context to be able to interpret a count properly. But in this particular case where we are just counting new clients coming in it's absolutely fine to monitor that as it is because the actual raw numbers of new clients is something that we do want to see an increase in and any increase is a meaningful increase.

So what sort of count measures do you guys have? John is confirming you do look at the Total Number of Claims as well as New Client numbers. Great, good examples. Anita also counts Inaccurate Orders – that's very useful. Melinda counts First Time Visitors to the museum – that's a really useful thing to monitor as well.

With people's websites there used to be this common website analytic statistic thing used called Page Hits or Website Hits and that really fell out of favour pretty quickly because people realised that the hits were really just counting the same person doing the same thing, so over time the website statistics have gotten better and now there is one called New Visitors or First Time Visitors so you are able to look at the new people that are coming to your website and if that number grows it's a good sign that your website is reaching out to a bigger market, or more of your market. So First Time Visitors to the museum has a similar value.

Now, I did say that there is a very special thing we need to do when you are measuring a count that is really infrequent. Let's take a look at those now.

Stacey Barr Pty Ltd
the Performance Measure Specialist
ABN 57 129 953 635
PO Box 422 Samford
Queensland 4520 Australia
Phone: 1800 883 458
info@staceybarr.com
www.staceybarr.com

Counts of Rare Events

These are counts of rare events. You could call them counts of infrequent events if you want to.

Some good examples of rare events are where you are counting up new discoveries. In the mining industry, for example, there is usually a group of people who are engineers and their responsibility is to go around and find new potential deposits of a valuable mineral in the ground that could potentially become a profitable mine in the future.

Now they call these discoveries. Can you imagine how infrequently you would make a new discovery in that kind of example? How often do you find a new deposit of diamonds that could become a diamond mine? Or gold, or uranium?

It's an infrequent thing and it's hard to set targets for how many new discoveries you are going to make because it's an unknown quantity. You just don't know what you don't know. There's a lot of time and effort and money invested in finding these new discoveries and qualifying them so it's a really contentious area in the mining sector, that particular measure. Counting the number of discoveries per year is not really the way to go here, and putting them on a chart is useless. You'd have a blip every year or 18 months and the rest of the data would be zero.

Innovations are another example of that. Probably not quite as rare as discoveries, or perhaps that depends on your industry. The number of innovations or the number of profitable innovations.

Workplace Industrial Disputes, thankfully, are quite often very rare in most industries so counting those on a month-to-month or quarter-to-quarter or annual basis is almost meaningless as well.

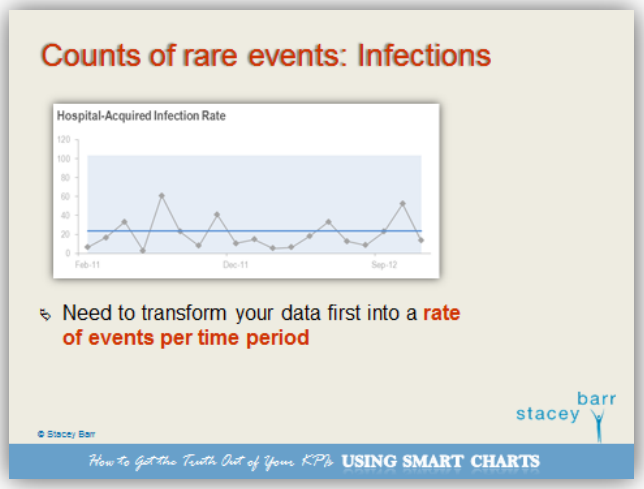
Another type of rare event is what's called a 'hospital acquired infection' and that's where someone goes to hospital for treatment and while they are in hospital they get an infection that was caused by the hospital environment. Obviously not something that you want to have and something you definitely want to make as rare as possible.

So counts of rare events can be measuring things that you either want to increase the rate of or decrease the rate of, doesn't really matter which way. As they stand, they are not actually that appropriate for Smart Charts by just measuring the rare counts themselves.

Stacey Barr Pty Ltd
the Performance Measure Specialist
ABN 57 129 953 635
PO Box 422 Samford
Queensland 4520 Australia
Phone: 1800 883 458
info@staceybarr.com
www.staceybarr.com

Counts of rare events: Infections

Here's the example of Hospital Acquired Infection Rate.



This is what we have to do to our counts to make them more meaningful: you can't put the actual count on the Smart Chart – you need to convert the number into something different.

And what we do is turn it into a rate of events per time period. It doesn't have to be annual, the idea is to think about the rate value as opposed to the count value. It's quite a simple thing to do and I do have a template for you to download that shows you how to go about doing this. It's called the Template for Rare Events and it's on the web page for you to download.

What we need to do to prepare our data is actually on this other sheet here… When you have rare event data **the data that you are actually collecting is the date on which the event happened**. What was the date on which we decided we had a new discovery? What was the data on which we had an industrial dispute? What was the date on which we decided on an allocated investment to a new innovation? So that's the raw data really for counts of rare events, the date on which the event occurred.

To convert those rare events into rates what we do is a couple of things. I'm not going to explain this into a lot of depth, I'm going to let you play with the spreadsheet a little bit and rely on the instructions that are in the Lesson 4 workbook. Those instructions will be much easier for you to follow on at your own pace than just listening to me rambling into all of the detail.

Essentially what you are doing is calculating the rate by working out the days between events. You do that quite easily by looking at the date of the most recent event that happened and the event date before that and calculating the number of days between. You do that between each successive event for which you have collected data for over time.

These dates here in column A for our example are the dates on which a hospital acquired infection was diagnosed.

Then in column D here you can see the days between those diagnoses of hospital acquired infections. So 57 days lapsed between those two infections here, 22 days had lapsed between the next two infections, and so on.

Stacey Barr Pty Ltd
the Performance Measure Specialist
ABN 57 129 953 635
PO Box 422 Samford
Queensland 4520 Australia
Phone: 1800 883 458
info@staceybarr.com
www.staceybarr.com

When you have got those days between events you can then compute a value of the number of events per day by simply inverting this value here and that helps you calculate a value in column F, which is an event rate per year. That's just the time period that these particular people chose for their measure of Hospital Acquired Infections.

That final column is the rate that becomes your measure value. That column F is now the performance measure, not the actual count itself but the rate that you have computed here. That rate then is what you plot in your Smart Chart. It becomes the data for column B in what should now be quite familiar to you, in the Smart Chart template. Then you treat it like any other measure, nice and easy.

Let's see – do you guys have questions about this, or any examples of rare events that you have been trying to figure out how to measure and how to monitor and analyse over time? While you do that I am going to flip us back to the presentation and make a couple of comments about interpreting this particular Smart Chart.

When you look at that chart you can see that there are no signals there at all. That is an interesting thing. If you showed this to the management staff at the hospital and said 'We are getting this level of an infection rate per year. We are not getting any better. Should we be setting a target for this? Is it unethical for us to leave this as it is? Is this rate too high? How does this rate compare to the infection rate at other hospitals?' That dialogue really ought to be happening simply because this chart doesn't show a signal and we kind of want it to show a signal. We want it to show an improvement, a reduction.

Veronica is asking,

> *"Why is the upper limit so high in this?"*

That's the way that it's calculated probably because of these points here, these higher ones have increased the calculation of the upper limit out that far. Sometimes it's a little surprising why it can be as high as it is but it really only sometimes takes a few points that are a little bit bigger to make that limit where it is. But that's using that same formula for a Smart Chart upper Natural Process Limit.

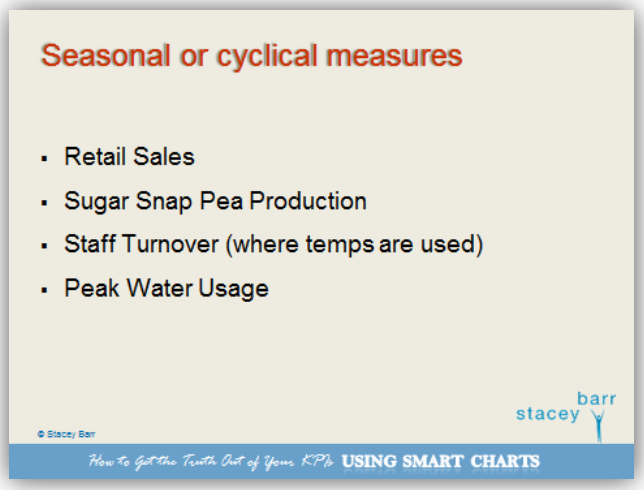
Not seeing any more examples or comments come through relating to these count of rare events. I'll keep an eye open for them though. We'll continue on to another of the problematic measures. Not just for Smart Charts but problematic for interpreting in general.

One of those is the seasonal or cyclical measures.

Stacey Barr Pty Ltd
the Performance Measure Specialist
ABN 57 129 953 635
PO Box 422 Samford
Queensland 4520 Australia
Phone: 1800 883 458
info@staceybarr.com
www.staceybarr.com

Seasonal or cyclical measures

It's really common for people to use moving averages for when you have seasonal or cyclical measures.



It's in that case where a moving average is quite appropriate and not a bad way to look at the overall pattern of a measure that is seasonal or cyclical.

However, if you want to draw conclusions from that measure and be able to say if things are getting better or worse, it's very hard to detect that from looking at the raw cyclical data but also very hard to detect from looking at the moving average as well, because we just go into those old problems of how do we decide when a difference is big enough to really mean that there has been a true change.

Examples of cyclical measures are things like Retail Sales, Sugar Snap Pea Production - a lot of the foods that we grow have a cyclical pattern. Staff turnover can certainly be cyclical too if you are working in an industry where at certain times of the year you bring in a lot of temporary staff but other times of the year those temporary staff are not there anymore. Peak Water Usage is one of the measure from Cheryl and it is a cyclical measure as well. And that's the one that we are going to take a closer look at.

Seasonal: Peak Day Water Usage

You can't see a cycle here in this Smart Chart for peak water usage, and that is because the cyclical variation has been taken out.

That's what you've got to do to be able to really pick up signals of change in a measure that has a seasonal pattern. You need to remove the seasonality from the measure values.

Stacey Barr Pty Ltd
the Performance Measure Specialist
ABN 57 129 953 635
PO Box 422 Samford
Queensland 4520 Australia
Phone: 1800 883 458
info@staceybarr.com
www.staceybarr.com

You know that it's possible because you are seeing it before your eyes that it has actually be done. There is a reasonably simply method for doing it, but before you jump in and apply this de-seasonalising process to your performance measures or KPIs you really should check that there is a seasonal pattern there and to do that is to look at the data in a sample time series and if you see a pattern that repeats at a regular time interval, like each year, then you can be confident that removing the seasonality will make it much easier for you to interpret what is going on and will make it useful in a Smart Chart.

A couple of comments before we dig into this example and into the template for how to de-seasonalise your data…

You want to make sure that you can **accurately describe the period over which the seasonality is happening**. In this particular case it's an annual cycle that's happening with the peak day water usage.

The other thing is to **make sure that you have got at least two periods of data**. If you just have one year and you look at it and say 'Oh that looks like a seasonal pattern' but you haven't got a second year's worth of data to confirm that the pattern has repeated and is not just truly due to something other than a seasonality, then you really don't have enough data yet. You need at least two periods.

So if you have an annual seasonal pattern you need two year's worth of data. If you have a quarterly seasonal pattern I would say in that case you probably want four quarters worth of data. If you have a seasonal pattern that happens every two years then you want four years' worth of data. I hope that is making sense. You really need at least two periods to be able to confidently calculate the values you need to calculate in order to de-seasonalise the data.

If you do have an annual repeating pattern going more than 4 or 5 years back is probably overkill. And in fact Cheryl had 6 or 7 years' worth of data for this measure and I didn't use it all. I have just looked at the four most recent years. This is what Donald Wheeler says in this book: he said if you go beyond 4 or 5 years you are really talking about ancient history as far as performance is concerned so you may end up getting an inaccurate de-seasonalising factor. So 4 or 5 years is fine, or 4 or 5 periods.

Let's take a look at this in a little more detail.

I'm going to show you first the original data that Cheryl sent me. You can see it here in this Smart Chart. The Smart Chart is not helping us at all. It's assuming that the data are all just random over time, but they're not. You can definitely see a repeating pattern there, starting from the data that we have here back in mid-2003 up to almost current. Definitely a pattern there.

When you look at that pattern you can see it kind of looks like the peaks aren't as high as they used to be but there's a much more deliberate analysis that we can do by de-seasonalising this data. We do that on a spreadsheet that you will find in the template for seasonal data. Again, you can download it from the web page.

Stacey Barr Pty Ltd
the Performance Measure Specialist
ABN 57 129 953 635
PO Box 422 Samford
Queensland 4520 Australia
Phone: 1800 883 458
info@staceybarr.com
www.staceybarr.com

There is a sheet in there called 'de-seasonalising' and it takes us through the steps to remove the seasonal component from our measure values.

Again, I'm not going to go into the nitty-gritty detail of this because there are instructions for de-seasonalising your data in the workbook for Lesson 4.

Essentially you start in columns A & B with your original data, your actual data that has the seasonal effect still in it. What we are going to do is take an average for each period of seasonality. So Cheryl decided that this is an annual cycle that keeps repeating. So every year we have computed a monthly average based on that year's data.

These highlighted yellow cells are where those calculations happened. So you can see that for the first year we got an average value of 27M gallons per capita on the peak day, the next year we got 23M and the third year we got 22.9M. That's what you are doing there, calculating those average monthly values and that helps you compute what is called a Seasonal Relative.

The Seasonal Relative is where you are comparing the actual month to the average monthly value for the same year that month is in. To calculate this **seasonal relative** it's the ratio between the actual value for July 2008 and the average monthly value for that year of 2008/2009 that the pattern is in.

There's another calculation that needs to be done where for all the Julys and all the Augusts and all the Septembers etc… a Seasonal Factor is computed and it's computed from those Seasonal Relatives. Again, I won't go into the detail but really what you are coming up with is for each time period within your seasonal period – our seasonal period is a year - so for each month within that year we are calculating an adjustment factor and that adjustment factor is called the Seasonal Factor.

It takes out the seasonality when you apply it to the original values. So those Seasonal Factors are then applied back to our original data and it produces a de-seasonalised value.

So column I has the new values of the peak day usage per capita de-seasonalised and when you look at that in a Smart Chart – because they become your new measure values so on the Smart Chart sheet that is our new value for the column B. We proceed as per normal with the Smart Chart to put those values into the chart. That's what you can see over here in this graph, the Smart Chart for a de-seasonalised peak day usage and there is a very distinct signal in that data.

If you have any measures that have a seasonal factor please feel welcome to share them now. While you are doing that I will go back to our presentation. Cheryl is on this course but she wasn't able to join our live webinars so I'm not in a position that I'm able to ask her the very question I'm sure you would want to ask her as well, and that is: what happened back in July or August of 2009 that caused such a sudden dramatic downward shift in the Peak Day Water Usage? Did they bring in water restrictions at that time? Did they have a campaign where they were encouraging people to use their

Stacey Barr Pty Ltd
the Performance Measure Specialist
ABN 57 129 953 635
PO Box 422 Samford
Queensland 4520 Australia
Phone: 1800 883 458
info@staceybarr.com
www.staceybarr.com

water more wisely? Did they have a ban on using water for sprinkling? Who knows? It's really curious what caused that sudden decrease that has been sustained for a very long time in their water usage.

No comments coming through on seasonal measures so that could be a bit of a delay. I'll keep checking and come back to that.

Stead trend of growth or decline

What we'll do is go onto our final tricky measure for interpretation and that's the kind of measure where you have a continuous steady trend of growth or decline in the measure which is making it really hard to pick up whether the rate of the trend is changing or not over time.

Examples of this is Mobile or Cell Phone Network Usage – that's continuously growing and it's growing because more and more people are using those phones. And there are more things you can use your cell phone for, so that network usage would naturally be growing. And it's going to continue to grow.

Before I go onto the others, Melinda has shared a seasonal measure which is Museum Visitation and that makes plenty of sense. I guess people go to the museum more through tourist or holiday season. Maybe there are certain times of the year where the schools do day trips for museum visits so there certainly could be regular seasonal patterns that occur very similarly each year for the museum. Thanks Melinda.

Back to our steady trend measures.

Blog Readers - more and more people are finding out about your blog and they are reading it and that's going to be a natural growth over time because you are also getting all of your existing readers continuing to read your blog as well. So there's always going to be an underlying steady growth unless you do something stupid and your blog suddenly sucks and nobody wants to read it anymore, but you get the idea.

Non-recyclable Waste – the world is constantly moving in the direction of recycling things and not having stuff that goes to landfill and sits there for centuries, so there will always be that steady decline in the amount of recyclable waste that we are producing.

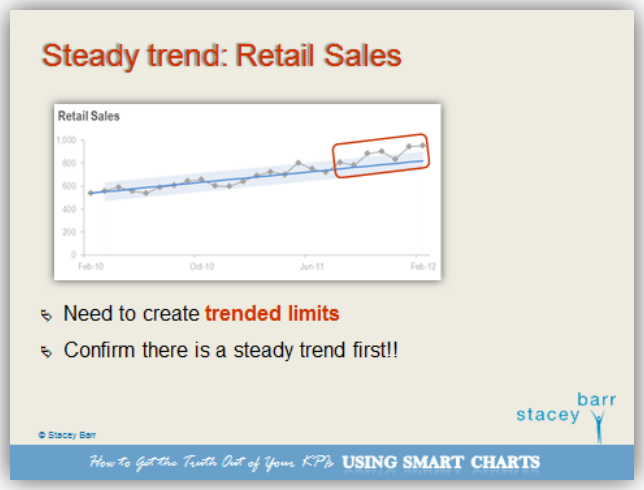
Stacey Barr Pty Ltd
the Performance Measure Specialist
ABN 57 129 953 635
PO Box 422 Samford
Queensland 4520 Australia
Phone: 1800 883 458
info@staceybarr.com
www.staceybarr.com

Retail Sales – they are always going to have that steady upwards increase, but you want to be able to still detect what the impact is of some of your marketing campaigns or introduction of new products. That can feel like it's being masked by that underlying steady growth trend.

You absolutely can solve these problems. You can pick up true signals of change over and above that underlying cause that is causing that basic steady trend.

Steady trend: Retail Sales

Here's the retail sales example. Now if you guys have any measures that are in the same boat where there is a steady increase or a steady decline over time and you are trying to work out signals then go right ahead and share them.



I am a bit distracted because I can see a couple of comments coming through from people saying that they have lost their audio. My guess is that it's a bandwidth issue. It tends to happen when I am showing the spreadsheets and I guess the video is taking up a bit more of the bandwidth and you are losing some of the audio. I'll try and be a bit more careful with that.

When you have a measure that is on a steady trend, either up or down you need to create what are called **trended limits**.

You can see in the example here that we have a Central Line and Natural Process Limits that are following the underlying general trend direction of the performance measure, in this case Retail Sales.

Before you go doing this though, you want to avoid the same risk that you expose yourself to when in Excel you just take your measure values and add a trend line through those values and think that you are doing something useful. You've got to look at your data and ask that question sensibly: **is there actually really a steady trend in this data?**

You *don't* want to use the trend line to explain the data. You want to use the trend line to **establish a new baseline** to compare values to, as you add them to the chart to see if there are any signals emerging. So make sure there really is a steady trend first before you go down this path.

Stacey Barr Pty Ltd
the Performance Measure Specialist
ABN 57 129 953 635
PO Box 422 Samford
Queensland 4520 Australia
Phone: 1800 883 458
info@staceybarr.com
www.staceybarr.com

Generally it's pretty obvious. You just lay out your data in a time series and you'll be able to answer that question. Also remember it doesn't have to be in just the upward direction. You can certainly have measures that follow the opposite direction and have a steady downward trend, but logically and obviously a lot of these trends don't continue on forever.

But your Smart Chart will help you detect when that trend is no longer there and when your measure is starting to level off or behave differently. So that's the added advantage of a Smart Chart, that it will pick the point at which that trend has petered off or stopped and things have levelled off. A very useful piece of information, that is!

Now again there is a template for this, like with the seasonal data one. The trend data one. Like with the other difficult measures you have a sheet in this particular template for transforming your data, for calculating that Trend Central Line. That's what you want to do. You are not changing your measure values here. You are not de-trending them like you were de-seasonalising. Instead, what you are **changing is the way that Central Line is calculated.**

Now that is done by using a very simple method. You don't use the Excel trend line calculation. You do a really simple calculation that divides your data into two sub-groups. Say take the first 9 values of retail sales and calculate the average. The average is 587 and I'll put that at the mid-point at those 9 values. I'll do the same with the next group of 9 values for the measure, calculate their average and that is 692 and I'll place that at the mid-point.

And then using those mid-points you are able to calculate an increment per time period and that increment simulates the slope of the Central Line. And we use that increment to calculate a new Central Line. I call it the Trend Central Line and that value becomes, on your usual Smart Chart template sheet, the new Central Line values in column C.

When you do that, you automatically have the upper and lower limits being the same distance away from that sloping Central Line as they would have been away from a horizontal Central Line. So the effect that has, given that your Central Line now slopes, is the values aren't all the same – they are different. That means that you naturally get your sloping Natural Process Limits as well, and that's the resulting chart that you have.

If you look at this chart you can see that we probably do have a signal in it. I'm not sure if you can tell but the rules are the same – look for a long run of points on one side of the Central Line. Well, there we have those last seven points in this retail sales measure above their trend Central Line and that's a signal.

That means there has been an increase there. Whether it means that we need to calculate a new trend line or whether things are going to start stabilising off at a higher level we don't know yet. We need to wait a little bit longer. While I haven't been able to find any definitive answer on this to do a recalculation of the Central Line when you get a signal like, that you probably want to have a minimum of three or five points to do

Stacey Barr Pty Ltd
the Performance Measure Specialist
ABN 57 129 953 635
PO Box 422 Samford
Queensland 4520 Australia
Phone: 1800 883 458
info@staceybarr.com
www.staceybarr.com

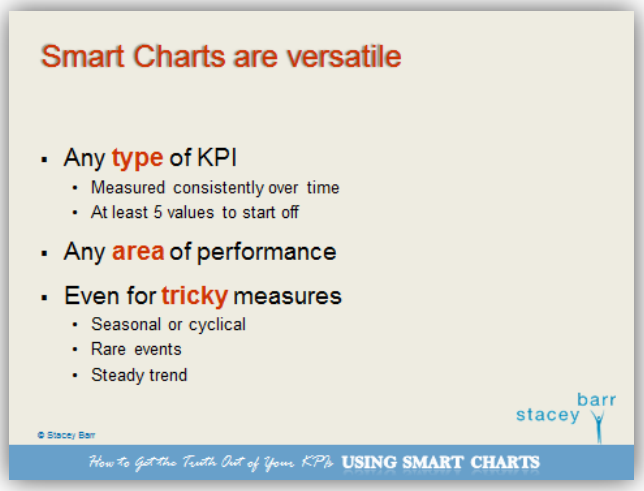
the calculation of the first half your trend line and you would need another three to five points to calculate the second point in your trend line that then helps you work out a new increment value and therefore a new Central Line value for after that. So you would see a step change then – it would probably be up a little bit but it would still be another sloping Central Line.

Again, I have instructions and considerations in your workbooks if you are in a situation where you want to or need to use the trend data approach to Smart Charts.

Back to our slideshow… That's essentially it for the types of performance measures that are appropriate for Smart Charts and the types of performance measures that aren't… but, what to do in order to make them appropriate for Smart Charts.

Smart Charts are verstile

So my guess is, that you are realising just how versatile Smart Charts are for such a broad range of performance measures.



Any type of KPI, as long as you are measuring it consistently over time, and you have at least five values to begin with, anything that you are measuring as a performance measure or KPI can become a Smart Chart.

It doesn't matter which area of performance you are working in either – Smart Charts aren't just for quality type measures which is traditionally where they have come from.

We can use them for any type of management area at all: HR, safety, operations, customer service, IT, supply chain. It's endless how broadly we can apply this concept. Where you are measuring something consistently over time and you have at least five values to start with and it's something that you are interested in improving, interested in looking for signals so that you can interpret and understand what is going on, a Smart Chart is the way to go.

As we have just seen you can even use Smart Charts for some of the traditionally quite tricky measures as well where you have seasonal or cyclical variation, rare events or an underlying steady trend. In all those situations, it's making it quite hard for you to pick up true signals of changes in your measures.

Stacey Barr Pty Ltd
the Performance Measure Specialist
ABN 57 129 953 635
PO Box 422 Samford
Queensland 4520 Australia
Phone: 1800 883 458
info@staceybarr.com
www.staceybarr.com

This is a good point to stop and see if any of you have any questions about what we have covered or any thoughts or any reactions you would like to share. I'm going to give you a few moments to do that so if there are any questions you have or thoughts you would like to share go right ahead and do that now and I will get us started on the final Lesson in our course.

That final Lesson is about some considerations and ideas for using Smart Charts in KPI reports. We are going to look at formatting and a few other options that can make them really so much more valuable in reports, whether they are paper based or digital or dashboard style reports.

Anita has just got back after having the audio problems, so that's a bummer. Welcome back Anita. No one else seems to have a question at this point so I will keep going and keep an eye on the Q&A box as I go.

End of transcript.