



### Transcript for Session 014

Listen to the podcast session, see resources & links:

<http://chandoo.org/session14/>

#### **Transcript:**

Hello there and welcome back to chandoo.org podcast session 14. Chandoo.org podcast is dedicated to making you awesome in data analysis, charting, dashboards and VBA using Microsoft Excel.

Thank you so much for joining me in this episode where we are going to talk about '**How to create awesome dashboards using Excel.**'

Dashboards have been a familiar topic in recent years with many organizations trying to implement Excel-based dashboard reporting. This is because of several reasons. The primary one, of course, is that Excel has grown in terms of capability and ease-of-use over the years. Well, Excel has been a very easy-to-use software for the past several years but in the recent past, many more companies have started to realize that Excel can do a lot more than just storing a bunch of numbers and adding them up. That's the primary reason.

The second and most obvious reason for companies shifting to Excel for dashboard reporting is cost. Excel is a very low cost alternative when compared with the 'enterprise dashboard solutions' or 'business intelligence reporting suites' that are available. When you compare Excel with these, it comes up as a natural alternative. It is really quite cheap. I think that at a large organization, the per unit license fee would be about \$25-30, because the total price that the company pays includes all other applications like MS Word, PowerPoint, etc.

Due to all these reasons, Excel is being increasingly used by companies to create dashboards. For us Analysts and Managers, that means a lot more things to learn. Nowadays an Analyst is expected to know how to create a basic dashboard in Excel and how to put together a bunch of charts or a report very quickly. It's no wonder that whenever I get a call from some of our prospective students, most of them ask me something like, "I have an Analyst interview coming up - how do I answer questions on dashboards?" I usually guide them on the process of how to learn dashboards and so I thought that doing a podcast on this theme - 'How to create an awesome dashboard using Excel' - would be useful for all of us.

Before we jump into the topic, I'd like to share a couple of exciting announcements. These are really exciting for me, so I hope you will also find them useful and interesting. The first announcement is that I'm speaking at an international Excel conference called 'Excel Balooza'. It is a conference organized by BizNet Software. They make a special add-on for Excel which can be used to create reports and dashboards using Excel. So, they have been conducting this workshop for a couple of years and this year they have invited me to conduct sessions and speak on various Excel topics during this conference. This is happening in Dallas, Texas from September 20-24. September 20th is Sunday and that's the kick-off



day of the conference. Nothing much happens that day except socializing and getting to know each other. On 21st, 22nd and 23rd September they have lined up a lot of useful sessions and they have a dedicated 'Chandoo track' where I will be speaking. I am planning to take up sessions on 'How to create the right charts using Excel', 'Ten mistakes to avoid when making dashboards' and 'A hands-on Excel dashboard design session' where people will be creating a dashboard using Excel all in an afternoon. This is a really exciting conference for me because the last conference where I spoke was almost a year ago and I'm really eager to visit this conference, share the knowledge that I've learned over the years, meet some interesting folks, network with fellow Excel users and Excel business people and maybe meet some of you. So, you can also participate in this conference. You can register yourself or you can ask your company to sponsor you as a delegate. For more details on this, please visit <http://chandoo.org/session14/> which is the link for this podcast and where I'll be putting up some information about the 'Excel Balooza' conference. As a user and listener of chandoo.org, you will get a 10% discount on the conference fees. That's one more incentive for you to come to this conference! Again, the conference is happening in Dallas, Texas between September 20th and September 24th. That's the first announcement.

The second announcement is that since I'm going all the way to Dallas in September, I thought I should make better use of the trip. Of course, speaking at the conference itself is a lot of fun and excitement, but since I'm going all the way there from India, I am planning to spend one more extra week and conduct a live master class on 'Advanced Excel, Dashboards, PowerPivot and PowerQuery' in Houston, Texas. The master class will take place in Houston whereas the conference is in Dallas. I usually conduct master classes every year in a couple of locations. Last year I did these in Chicago, Columbus, Washington DC and also in Kuala Lumpur, Malaysia. Whenever I do these master classes, there is one thing that I can tell you and that is that we always sell out! Since I'm conducting only one master class this year and that too in Houston, I'm hoping that we will get a fantastic response from our readers and that we'll eventually sell out this master class as well. Again, the theme for this master class is 2 days on 'Advanced Excel and Dashboard designing' (on 15th and 16th September) and 2 more days on 'PowerPivot and Data Analysis using PowerPivot' (on 17th and 18th September). The master classes will be happening prior to the 'Excel Balooza' conference. You can visit <http://chandoo.org/session14/> to access all the details about the master class.

I'm really eager to go to the United States. The last time we could only conduct these classes in the North-East part of US to be precise - Chicago, Columbus and Washington DC, and quite a few of you asked me, "Chandoo, why don't you come down South and conduct some of these classes?" It's a big country and I couldn't find the time when I was there last. So this year I am really eager to visit Houston. It'll be my first time in Texas and I'll meet some nice folks and have a good time there. That's the second announcement.

I know it's become a little long, but I have one more announcement to make! The third announcement is that we recently concluded our 'Annual Excel Dashboard Contest'. This year the theme was to visualize migration between the various States in the United States of America. US has a lot of States; 50 to be precise. -- And, a lot of migration happens between the States, people move from one state to another. To visualize these migration trends, we published all the data and I asked the viewers to prepare dashboards. We've concluded the contest and we have 49 dashboards in the final list! All of these are really beautiful and fantastic and can provide you with lots of inspiration, ideas and techniques if you examine them. I will provide a link to it as well on the show notes page at



<http://chandoo.org/session14/>. The results of this contest have also been announced and are available there.

Let's move on to our session topic for today which is 'How to create an awesome dashboard using Excel'.

Even before we talk about 'How to create an awesome dashboard', it is important to understand what is an awesome dashboard. For example, what is a normal dashboard versus an awesome dashboard? In my mind, I would consider a dashboard to be awesome if it meets these criteria:

1. It should **provide clear insights**. This means that if I am looking at the dashboard, the message that it is trying to convey should jump right out. It should be really simple and clear to understand.
2. The second thing that is important for me is that the dashboard should be **easy to read, print and share**. Some of us will be looking at the dashboard in Excel, so it should be easy to read there. Some of us will be looking at it on a projector or screen where it is being projected and some of us will read it on a print-out. So, in all these mediums, the dashboard should be easy to follow.
3. The third criterion is that it should have **excellent design**. What is excellent design? We will talk about that further along this podcast, but you know that something is designed well when you see it. For example, when you pick up your iPhone or Sony Walkman etc., you can feel that it has excellent design. It is consistent, it feels correct and it meets the purpose for which it is designed. A dashboard, in the same way, should also have excellent design.
4. For me, the most important criterion apart from all the above three criteria, is that it should **help decision makers**. A dashboard that has excellent design, clear insights and is easy to read is practically useless if it is not helping the decision makers. A dashboard is usually designed so that somebody can make a better decision. Or, it is made to help somebody understand a particular aspect of the business and proceed with their decisions. In such cases, an awesome dashboard is the one that helps us make better decisions.

These are the criteria. Now let's learn how to create these awesome dashboards using Excel. This is a process that I have been following since 2008. For the past 6 years, I have been following this process and refining it. This is the process that I teach my students in live or online classes as well.

This process has 10 steps, so let's call it '**The 10 steps process for creating awesome dashboards**'.

1. The very first step is - '**talk to your end users**'. Whenever you have a requirement to develop a dashboard, the very first step that you should follow is not to open Excel or think about how the dashboard should look, the colors or fonts to use, but to pick up your notepad, book and pen and walk straight to the end users of the dashboard and spend time talking with them. What should you talk about? You should ask all the 'WH questions'. I don't know if you've heard this term, but back in school we used to have this term called 'WH questions' which are basically questions that start with the letter 'W' or 'H' as the beginning word. These are questions like why, what, who, where, when, how etc. For example, if I am designing a dashboard, the very first question that I'd ask is 'why do you need this dashboard', and 'what is the purpose of this



dashboard'? So, that's a set of 'WH questions'. Why and what? I would also ask the question, 'when do you need this dashboard?' Here, 'when' is in the context of not only the deadline, but also [more importantly] in terms of how frequently the dashboard will be required. Is it something that you need to see every week, every month, every year etc. Depending on the answer, we'll decide the kind of information and intelligence that will be part of the dashboard.

Likewise, we'll also ask questions like, 'how do you use this dashboard?' Would you be using it on a desktop, laptop, projected screen or as a print out. Where do you use it? At what stage of the business process will this dashboard help you? Is it part of decision-making, tracking or monitoring? Where will the dashboard be deployed? These are the kinds of questions that you'd ask. It's almost like the kinds of questions you'd ask if someone asks you to build software or construct a building etc. If somebody asks you to build a house, you don't start by laying the bricks or digging the foundation right away. Instead, the first thing that you do is to ask questions like - 'what do you need the house for', 'what kind of living conditions are you expecting', 'how many people will be living here' etc. These are the kinds of questions that you ask. You need to follow the same clear and methodical approach when you are designing dashboards as well. So, the first step is to talk to your users and understand what they need.

2. The second step is to **make a sketch of the dashboard**. Once you talk to your users, you will have an idea of their requirements. Then, go back to your desk, take a pen and paper, and make a rough sketch of the dashboard. This is the easiest and simplest thing to do. You can go hi-tech and probably use MS Paint, PowerPoint or any other illustration software to create the sketch. But, let's keep it as simple as possible because anyway you'll be developing this in software like Excel later on. So, at the first stage, all you need is a rough sketch of the dashboard. The sketch will depict how the dashboard will eventually look and how it will behave. So it's not just about looks, it also tells the end user how the dashboard will behave.
3. Once the sketch is created, the third step is to go and **validate it with your end users**. The first step is to talk to your users, the second step is to make a sketch of how the dashboard will look and the third step is to go back to the users and show them your design. Walk them through the dashboard explaining how they will interact with the dashboard, what kinds of things they would do to interact with the dashboard, and the kind of insight of information that the dashboard will provide. Your sketch can be very simple. You don't even have to draw, you can just draw a placeholder for where the chart will go and you can write something like the following statement inside the placeholder - 'this will depict sales trend or the number of faults we have in each division of our manufacturing plant' etc. While you are validating the sketch with your users, they might come up with more information and ideas. When you are asking things the first time, they may not specify everything. They may assume that you know certain things and they won't spell it out. However, when you prepare a drawing, they might realise 'hey, we need a roof on this house' and this drawing does not depict a roof! We all know that a house requires a roof, but maybe they haven't explicitly said it and so we haven't added it to the sketch. In the same way, when you prepare a sketch, your users will be able to see through some of the things that they have missed specifying, and they can add them. The validation step is very important in this way. If there are some corrections or new information that you gather in the validation stage, then you should go back to step 2. Include those in the design, refine it, and go back for another validation. Steps 2 and 3 are like a small loop that runs a couple of



times until everyone is happy with the validation.

4. Once the validation is done, and once you know what your users want, then we come to step 4 which is **data collection**. In many corporate environments, the kind of data that you require to make a dashboard, report or chart, is not easy to get. Sometimes the data may not be in one place. It may be in several different places and you have to collect it. This is where step 4 is really important. Again, as a tool, Excel has lots of powerful features to help us collect the data. The most important feature present in Excel to help us collect the data is 'data connection'. Using a connection feature in Excel, you can connect to any database like a MS Access database or a MySQL database or an Oracle database or SAP etc. You can connect to these various places where the data might be held and bring the data back to Excel. This is the collection of data. When you are collecting the data, it is important to know what to collect and what to exclude.

For example, if you have to make a sales dashboard to analyze the sales performance of your company - let's imagine you are doing this for a company like WalMart which is a big company that has been in business for 50 or 60 years now - you won't go and collect the data for the past 50-60 years. You could, of course, collect and analyze the data, but that kind of insight is almost useless for your day-to-day business operations. Instead, you'd define a subset of the data based on the number of years of data that you need, say for the last 12 months. Another way to define the subset could be based on the regions for which you need the data. For example, you might decide to collect the data for your stores located in Florida for the last 12 months. In this way you define a context for the data and only collect that data. Don't collect everything because once you do, it becomes increasingly difficult to filter it out in Excel and analyze it. Excel is a very powerful software but if you put millions of rows of data in it, it can become really slow and unstable. You don't want to do that. You want to bring only the required data into Excel and manipulate it there.

Likewise, any kind of heavy manipulation of data - for example the sales data that you are collecting has a timestamp of the transaction and you don't really need the timestamp, but you just need the month and year when the transaction happened - so if you need just that, there is no point in getting the timestamp into Excel and then writing a formula to extract the month and year from it. Instead, you could write the formula in your database itself to extract the month and year and then just get those portions into Excel. This can be done with a little bit of SQL or any other database manipulation software. SQL is the most preferred one, but it's not my intention to share information about SQL in this podcast. We'll reserve that for another day! You can look it up online and get information about SQL and understand it.

The key thing to keep in mind is that any kind of bulk transformation or bulk manipulation of data [anything that happens on the entire data set] is better done outside Excel. Clean up the data before it comes to Excel - remove the data that you don't want, convert it from one format to another etc. - so that Excel has less work to do. The important concept when you are collecting data is to use connections and queries and [if possible] automatic imports. Sometimes data does not come to you from a database, but from a text file or a .csv file published on a network path. In such cases, you could write a simple VBA script to fetch the file as and when you want it. This kind of automation can help you focus more on the dashboard instead of the data.



And, finally, if you are using Excel 2010 and above, you could use a powerful add-in called PowerQuery (which was called Data Explorer prior to 2013). PowerQuery is a very powerful way to collect data in Excel and manipulate it. It has simplified a lot of the steps that are usually required when you are bringing data in from different databases. For example, in many companies, sales data or project data or expenditure data is not in one database but is located in a couple of databases. I am sure you can relate to this. Let us take sales data as an example and assume that you have two stores; store 1 is storing the data in an Oracle database and store 2 is storing the data in a SAP system. This happens quite often in many companies. Now, how do you fetch the data? Of course, you can make separate connections and pull in the data. But, how do you combine it? In order to analyze the data, you need to combine both the data sets, in order to make a reasonable insight out of it. As Analysts, most of our time goes on merging data or synchronizing data or doing some kind of data manipulation even before we can create our first Pivot table or chart. This is where PowerQuery can be incredibly handy. It can merge data, it can carry out manipulations to create a union of the data, and combine data from different columns very easily. We will reserve another podcast session for PowerQuery and I will also talk more about it on the blog in the coming months. You can also search for it on google. There are some excellent websites that provide tutorials and information about PowerQuery. Do keep in mind that PowerQuery that is only available in Excel 2010 and above. So this is how you collect the data. To recap, step 1 is to talk to your users, step 2 is to make a drawing or sketch, step 3 is to validate, and step 4 is to collect the data.

5. Once all the data is collected, step 5 comes in to the picture where you need to **structure the data**. This means that the data comes into Excel but it is sitting in a bunch of worksheets in a raw format. However, to do a good analysis or to crunch the data efficiently, you need to structure it in a better way. Structuring is where you would make sure that the column names are identical if the data is in multiple tables, so that you can easily combine them or manipulate them better.

The most important ways to structure data in Excel are:

- Use **tables** - Tables is a feature in Excel available since Excel 2007. It helps you structure data automatically so that you don't have to worry about it every time the data is refreshed. You can blindly use tables anytime that you are importing data or collecting data in Excel and maintaining it. Just give the table a name so that you can forget about the location of the data etc. You can refer to the data by the name of the table. Tables have lots of other advantages. I will provide a link to table information in the podcast notes. Please visit <http://chandoo.org/session14/> for accessing it.
- The second feature is a feature called **relationships** which is available since Excel 2013. If you have two sets of data and they are related to each other - for example, let's say that you are looking at the sales transaction data and the product data. Within the sales transactions data, you would have something like a transaction number and a product ID and the number of units purchased. In order to find out which product it is, there is a products table where all the details of the products are mentioned which would include the name, size, unit cost and other details about the product. These kinds of things are





very common in the database world. But, in Excel we would usually write a bunch of VLOOKUP formulas so that the entire product data is combined with the transactions data. However, this kind of thing will drastically slow down Excel because you are writing all these unnecessary formulas even before you can analyze the data. This is where relationships are handy. This new feature introduced in Excel 2013 can help us connect one table to another by specifying a primary key and foreign key kind of relationship so that you can focus on analyzing the data rather than worrying about lookup formulas. Again, I will link to a video and article on relationships in the show notes. Please go to <http://chandoo.org/session14/> for that information.

Likewise, you should remove anything that is unnecessary when you are structuring the data. Ideally, you should remove it even before the data comes into Excel. However, if it has to come into Excel for some reason, then you should remove anything that is not required when you are structuring the data, so that your analysis focuses only on the required data.

These are the first five steps. So far we have understood what users want, and we collected the data and structured it.

6. Now we come to step 6 and here we **crunch the data**. By crunching the data we mean that while all the data that we want for the dashboard is ready, for our dashboard we need certain things. For example the user might have specified that s/he wants to understand the trend of sales. So, in order to see the trend of sales, maybe we need to have a weekly or daily total sale for the reporting period. In order to calculate this figure, we can use Pivot tables or Excel formulas or PowerPivot or VBA macros. Using these various techniques, we can crunch the data. Crunching the data is where you would rely on your Excel skills. The most obvious one is to use Pivot tables because they are very easy to set up and they don't require formulas. But, they are somewhat rigid and can't do everything that you might want. So, in such cases, you would use either formulas or PowerPivot. Both of these are very useful. In some cases, where we can't calculate using PowerPivot or formulas, we would revert to a VBA macro to calculate or crunch the numbers.
7. Once the crunching is done, we **create a chart or visualization**. When you are making charts for your dashboard, please keep these comparisons in mind:
  - You should always **use a simple chart** against a complex chart. For example, a bar chart or column chart or line chart is a simple chart. Whereas a complex chart would be something like a donut chart or a bubble chart or a 2-D surface chart or a radar chart. These are the charts which are very tricky to understand. So, don't make such complex charts. Make simple charts as much as possible. That's the first rule.
  - The second rule is to **use fewer colors** as opposed to more colors. If you use more colors, it can create a busy impression in the dashboard.
  - **Use a clean look**, instead of special effects. Excel charts have lots of special effects. For example, you could add drop shadows, reflections or other fancy effects. Don't do that. Just use a simple look.



- If possible, and if it's okay, **prefer interactive charts** to static charts. This is because there is a lot of information in a dashboard and decision-makers would love to play with it and get what they want. So, give the control back to the end users by adding in some interactivity. This is where you can use features like form controls, slicers, hyperlinks or VBA, so that users can talk to the dashboard and get the results. Again, we have discussed these topics like form controls in earlier podcast episodes. You can go to <http://chandoo.org/podcast> where all the previous episodes can be accessed. Or, you can go to the show notes page for this podcast at <http://chandoo.org/session14/> where I will provide some examples of interactive or dynamic dashboards.

So, whenever you are making charts, choose simple charts, use fewer colors and create a clean look as against a fancy look, and if possible make it interactive. This is step 7.

8. Step number 8 is to **bring it all together**. Once we've written all the formulas and created the charts etc., it's time to bring it all together into one dashboard report. This is where you need to make choices related to the colors of the various elements of your dashboard, the types of fonts to use, how many different fonts to use, how many different font sizes to use, the kind of layout to follow for the dashboard and how to align it. This topic would itself take an hour or two to talk about, so I'm not going to go into those details. But, I will highly encourage you to explore the 49 state to state migration dashboards that we recently published or any of the hundreds of dashboard examples on our site so that you can get some inspiration and ideas about what is good design and what is bad design. Bring together all these elements to the dashboard to complete step number 8.
9. Once the dashboard is ready, then we come to step number 9 which is to **showcase it**. Showcase it to your users so that they can use it and give you constructive feedback, or present the dashboard to the decision makers so that they can understand whether all their requirements have been met or if there is something pending.
10. The final step is to **repeat**. In any corporate environment, a dashboard is usually a decision support tool. And, the way we make decisions always changes. We might make a decision on whether or not to offer a discount based on the sales trend now. However, after a few months, we might want to consider additional information to make the same decision. For example, I might say today, "Hey, sales are going down, let's offer a discount." But after a year, I might say, "Hey, the competitors are offering discounts; let's also offer a discount [even though our sales are up]." It's the same decision but is based on different criteria. This means that the dashboards that are helping us make these decisions should also evolve. So, step number 10 (the last step for our dashboard design process) is to repeat the same process once every few months so that your dashboard also evolves and helps decision makers better.

**To re-cap**, the ten steps are:

1. Talk to your users and understand what they need.
2. Make a sketch of your dashboard so that you can explain your entire understanding there.
3. Validate the sketch by taking it back to the users so that they can also help you identify any gaps or missing information.





4. Collect data by using tools and features like connections, queries, PowerQuery or through automated imports using VBA.
5. Structure the data using features like tables and relationships in Excel.
6. Crunch the data using Pivot tables, PowerPivot or formulas.
7. Create charts - keep them simple, use fewer colors, prefer a clean layout and use interactivity if allowed.
8. Bring all of these together into one dashboard output.
9. Showcase and get feedback.
10. Repeat this entire process once every few months so that your dashboard can evolve.

This is how I would create an awesome dashboard. I have been following this process for almost 7 or 8 years now. Whenever I follow this process, I see tremendous results. People are always impressed with the output that we create when we follow a methodical process like this. Of course, you might be able to create a good looking and awesome dashboard even without following this process. But, that's more like a case of hit or miss. However, if you are following a process, the chance of making errors or wasting time is very little. So, I encourage you to follow this process for making awesome dashboards. Again, I just want to remind you that if you want to create dashboards using this process, and if you want to learn how to follow this process and see some examples, there are three ways in which you can do this:

1. Join us at '**Excel Balooza**' where I am going to take you through this process and show you how to construct a dashboard in an afternoon. This is the conference that is happening in **Dallas, Texas** from **20th-24th September**.
2. You can join a **live class** that I am offering in **Houston, Texas** this year from **15th-16th September on dashboards** and from **17th-18th September on PowerPivot and PowerQuery** dashboards.
3. You can enrol in our **online Excel school program** where we teach people how to construct dashboards.

Again, these are three awesome, spectacular and value-for-money ways to learn how to create dashboards and powerful analysis using Excel. I hope you will consider one of these three. Even if you don't, since you are listening to this podcast, I assume you are already learning a ton of material and you find this useful.

Thank you so much for joining me in this podcast episode. I hope you have enjoyed it. Please visit <http://chandoo.org/session14/> to access the show notes, links and resources mentioned in this episode.

Thank you so much and I'll see you again in another episode. Bye.