Transcript for Session 037

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Transcript:

Hi and welcome to http://chandoo.org podcast. This is session number 37. Chandoo.org podcast is designed to make you awesome in data analysis, charting, dashboards and VBA using Microsoft Excel. Thank you so much for joining me in this episode. In this episode, we are going to talk about Excel errors and hence the title "Error error on the wall".

Whenever we are writing Excel formulas, we often bump into various types of errors. Sometimes we see **#N/A!, #VALUE!, #REF!, #NULL!, #NAME?** or a bunch of hash symbols. These are nothing but errors that occur when you are trying to build a formula or a spreadsheet.

In this podcast, let us quickly understand the **various types of errors that you would see in Excel, how to deal with them, some of the best practices when it comes to writing formulas and when you would use errors at all**. There is a purpose for some of these errors and we could use them for some very special reasons and we are going to talk about those as well.

There are a lot of errors that you see when you start working with Excel formulas. The obvious mistakes are when you are trying to write a formula and you press Enter or you tab out of the formula that you are typing. Excel will show a warning message saying that the formula you have typed seems to be incorrect. This is purely a **syntax error**. So, we are not really going to talk about those kinds of syntax errors because those are fairly straightforward. Let's say that you are trying to write an expression '2+3*7' but somehow you didn't write the expression the way you want. Instead of writing '2+3*7', you wrote '2+3(7'. This is an expression that Excel cannot understand and it will come back and show you a warning message when you are trying to type that formula into the cell. It will simply say that what you are trying to type in is incorrect. Sometimes, Excel is quite smart and it will automatically try to correct the formula. This is truer when you forget to close a parenthesis or something like that. When that happens, Excel will guess where that extra bracket should go and it will fill it up for you.

But, some of the errors are not so straightforward, i.e. some of the syntax mistakes. In such a case, Excel will throw back a warning and it will ask you to correct the formula. As I said, these are fairly straightforward and beginner level mistakes and errors that you see and there is not much mystery in

them. But, the real mystery or challenge comes when you see a bunch of error messages in a cell like a #VALUE! or #N/A! error and you don't know why it is happening.

Let us start with the most obvious and easiest error message of all - **#DIV/0! error**. All errors in Excel formulas will show up with a # or a $ symbol in the beginning. As I have established very early on in this podcast, when I keep saying # a bunch of times, I sometimes twist my tongue and ruin the next word. So, I am not going to say # anymore. I am going to simple say DIV/0 error. As the name suggests, #DIV/0! error is something that happens when you try to divide a number by 0. It is potentially trying to ask Excel to print the infinity value and since it is not possible for computers to imagine or think about values as infinity, Excel will come back and say #DIV/0!. The easiest fix for #DIV/0! error is not to divide by 0. That sounds like an obvious way to do it but that is the easiest answer. What if you have to divide by 0? In that case, you could use either an IF function - you could something like if my denominator is equal to 0 then I want to print an alternate value else divide the numerator by the denominator. So, you would use some sort of an IF condition to check this. You could also use an IFERROR formula to suppress the #DIV/0! error. All of these are methods for handling #DIV/0! scenarios.

The thing with Excel is that whenever you divide by 0, it will come back and give you the answer. But, in PowerPivot where they have a similar functionality of dividing one number by another, they have added a new function called DIVIDE which is like a safe divide. So, whenever the division happens by 0, it won't divide. It will give you an alternative result which could be another number or a blank value.

The next error message that you often see is called **#NAME? error**. What does this mean? This means that you are trying to write a formula or something in Excel but it is referring to something that does not exist in the Excel world. A classic and very simple way to imagine this would be that you are writing a formula and referring to a named range but the named range hasn't been defined. When that happens, you see a #NAME? error. Likewise, if you are sometimes trying to call a function that itself does not exist like a user-defined function or you have mis-spelt a function, for example instead of saying SUMPRODUCT, you wrote MULTIPLYPRODUCT. Since there is no such function, you would see a #NAME? error which means that Excel couldn't understand the name you are after. Whenever you see a #NAME? error, it really means that there is something wrong with your calculation engine. Either the names are missing or the functions are missing or something else like wrong like there is a typo in one of the things. So, the fix for #NAME? error would have to be that you have to go and examine that function or formula that you have written, understand where the mistake is happening and fix it. There is really no other recommended way to handle #NAME? errors.

The third kind of error message that we see is **#REF! error**. This is similar to #NAME? error in a way but with the #REF! error, you are trying to reference something that does not exist. A simple example would be that let's say that you have written a formula that talks to cell A1 - it is an absolute reference - and then somebody goes and deletes column A or row 1. When somebody deletes it, the cell A1 doesn't

exist anymore. In such cases, you might see a #REF! error because Excel is trying to talk to a cell that just got deleted and Excel does not know where to move that reference because you have either written it as an absolute reference or are referencing it through some other mechanism like OFFSET, INDEX or INDIRECT. In such cases, Excel does not know what to refer to and it will come back with a #REF! error.

There are a few other scenarios where #REF! error might occur, but, in general, whenever you see a #REF! error, it simply means that you formula or expression or function is referencing something that does not exist. It could be that it might exist but Excel either couldn't calculate that value or that cell doesn't even exist. To give you an example of things that are not possible to calculate, let's say that you are using an INDEX formula and you are asking it to return you the seventh value from the range. But, if the range does not have 7 values and has only 5 values, essentially, you are asking it to pick up the 7th value from the 5 values. Now, there is no 7th value in those 5 values, Excel will come back and say #REF! because it couldn't reference the 7th value of those 5 items list. That's your #REF! error.

The next error is quite common called **#N/A! error**. Most commonly we see the #N/A! error when we are trying to do a lookup like a VLOOKUP, HLOOKUP, MATCH or one of those kinds of lookup formulas and you are trying to look up and the data does not exist. Assuming that we are doing a VLOOKUP and we are doing an exact lookup and not an approximate lookup and so the last parameter is false, but the value you are trying to look up is not there in that list then Excel comes back with a #N/A! error. Now, this is not the only scenario where #N/A! error occurs but this is the most common situation. This is probably also the really frustrating error message of all. You know what to do in case of a #DIV/0! or #NAME? or #REF! but the #N/A! error is the one that you don't really anticipate. When we are building a VLOOKUP or any other calculation based workbook or model or dashboard, we often, by default, assume that things exist in the data. But, in many business situations, whatever you are trying to lookup may not exist. It could be that it exists but there is a spelling mistake or a typo or an extra space at the end or whatever. Whatever may be the scenario, #N/A! error is the thing that kind of frustrates us Analysts quite a bit.

Whenever you see #N/A! error in the context of lookup formulas, your immediate suspicion should be that the lookup has failed and you could not lookup. The thing to keep in mind with lookups is that if you are doing an exact lookup then #N/A! error might occur when the value doesn't exist. But, if you are doing an approximate lookup that is either less than or greater than the value type of a lookup then in such a case, Excel will come up with an approximate match all the time and so you seldom see the #N/A! error. That is something that you need to keep in mind. With respect to VLOOKUPs, if you have a #N/A! error, you could use a couple of techniques. You could use an IFERROR formula to handle that kind of a problem. You could also change your lookup to do something else in case the value does not exist. So, you could change the VLOOKUP to a mix of IF, COUNTIF and LOOKUP kind of formulas so that if there is a value then only you will lookup otherwise do something else. Alternatively, IFERROR could also be used as I said earlier. That is your #N/A! error.

The next error is **#VALUE!**. This is what happens when you are trying to calculate a value but Excel cannot calculate that value. A very simple example is if you are trying to do some sort of an arithmetic thing like 2+3 but one of the parameters is text. It is not a number but it is text. So, you wrote 2 and then + and then instead of typing 3, you wrote THREE. Now, THREE is a thing that exists in the real world but in Excel it does not. Only 3 exists and so Excel will return a #VALUE! error. There are other places also where you would see a #VALUE! error. Essentially, the word #VALUE! refers that Excel is trying to calculate a value - a number in other words - and it can't. That's when a #VALUE! error usually occurs.

These are some of the common errors that we see. There are three more errors that we often see but they are not very common. The next one is **#NUM! error**. This is where you are trying to come up with a number that is not represented by the world of Excel. To give you an example, the maximum number that you could have in Excel - I don't exactly remember it off the top of my head, but it is something to the power of 10. So, usually, you can have day to day numbers like billions and hundreds of billions and trillion but numbers that are too big are not able to fit into Excel. I think the cap is at 15 digits if you are talking about whole numbers but, with fractions, I think it is even more. So, what would happen when you try to enter a number that is too big in to Excel? By default, Excel will convert the number into an exponential format so that you can keep on typing. I think it is close to 1E+307 but I may be wrong. So, if you try to put in a number that is really big like 297 to the power of 7 billion - that is a really big number; I don't know how big it would be - it is a number that can be calculated in the real world but in the Excel world it is probably going to throw you a #NUM! error. #NUM! error is something that will be thrown up in Excel whenever the value that you are calculating is not possible for Excel to represent. It could be a very high value or it could be a very low value or it could be an imaginary number value or one of those kinds of things where Excel will go into a situation where it cannot represent that number in the cell. That's your #NUM! error.

Again, as I said, from a business analysis kind of perspective, I seldom see #NUM! error. I might see it once in a year when I am trying to do something obscure. But, usually, in day to day scenarios, you never see #NUM! errors.

The next one would be a **bunch of hashes in a cell**. You are trying to write a formula and all you see is a lot of hashes in the cell. You are not seeing the result. Whenever this happens, there are two potential reasons. The most obvious one would be that the value that is calculated by that formula is too big to be displayed in that cell. If the cell width is too narrow and it can only print 4 characters whereas the calculated value is 7 characters long then Excel will show a bunch of hashes. This means that you need to adjust the column width to see what is calculated there. This is the most obvious one.

The second reason why a bunch of hashes might show up is when you are trying to work with a bunch of dates and you have entered a date or time value that does not exist in the Excel world of date and time. To give you a really simple example, Excel does not have negative dates. So, any date like -1 or -205 does

not exist in Excel and it will show up as a bunch of hashes. Likewise, any date prior to 1st January 1900, doesn't exist in Excel. Excel date systems started on 1st January 1900. Anything prior to that doesn't exist in the Excel world. Likewise, any date after 31st December 9999 does not exist either. So, anytime that you have a date that is beyond the boundaries of Excel date and time limits, you would see a bunch of hashes in the cell. Especially with date errors, if you point the mouse pointer on the bunch of hashes, there will be a tool tip shown whenever that happens and it would usually say why Excel could not represent the date. It could read something like negative dates are not represented by Excel or this date is too far ahead in the future and we can't represent it in Excel. So, those of you who are trying to model something like time travel or your favorite Star Trek episodes or whatever, keep in mind that we cannot travel back in time before 1st January 1900 or forward in time after 31st December 9999. That's your bunch of hashes in a cell.

The last error that you see is **#NULL!**. Again, this is one of the rarest of rare errors in Excel. I am sure many of us have spent years and years before coming across this error. This represents that the range you are referencing to has null value which means that it is a zero-sized range. It is really difficult to reference to a range of null or zero size in Excel but if you try hard you might be able to succeed. A couple of methods for this would be to come up with some sort of a representation using INDEX, OFFSET or INDIRECT and construct a range that has 0 elements. When you do that, you would see #NULL! which represents that your formula has a range somewhere that has 0 elements and hence the formula cannot proceed. The other simplest alternative would be to use the intersection operator. Remember the operators lesson that we had in the podcast a while ago - it is episode number 26 of http://chandoo.org podcast where we talked about various operators in Excel. There is a special operator called space. The space operator is called an intersection operator. When you give two ranges separated by a space, Excel will tell you what is at the intersection of both of these ranges. It is a very obscure operator and not many people would use it on a day to day basis. So, when you use an intersection operator, you might construct a range that has no intersection at all. A good example would be that let's say we are writing 'A1:A10 B1:B10'. The ranges A1:A10 and B1:B10 have no overlap. There is really no intersection between them. So, that intersection range would refer to a range of 0 elements and hence you would see a #NULL! error message in a cell. Just as a fun challenge, go ahead and try to construct the #NULL! error message in a cell by writing a formula and tell me what you could come up with. Here is an extra challenge for you - don't use the space operator - try to construct it without the space operator and tell me how it works out. You can go to http://chandoo.org/session37/ and post your comments there about this experiment.

Let me now quickly recap the errors that commonly occur in Excel. The very first kind of errors are the syntax errors and we are not really going into them because those are really beginner level kinds of mistakes and they are easy to work with. Then there are 8 types of errors that you commonly see in Excel. We started with #DIV/0!, #NAME? and #REF! error. Then, we talked about #N/A! which is what you see when you are trying to do a look up and #VALUE! error which occurs when you are trying to calculate a value but Excel can't calculate it because there is a portion of the value that is coming in like text like 2+THREE. Then, there is #NUM! error which happens when you have too high or too low a value

that cannot be represented by Excel. Then, we have a bunch of hashes which could happen when the value cannot be fit into a cell or the date is negative or too positive. The last error is #NULL! which is very difficult to create and we see it very rarely in a normal day-to-day spreadsheet. Those are the eight types of errors.

Now, let's briefly talk a little about how to handle errors in Excel. What would you do when you see such an error? The easiest mechanism that we use is called **error handling** which is where you could use a formula like **IFERROR or ISERROR** to check the error and handle it. IFERROR function is really powerful and is available in all modern versions of Excel. All you have to do is wrap your original function with IFERROR. So, you would write:

=IFERROR(VLOOKUP(.....),".....")

You could print an alternative message or run another function or what not. That's your IFERROR. In earlier version of Excel where IFERROR does not exist, you could use ISERROR to check whether something has returned an error. If so, you could run an alternative function. It is basically IFERROR(VLOOKUP..... or ISERROR(VLOOKUP..... - do this or else do the VLOOKUP. That's how the IFERROR and ISERROR functions work.

In Excel 2013, they have added a new functions called **IFNA()** which is specifically designed for handling #N/A! errors. Especially with VLOOKUPs you only want to handle the #N/A! errors but with #NAME? and #REF! errors you want to know because those could mean trouble for your model. In such cases, you could use IFNA().

You can also use the **error checking options in the formula ribbon** to check the error and flag the error cells and de-bug them using the F9 key etc. So, there are a couple of mechanisms like this to handle the errors. In case you don't want to ever see errors especially in an output dashboard or report as there is really no point showing the error message there, you could simply use the IFERROR to wrap everything in your output sheet so that no errors will ever show up there. That doesn't mean that you should use IFERROR everywhere because using it is like just trying to hush the errors every time. Sometimes you want to listen to the errors, understand why they are happening and fix the problems with your data, for example may be there is a range that is not named properly or something else is going on like you are getting incorrect data all the time. In such cases, you want to really know that instead of using IFERROR and not seeing the errors. Keep that in mind when you are using IFERRROR.

Now that we have talked a little bit about how to handle errors, let me very briefly talk about when you would actually use errors. Of course, errors are annoying but there are **some special cases where you might actually want an error**. A simple scenario is - let's say that you are creating a dynamic or interactive chart where the user can ask to be shown this or that or the sales of 2014 and 2015 and compare and things like that - when you have such a chart, we want to add elements or delete elements

from the chart like add a new line or get rid of the line. This kind of thing can be done by using #N/A! error. Whenever you want to **turn off a value from a chart, if you print NA in the cell** instead of the value, then the **Excel chart will ignore that value** and that line or column wouldn't appear in the chart. To produce the NA error, you can simply use the **NA() function**. Simply type =NA() and that will give you a #N/A! error in a cell. So, if you will write something like this:

=IF(line should be displayed, original value of the line time, NA)

Using such logic, we can kind of force the chart to ignore errors because that is the default behavior of charts anyway and use errors to get that purpose. The second reason why you might want to use errors is in **data validation**. When users are inputting data like they are entering dates or some values like their age or whatever, you could write data validation that checks that value in a function, for example whether they have entered valid data or not. You could use the DATEVALUE function and the DATEVALUE of the cell to check that. If that returns the correct thing, it means they have entered a date else it is an error which means that we need to warn them. So, by building data validation or in conditional formatting, you can pro-actively use errors, i.e. check whether a cell would return an error when applied in a formula and accordingly warn your users. These are a couple of places where I would usually use errors deliberately so that we can get something done.

This is in a nutshell about various Excel errors that commonly occur and how to handle them and when you would actually use them. I hope you find this particular episode interesting and I hope you will go ahead and produce more error-free worksheets. Let me give you a bit of a challenge - can you produce a #NULL! error in a worksheet? What kind of formulas would you write to produce them? Go ahead and try to produce that and then post your answers to http://chandoo.org/session37/. You can also visit http://chandoo.org/session37/ for all the show notes and resources about error handling and debugging formulas etc. I have got a couple of articles on http://chandoo.org and some examples and tutorials on IFERROR and ISERROR functions. I am going to post links and material about the error handling things in our blog. Please visit http://chandoo.org/session37/ for all of that information. Thank you so much for listening to this podcast. I hope you enjoyed it. I'll see you again in the next one.