CLOUD MODELLER

ENHANCING THE POWER OF SPREADSHEETS AND ELIMINATING MANY OF THEIR DISADVANTAGES

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Autumn 2018

THE AUTHORS

Simon Hurst *ACA is a chartered accountant who fled the fire of working in practice to land in the frying pan of software development. After several years as a director with Orchard Business Systems Limited - a company which produced software for firms of accountants, including the internationally renowned 'Finax' package - Simon set up his own organisation dedicated to providing IT consultancy and training services to firms of accountants.*

Simon was part of the ICAEW teams that produced the influential documents: '20 Principles for Good Spreadsheet Practice' and 'The Spreadsheet Competency Framework'.

Simon specialises in helping accountants to use spreadsheets as efficiently and safely as possible. He regularly lectures on the subject of spreadsheets throughout the UK and Europe.

He also writes about spreadsheets for leading accountancy websites, including ICAEW. Much of Simon's writing concerns his belief that £billions is wasted each year by organisations through inappropriate and inefficient spreadsheet use.

Dr Josef Baker PhD, Product Manager, Synapse

Josef was a Research Fellow in Computer Science at the University of Birmingham with a strong background in the academic research of complex database systems. On joining Synapse, he was presented with a challenge – one of the largest Banks in the UK had to solve the problem of 1000 users all trying to access a single spreadsheet simultaneously. After resolving this challenge, enabling 50 to 100 users to manage Group Company Monthly Consolidated Accounts Production with the Synapse flagship product, Cloud CFO, came as light relief! Josef's recent work with Cloud Modeller has been in response to the well- known challenges described in this paper.

Executive Summary

Over the years, many applications have tried to free users from the repetitive drudgery of spreadsheet modelling with custom software solutions, but few have made any major inroads on the spreadsheet use of most finance teams.

The cost, additional training requirements and perceived reductions in flexibility created significant barriers to the adoption of these solutions - as a result, many people returned to Excel, despite knowing its limitations.

Through work with one of the UK's largest banks, Dr Josef Baker and his team at Synapse have developed a solution that connects standard desktop spreadsheets to a Cloud Database to deliver the multi-user data integrity, security and audit that Excel lacks.

Synapse is now applying this technology to the part of the spreadsheet market that focuses on building models of any variety, for example, forecasts, budgets or even complex solvency analyses.

Cloud Modeller is a transparent spreadsheet add-in created by Josef's team that seeks to retain and enhance all of Excel's flexibility whilst adding the database benefits described.

The flexibility enhancements for the user are achieved through using familiar spreadsheet commands to create a logical model structure that is designed to automate production of the final physical model – avoiding en route the repetitive copy and paste tasks that consume so much time.

By using the Cloud Database, the data quality issues caused by proliferation of workbooks, formulae and file links can also be resolved and of course multiple colleagues can work on the same model in parallel with no problems of concurrency conflict.

Cloud Modeller will reduce the costs and risks of building and maintaining spreadsheet systems by:

- Reducing the effort needed to build and then maintain models – for one person or a team
- Eliminating the well-known data quality issues of broken links, incorrect formulae etc.
- Providing true multiple user access to the same model - more work can be completed faster
- Providing multiple scenarios based on the same underlying model – more analysis faster

Analysing the hidden cost of spreadsheet flexibility

We love Excel because of its immense power, familiarity and flexibility.

However, it is this very flexibility than can cause us the most problems. What starts off feeling like the freedom to be creative, and to use our hard-earned skills to their utmost, can quickly turn into the nightmare of struggling to track down seemingly untraceable errors through a maze of formula references – this is particularly true when we must deal with spreadsheets created by others.

We often spend much time in Excel in the areas where our skills are least valuable. The real skill lies in understanding what we are modelling and working out how to translate this into a model. At the end of the process, we use our expertise to report the result in a way that communicates the message behind the numbers with maximum clarity and impact.

However, it's the mechanical bit in the middle that takes up much of our time: entering thousands of formulae, checking and testing, and often troubleshooting problems and issues. Replacing the mechanical element with an automated process would allow us to focus our expensively learned skills on to the areas where they can provide the most benefit.

When we deeply analyse this 'mechanical bit in the middle' we find that the core problem comes from Excel's implicit lack of partitioned structure, i.e. logic and data are bundled together inside each cell – and then replicated many times.

In fairness, it is this intuitive simplicity that made 'VisiCalc' - the first spreadsheet – so popular; it is easy to create formulae initially but very hard to disentangle the replicated copies months later.

Alan Turing, however, separated Programs from the Data they operate upon. All professional software today takes this approach, but spreadsheets understandably trade ease of initial use against making accountants learn to be programmers – quite rightly so!

We saw an opportunity for a middle ground solution where spreadsheet users could carry on as they normally do but in the background Cloud Modeller could separate out the programs (formulae etc), data (drivers and parameters) and the structure of the model itself. We believed that this would lead to a solution of the problems outlined, and after reading this paper we hope you may be tempted to agree!

Before we describe the Cloud Modeller solution we need to analyse another, more fundamental Excel problem.

Misusing Excel as a multiuser system – more hidden costs

Because creating spreadsheet models is so fast and intuitive it is natural to share them; soon, whole departments are using the same workbook. Sadly, this is exactly what Excel was *not* designed for.

Ideally what we want is to type data into any one cell in our workbook and for said data to appear, in a controlled fashion, on every other member of the teams 'copy' of that workbook; they would share a **S**ingle **V**ersion **O**f the **T**ruth (SVOT in database parlance).

Without this ideal solution however, people are forced to email, for example Rolling Forecasts, out to multiple team members so that they can make manual updates, return their copies and then someone must cut and paste them back together again to emulate SVOT.

Experienced spreadsheet users know all about these inefficiencies, the wasted FTE time and the risks of error.

We often forget however about the cost of the delayed time to completion, for example a financial close taking several days longer than it needs or slow review of audit calculations.

Synapse has in fact built precisely this needed Excel multi-user SVOT system, deployed at the scale of 1000 users in one of the UKs largest Banks, but before we describe that, let's look at one more problem people face with single user Excel today that must be eliminated first.

Since VisiCalc, people have typed "+A1 + A2" and +' c:\mydesktop\thisworkbook' etc.

These hard-coded links and references are fatal to the data integrity of a multi-user system, so we have had to solve this problem. As we shall see, we let the spreadsheet user carry on with this way of *representing* their logic, but we use a better abstract notation for *storing* the logic.

The modelling process must be 100% familiar to Excel users

Even with an approach that makes spreadsheets easier to create, more reliable and more efficient to manage, if users don't feel as though they can still work in the same way that they are used to, that

they can still have the same degree of flexibility, then they are unlikely to be persuaded to embrace a change. Similarly, most people feel confident in their existing spreadsheet skills so any requirement to undergo lengthy training on a new system presents a significant barrier to adoption.

Cloud Modeller lets the user keep 100% standard Excel workbooks available on their desktop; there is no software to install. Instead, a simple Login toolbar connects the Excel workbook to a Cloud Database, allowing multiple users to work on the same model in parallel with no conflicts.

Cloud Modeller allows models to be created in the normal fashion but adds a Ribbon tab that provides additional features to make model development quicker and easier and with the significant advantage of facilitating better structural integrity and improved data validation.

The Cloud Modeller process is designed to be intuitive enough that users will be able to take advantage of even the most advanced aspects with minimal or zero training.

Rather than forcing you to adopt a new and unfamiliar way of working, Cloud Modeller extends what you build in the traditional manner by creating a logical structure that reflects your model. This logical structure appears as an Excel 'Tree' in the diagram below and it is this tree that can generate your model and eliminate the need for you to manually type, copy and paste thousands of formulae.

You use your expertise to set out the basic structure of your model in the same way as always and Cloud Modeller generates, in the example shown next, the forecast, whether that involves thousands or millions of individual cell contents.

The aim of Cloud Modeller is to free you up to devote your expertise to the creative aspects of the model and maximise the value of your time. Let's see this in practice.

What does working with Cloud Modeller look like?

Cloud Modeller has generated the forecast in the screenshot (on the right-hand side below) from a single Ribbon command.

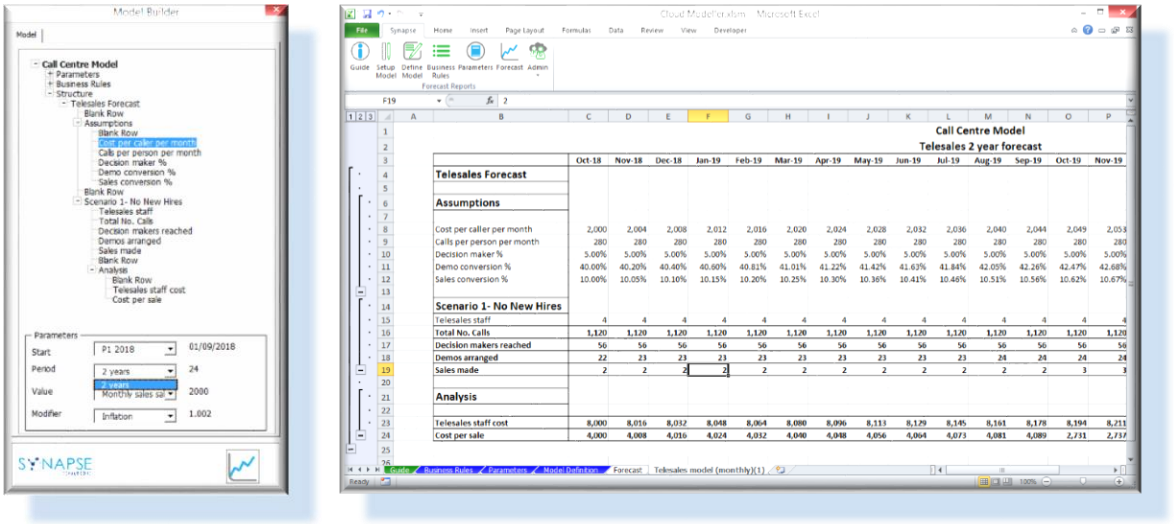
Whether there are 10 or 40 years of monthly columns and 1,000 or 10,000 rows of profit and loss items, the entire output forecast model is generated, thereby removing the need for the user to copy and paste thousands of formulae.

Cloud Modeller achieves this by inviting you to store the *Logical* parts of your model separately – from this it can generate the actual *Physical* Model.

We start by defining the structure (the labels in column B and the labels in row 3) and the format of the desired output forecast.

We now see a standard Excel 'Tree' format Form on the left-hand side, and the generated forecast on the right-hand side.

The Tree is structurally identical to the forecast, i.e. the row labels in column B appear as leaves in the Tree. This is an efficient mechanism for navigating thousands of rows of a spreadsheet and we replicate the leaf indentations with the standard Excel Group by + signs you can see below.



The user can choose to layout the structure of the forecast model in a traditional worksheet and Cloud Modeller will reflect this by dynamically building the Tree or they can modify the tree and the forecast will be generated – there is an immediate two-way synchronisation between the two views.

Whether one calls them parameters, drivers or variables most model builders will want to store values such as 'Sales Conversion %' in one tidy place and have their formulae reference these by a link to that location.

Parameters have their own branch in the tree above meaning that they can be grouped and stored in tidy categories; this allows efficient re-use of parameter values across multiple scenarios of the same model.

We already know that the column headings are months extending over 2 years, so instead of pasting these values into our forecast, we just create parameters describing that (as above) and all of the column headings are generated. Note that the formatting (fonts, colours …) changes you make to your forecast are automatically captured and stored as a set of Parameters; this could mean that if you have a house style for your reports, all generated copies will inherit this automatically with no copy and pasting.

Many model builders use the notion of scenarios, i.e. they want the identical model structure to be used across multiple scenarios that may only vary by a few parameters.

Rather than replicate a model with 1000 rows three times manually when only 3 parameters vary, Cloud Modeller stores just the 3 values and the 1000 row structure and generates 3000 rows of scenarios.

This economy of representation extends to formulae.

A Cloud Modeller Business Rule is simply an abstraction of a formula – store it once and the system will generate all of the formulae for you.

For example, in the case of the Date headings above, you have already told Cloud Modeller 'I want 24 of these, starting from this date, adding one month at a time, in this format, spread across this row'.

This implicit Business Rule and its parameters means that if you change the number of periods from 24 to 60 in one location in the tree, it will regenerate – say a collection of 10 scenarios – in the new layout automatically.

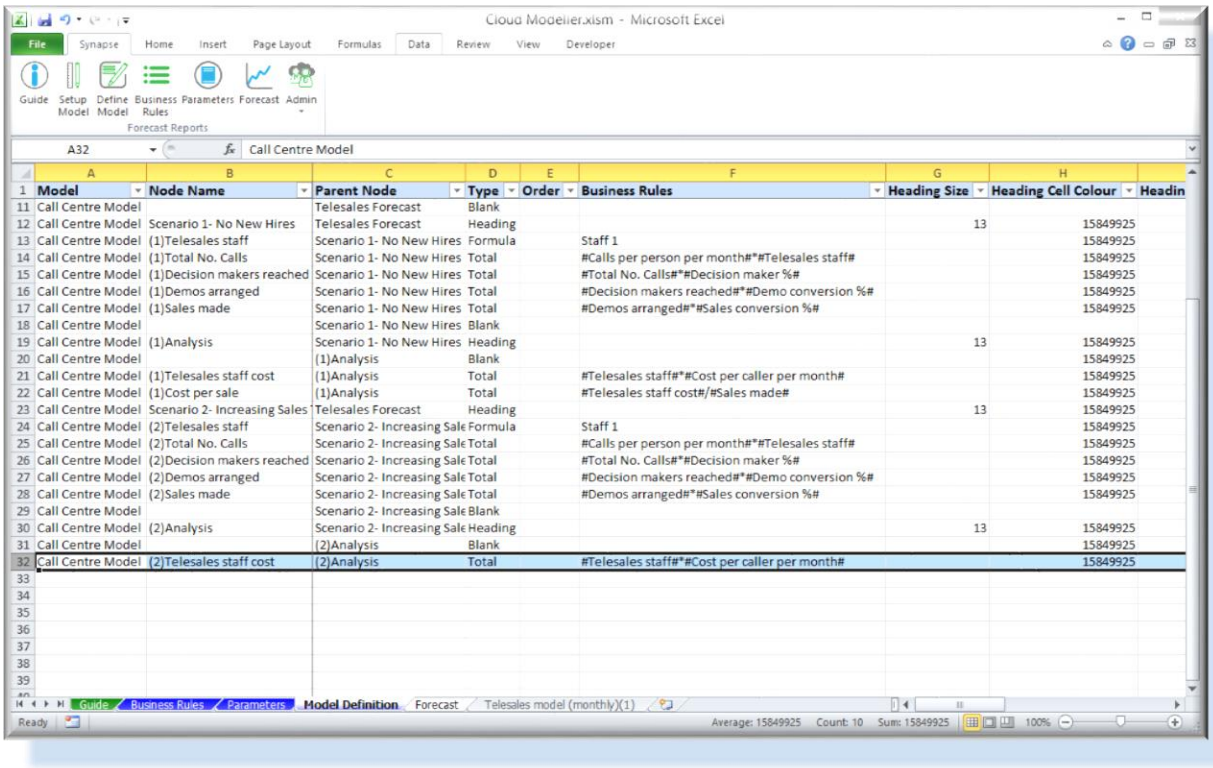
A key problem we wanted to overcome in Cloud Modeller was the maintenance headache trap of 'C1 = (B1 * A1)' or similar hard coded cell references – we will of course let the user enter this syntax, but we will store the information in more abstract form.

In the tree view, all of the leaves (whether parameter descriptions or row labels) have been assigned names automatically in Cloud Modeller and these are now automatically stored in Cloud Modeller in a similar way to Excel's name manager.

So, the names ('Sales Made' 'Demos Arranged' 'Sales Conversion %') can now be used in standard syntax to express a formula, for example a Business Rule in row 28 says 'Sales Made' = 'Demos Arranged' x 'Sales Conversion %'.

This makes storing the Business Rules in the Cloud Modeller database compact and elegant and we believe that having one and only one place to store all Business logic such as this make life easier for comprehending the model and maintaining it.

Note that Cloud Modeller may generate the Excel syntax 'C1 = (B1 * A1)' from this and put these formulae in the model or, alternatively, just the values that they transform into.



	A	B	C	D	E	F	G	H	
1	Model	Node Name	Parent Node	Type	Order	Business Rules	Heading Size	Heading Cell Colour	Headin
11	Call Centre Model		Telesales Forecast	Blank					
12	Call Centre Model	Scenario 1- No New Hires	Telesales Forecast	Heading			13	15849925	
13	Call Centre Model	(1)Telesales staff	Scenario 1- No New Hires	Formula		Staff 1		15849925	
14	Call Centre Model	(1)Total No. Calls	Scenario 1- No New Hires	Total		#Calls per person per month#*#Telesales staff#		15849925	
15	Call Centre Model	(1)Decision makers reached	Scenario 1- No New Hires	Total		#Total No. Calls#*#Decision maker %#		15849925	
16	Call Centre Model	(1)Demos arranged	Scenario 1- No New Hires	Total		#Decision makers reached#*#Demo conversion %#		15849925	
17	Call Centre Model	(1)Sales made	Scenario 1- No New Hires	Total		#Demos arranged#*#Sales conversion %#		15849925	
18	Call Centre Model		Scenario 1- No New Hires	Blank					
19	Call Centre Model	(1)Analysis	Scenario 1- No New Hires	Heading			13	15849925	
20	Call Centre Model		(1)Analysis	Blank				15849925	
21	Call Centre Model	(1)Telesales staff cost	(1)Analysis	Total		#Telesales staff#*#Cost per caller per month#		15849925	
22	Call Centre Model	(1)Cost per sale	(1)Analysis	Total		#Telesales staff cost#/#Sales made#		15849925	
23	Call Centre Model	Scenario 2- Increasing Sales	Telesales Forecast	Heading			13	15849925	
24	Call Centre Model	(2)Telesales staff	Scenario 2- Increasing Sale	Formula		Staff 1		15849925	
25	Call Centre Model	(2)Total No. Calls	Scenario 2- Increasing Sale	Total		#Calls per person per month#*#Telesales staff#		15849925	
26	Call Centre Model	(2)Decision makers reached	Scenario 2- Increasing Sale	Total		#Total No. Calls#*#Decision maker %#		15849925	
27	Call Centre Model	(2)Demos arranged	Scenario 2- Increasing Sale	Total		#Decision makers reached#*#Demo conversion %#		15849925	
28	Call Centre Model	(2)Sales made	Scenario 2- Increasing Sale	Total		#Demos arranged#*#Sales conversion %#		15849925	
29	Call Centre Model		Scenario 2- Increasing Sale	Blank					
30	Call Centre Model	(2)Analysis	Scenario 2- Increasing Sale	Heading			13	15849925	
31	Call Centre Model		(2)Analysis	Blank				15849925	
32	Call Centre Model	(2)Telesales staff cost	(2)Analysis	Total		#Telesales staff#*#Cost per caller per month#		15849925	

The key point here is that this Business Rule is identical for all 24 periods/columns in the model so rather than ask the user to copy and paste that many hard-coded formulae, Cloud Modeller generates them.

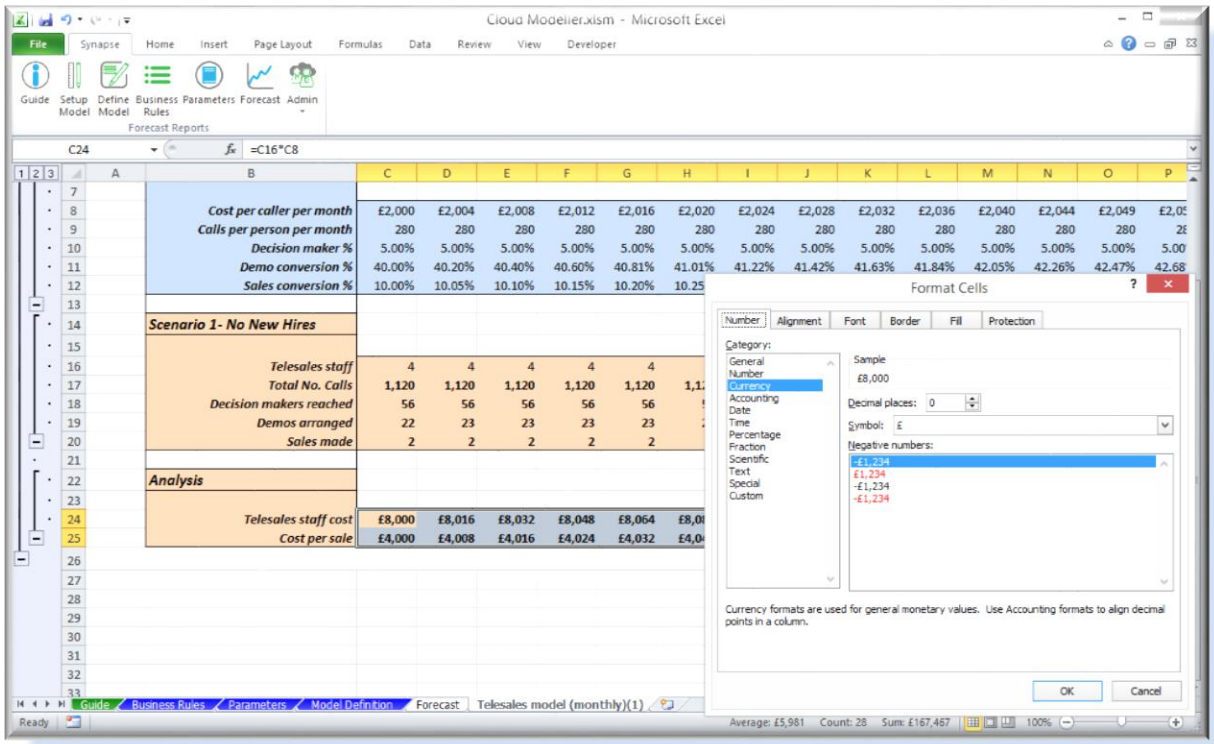
In fact, a single Business Rule could populate an entire Excel worksheet of 1,048,576 rows across 16,384 columns – a silly example but we do regularly see giant 100MB+ linked spreadsheets with millions of formulae.

Business Rules can easily be created by typing a normal Excel calculation into a cell with Cloud Modeller inferring the rule, or some users might prefer to create the rules directly from the Cloud Modeller structure tree with a couple of clicks. This takes the form of highlighting 'This leaf plus that leaf' and dragging and dropping the result to a subtotal, for example.

A year or so ago, this approach might have seemed somewhat alien and unfamiliar to most Excel users, but with the introduction of the Power Query add-in in Excel 2010 and its transformation into an integral part of Excel 2016 as the Get & Transform Data group of the Data Ribbon tab, the idea of generating a table structure from a series of inputs is now part of 'mainstream' Excel.

Now that we know the three logical parts of your model – its *Structure*, *Parameters* and *Business Rules*, Cloud Modeller can generate the entire model. Note that on the right-hand side of this previous screenshot Cloud Modeller has captured the formatting characteristics (Heading Cell Colour etc) of the final report which we see below.

You can format the report in situ in its worksheet and Cloud Modeller synchronises this with the Tree. Note that all of this information is now stored in the Cloud Modeller Database so that any team member anywhere in the world can load this and other models easily i.e. there is no need to email files to remote teams.



Simplifying scenario management

Much of the power of spreadsheet models comes from the ability to vary the input data and assumptions to reveal the effect on the result. Implementing this in the traditional Excel way can create duplicated formulae and workbooks which are costly and risky to maintain.

By separating the model into its three logical parts, multiple scenarios can be generated that share the same Structure and Business Rules but differ only in a handful of Parameters.

Clearly this means that there is less effort to maintain a suite of scenarios than in the traditional 'copy the whole file approach'.

Note that tweaking the structure centrally will mean that all scenarios reflect it automatically.

Most importantly, this makes the job of reading and understanding models and scenarios much easier for new and existing members of the model team.

Finally, the team can now make their own changes, i.e. write different values into different cells, and the entire audience will see the 'SVOT' – this is particularly helpful during extended budgeting review processes.

Finally - removing the problems of broken links

Individual Excel workbooks can be complicated and confusing enough but, when links to multiple other workbooks are involved, problems can increase dramatically.

Just some examples:

- Some Excel functions only work when referring to external workbooks that are open
- It is very easy for links to be corrupted by moving or renaming workbooks or their containing folders
- Changing the structure of a workbook can leave the workbooks that refer to it pointing at the wrong cells.

Because Cloud Modeller stores all data and metadata (Business Rules, Structure etc.) in abstract 'name' form this makes it possible to store all data elegantly and compactly in a Cloud Database.

This takes a little getting used to, we had to teach our large Bank Customer "You don't need to save your spreadsheets on the file system anymore – really!"

When you retrieve models from a Cloud Database you eliminate the problems referred to earlier of dozens or hundreds of rogue copies masquerading as the SVOT, and management control is so much easier. With worries about GDPR confidential staff data, it is far more defensible to argue that storage in a proper database is sensible compared with emailing spreadsheets to all and sundry.

With models being generated on demand we save a large amount of physical space but more importantly, avoid redundant and degenerate copies of out of date information.

This means that any authorised member of the team anywhere in the world can see all authorised models and load or save versions on demand – opening physical spreadsheets from file systems is a thing of the past.

A secondary benefit of this database approach is that there are no links to worksheets or external files to worry about – Business Rules use names which can be visible across many models and scenarios. Modern databases are virtually infinitely scalable for all practical purposes – there will be no more worries about hundreds of megabytes of interconnected workbooks with sharing violations.

This has great advantages for organisations of all sizes. Even an individual would benefit from the increased convenience and simplification of the modelling process.

For large organisations, one person can be working on the costs side of the model, another on growth projections and staff in remote entities can update their actuals in real time into the rolling forecast.

Management and control

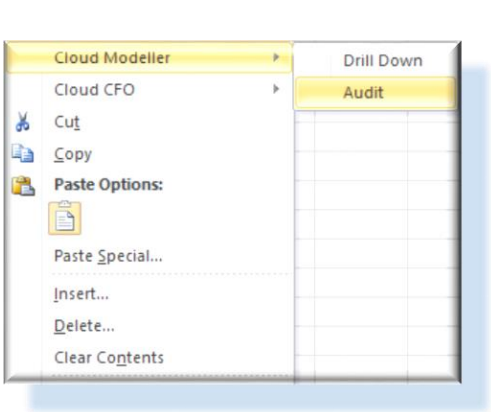
Not all spreadsheet problems occur within spreadsheets.

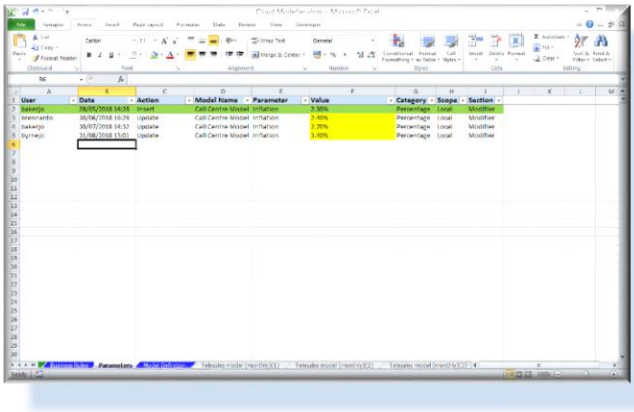
Many of the most serious spreadsheet issues relate to the control and management of your spreadsheet estate. Spreadsheet proliferation has become such an issue that many applications are available just to help organisations catalogue the vast number of spreadsheets that they have accumulated over the years.

Generally, the number of spreadsheets discovered greatly exceeds even the most extreme predictions. While many spreadsheets might be innocuous enough – from shopping lists to fantasy football league compilations – spreadsheet audits often uncover multiple versions of supposedly unique spreadsheets and spreadsheets that bypass accepted company procedures or contain confidential or personal data, a particularly significant issue post GDPR.

The ability to make models securely available to only authorised users at restricted times, wherever they happen to be, has enormous practical benefits and avoids the need to create multiple, potentially conflicting, versions of the same spreadsheet that are then distributed via email.

Cloud Modeller's database approach allows access to individual models to be restricted to particular users and designated classes of action. In addition, the system maintains a full audit history so that you can keep track of all spreadsheet events as we see below – spreadsheets with database audit!





Conclusion

It seems that every day there is yet another article that bemoans the bad characteristics of spreadsheets and then … comes to no clear conclusion or call to action?

We decided to change all of that by addressing the fundamental problems that give spreadsheets a bad name:

- The inefficiencies caused by hard coding data and logic together in a spaghetti mess
- The inability to use spreadsheets in the way we use proper multi-user database systems

We believe Cloud Modeller will save Excel experts and beginners time and money while reducing risk and frustration – Please find out more information about our product here at www.synapseinformation.com

About Synapse and the Cloud Modeller team

The team behind Cloud Modeller has won UK Govt R&D awards for the Cloud Database technology that supports the application. This underlying technology is now being used by 1,000 concurrent users in one of the UK's largest banks as well as by many group companies worldwide.

Cloud Modeller has been built to apply this powerful and well-tested technology to the well-known challenges in Excel model creation, distribution and version management that are faced by businesses of all sizes and types.

Synapse portfolio includes the following solutions:

Cloud CFO

- For Group Company Consolidated Primary Financial Statements
- For Statutory Accounts
- Insight for Project-Based Companies

Cloud Modeller

- For FP&A and many other types of modelling
- Integrates with Cloud CFO to generate all forward looking consolidated statements

Cloud Modeller is the latest product and resolves many of the difficulties that beset complex Excel models that are used in the FP&A and other modelling processes.

Traditionally, manual budgeting can be very time consuming and requires staff to pull data from disparate systems into Excel spreadsheets and then spend valuable time manipulating the data. This hinders collaboration and slows down analysis as multiple users are unable to work together in one document.

Cloud Modeller speeds up the building of these models and enables multiple team members, wherever they are located in the world, to work in parallel when preparing budgets or forecasts.

Cloud Modeller delivers sophisticated forecasting at an affordable cost with improved security, data integrity and back up.

Cloud CFO automates Group Company Consolidated report production, reduces operational costs, and improves data quality. By re-engineering the standard spreadsheet and connecting it to the Synapse Cloud, every user can share a single version of the truth from any desktop. This approach lets teams work in parallel on the same model so that collaboration and productivity are greatly improved.

With Synapse technology, spreadsheets gain data integrity, security and a full audit trail and all the other characteristics that major business software systems have had for decades. Working in partnership with customers, partners and major drivers in the industry, the goal of Synapse is to develop solutions that solve the challenges of spreadsheets whilst giving every user a view of a Single Version of the Truth.

Contact Synapse

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More information on Cloud Modeller at www.synapseinformation.com