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The next spreadsheet revolution

Sidarta Dash and James Burns discuss the evolution of the spreadsheet – from its role in the capital markets revolution in the 1980s, through to its current impact and to the ‘cousins’ that are driving more changes in capital markets and financial services

Without the spreadsheet explosion in the 1980s there would be no collateralised debt obligations, no structured finance, no derivatives and no financial engineering. In fact, the impact extends way beyond capital markets to every corner of finance, whether it is reinsurance or equipment leasing. With the arrival of the affordable server-side offerings such as Excel Services and Excel ‘grids’, spreadsheets are about to once again change the face of capital markets and financial services.

There was time when application development for traders, structurers and sales people essentially consisted of building a spreadsheet. In this golden age, a financial analyst, trader or sales person builds a model in spreadsheet form and uses it for valuing stocks, bonds, derivatives or for trading as the case may be. Slowly, the world became more complicated, with models being increasingly developed in C++ and linked to a user’s spreadsheet.

Although these models were drawn into increasingly complex infrastructures, there were many positives for the industry. The reference and market data infrastructure built by most financial institutions, for one, was a clear plus.

Spreadsheets have not disappeared. In fact, the bulk of the models and most analysis continued to use spreadsheets, even though many use standard add-in libraries. However, the sheer number of spreadsheets, many of which are multiple versions of the same data, in financial institutions has become a compliance headache. This environment has created silos of information with no means of easily sharing data between them. The proliferation of multiple versions of unsecured spreadsheets flying backwards and forwards on e-mail, and lodged in unaudited file structures on desktop PCs, is one of the most worrying and uncontrollable by-products of the ubiquity of spreadsheets.

The good news is that it doesn’t have to be this way and this

article focuses on the fact that we are on the threshold of a new era that combines the flexibility and immediacy that spreadsheets engender while also providing a structure for managing the complexity of the spreadsheet environment. This is an era in which spreadsheets will be automatically compliant (they will have audit logs, access rights and will use standard enterprise reference data), while also providing added functionality that comes with – what HCL terms – the spreadsheet ‘grid’.

Server-side versions of spreadsheets have slowly been trickling in, with Microsoft providing a landmark in its launch of Excel Services in 2006 – server-based Excel that has been developed especially for the compliance and performance needs of complex financial institutions. This includes functionalities such as web-browser access with a high degree of fidelity with the client, access and version control and an expanded worksheet size of one million rows and 16,000 columns.

Others who are providing – or are in the process of providing – critical infrastructure and tools are Cluster Seven and Xenomorph on the infrastructure side, and HCL, and Savvysoft on the tools or applications side.

So, what is the next-generation spreadsheet development environment and what exactly does it do? Calling this environment ‘Excel grid’ for simplicity and to enable us to describe the environment, fundamentally, it is a server-based repository of all Excel sheets, along with distributed grid farm to enable computation of the associated functions and data structures.

Excel grids provide a standardised infrastructure for spreadsheets. They comprise four distinct components that fit together to create a powerful spreadsheet proposition for financial services organisations:

- A file repository and front end, which provides a centralised and efficient store, workflow and publication capability and ability to provide sophisticated control and compliance. This is the remit of Microsoft’s Excel Services.
- A ‘data grid’ to provide distributed caching, data transformation and validation functionality. The data grid essentially allows for the integration of various spreadsheets and construction of novel spreadsheet-based data structures such as spreadsheet federations or databases.
- The ‘computational grid’ for job scheduling, load distribution, etc., which uses technology such as Microsoft Cluster Server.

- Vector languages to provide a high-performance environment for arrays of data, which enable efficient indexing and searching.

In principle, anyone could have constructed an Excel grid before, but it has never been simpler and more programmable. So, what has happened?

A critical event in the whole chain was Microsoft's release of Excel Services in late 2006. Combined with the Windows environment, this technology uses the spreadsheet as a conceptual reference point and data structure for programmers, as well as an interface for end-users.

The functionality of Excel Services for end-users is immensely powerful and so blurs the concept of end-users and developers, extending the idea of 'power users' of spreadsheets that can use the technology to develop their own specific functionality.

For developers, it provides a whole new realm of flexible, configurable and dynamic data structures, and allows for more control for compliance purposes, with rigid audit trails demanded by today's regulatory environment.

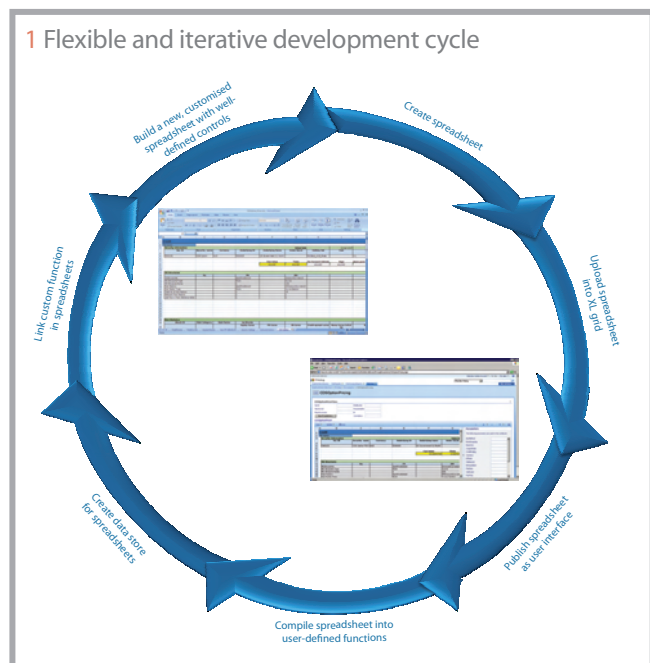
Central to the user-experience of the Excel grid is the concept of spreadsheet federation where a user can view all independent workbooks as if they were a single large spreadsheet or array. A federation data structure provides links and holds all spreadsheet graphs. This allows all spreadsheets to be treated as if they were the user's current active workbook, and access to all data is driven by access rights rather than physical access such as where it is located on the hard drive. What makes this possible is the set of data semantics resolution tools that operate on the centralised spreadsheet structures.

The structures can, literally, go on forever. But the power of Excel grids does not stop there. All access to both the base spreadsheets and their derived functions can be through access, control, workflow or a rules engine, since all data is logged and cached. This essentially ensures that developers can rapidly build complex structures and power users can solve interesting problems without being constrained by compliance concerns.

These features mean that development of financial applications has just become cheaper and more flexible. As an example, take derivatives trading platforms for the front office or risk and analytics infrastructure for the middle office. Both of these environments change quickly. In the first instance, think of callable range accrual swaps or power reverse dual currency swaps and, in the second instance, think of credit volatility calibration or scenario generation. Here the Excel grid allows end-users to drop in a new library or developers to develop a few user-defined functions for external grid or database functionality, for example.

The key roll-out of such user-based functionality shifts the developers' focus onto the control of data, models and overall audit processes rather than the minutiae of specific development issues. This frees developers from the lengthy, arduous and painful process of acquiring requirements from end-users. They now just have to ask the end-users to develop a spreadsheet and drop it in – rapid application development is suddenly fun.

The value to such areas as structured credit, structured products or equity derivatives – where the spreadsheets can encapsulate extremely complex multi-stage functionality and may knit together models from different libraries – is obvious. What if you could knit together a variety of spreadsheets, libraries and data references and not worry about performance and compliance? Well, you can. We strongly believe in the power of the Excel grid as a development platform and have invested both in the build-out of tools (to be



used in the Excel grid) and applications based on this grid.

The obvious areas that will benefit in financial services are those that are computationally intensive and have heavy Excel users, such as people in structured credit, derivatives deal capture and processing (interest rate, commodities, credit, foreign exchange), profit-and-loss (P&L) calculations, performance reporting, structured products and risk and research (credit, equities, quants, fixed income).

These are areas in which HCL has built reference solutions that can serve as templates for those who wish to build or extend solutions in these or nearest neighbour areas. One such template is the Xtrade framework, which provides a rapid and easy way for institutions to add new structures or products to their trade capture infrastructure, price them, calculate the risk, look at the P&L, perform attribution analysis and scenario analysis, and calculate economic capital utilised. As described, Xtrade provides an overarching set of functionalities, while institutions – or even individual dealers – could add functions, workflow and rules.

We believe that, 25 years after conquering the desktop, spreadsheets are taking their rightful place on the server side. When combined with other rapidly diffusing innovations such as vector languages, data grids and the rest of the server-centric office, we believe that a new wave of revolutionary applications and innovations are going to be available for the financial services industry. Be ready.

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