

# The Problem with Spreadsheets and a Cool Solution

*This Intellect Automation Ltd White Paper explains how using spreadsheets to model cash flows creates ineradicable problems – that Dashflow™ has been explicitly designed to resolve.*

## 1. Spreadsheets for Cash Flow

Since the 1960's, the business community has increasingly relied upon showing cash flow by developing tailored computerized spreadsheets.<sup>1</sup>

Probably more than a billion individuals across the world now produce some form of cash flow spreadsheet using computer technologies.

The basic 2D grid layout and much of the user interaction has not changed substantially since VisiCalc was created in 1968, followed by Lotus 123 and progressive versions of Microsoft Excel, the current standard.

The Excel spreadsheet is currently the best digital medium to share and review the assumptions and relationships between relevant items that are expressed numerically.

It has therefore become the standard for cash flow analysis and investment proposals.

More than that, financial modeling via spreadsheets has become a source of competitive advantage within the investment community.

## 2. Prevalence of Errors

The enormous popularity of this mode of financial analysis and communication conceals the reality that spreadsheets are not only time-consuming to develop, but

also dogged by pervasive and unavoidable human error. This has been known for decades.

A recent study found that 88% of spreadsheets contain errors, across a range of industry. Errors are made in small family budgets and by Harvard professors who comment with authority on global fiscal policy.<sup>2</sup> Other studies have suggested 90% contained errors.<sup>3</sup> The cost of spreadsheet blunders has been popularly estimated at \$billions.<sup>4</sup>

Spreadsheet use for cash flow analysis is a form of financial modeling in which there are numerous factors that interact in ways that can be calculated. In that modeling process, various factors combine to

escalate the likelihood of human error. These factors also increase the time required for modeling by users regardless of their abilities.

There are 3 classes of factors:

- (i) Technical hurdles involved in the creation of cash flow models
- (ii) Daily team working approaches to cash flow spreadsheet tasks
- (iii) Commercial timing pressures and the decline in cash flow standards

But there is an error that is more profound than these factors when it comes to modeling for investments. The fundamental 2D grid layout turns out to be an unsuitable substrate. This is because there is a third dimension: depth of view from high-level to low-level.<sup>5</sup> Exploration of the model without this dimension is limited and slow, which can lead to poor decisions.

### Cash Flow Analyses

A cash flow is simply the amount of money that is moving into and out of a business or project. Cash flows need to be transformed into measures that give information, for example in relation to liquidity or financial risk.

The focus in this White Paper is the use of cash flow to determine an investment's profitability, rate of return or value.

## 2.1 Technical Hurdles Cause Errors

Technical hurdles will be judged simple or complicated depending on the point of view and experience of the model designer in question. They range from the most mechanical design issue (like providing a cell border) to the most abstract design issue (like inserting a mathematical function).

Many spreadsheet technicalities remain hurdles as much for the best Wall Street banking model designer as for the average user investment analyst.

These hurdles include the knowledge and timely application of:

- (a) Keyboard short-cuts and combinations to navigate a spreadsheet and workbook quickly and effectively
- (b) Keyboard short-cuts and combinations to cut and rearrange cells in a spreadsheet (e.g. cut, copy & paste short cuts)
- (c) The correct libraries of ready-made formulas to calculate necessary basic cash flow components and timelines accurately for any cash flow projects. Typical libraries include:
  - Investment return functions e.g. IRR(), XIRR
  - Calendar & time functions for time horizons e.g. DATE(...), MONTH(...), EOMONTH(...)
  - Mathematical functions e.g. calculating the monthly or quarterly equivalent expected compounded interest rate to match an annual interest rate assumption.
- (d) Powerful formula construction methods that require quasi-programming level of Excel design e.g. array formula constructs that can replace thousands of other formulas when used effectively.<sup>6</sup>
- (e) Formatting options and menus to change
  - printing layouts,
  - cell borderlines,
  - cell background colour
  - font colour

- numerical formats e.g. “£ X,XXX” or “\$ X.XX million”
  - date format options e.g. “Jan 2014” or “01-01-2014”
  - text and numerical format options for easy result reading in cells e.g. “£ XXX p.a. per square foot” or “£ XXX per annum per square metre”.
- (f) 1-way and 2-way data tables for sensitivity investment scenario analysis
  - (g) Graphs to ease reading numeric trends from the cash flow projections; and any of the above numeric or text formatting options for associated graph text, colours and numbers

**2.1.1 Technicalities & Design.** Best practice design must consider two perspectives: that of the designer of the model, and that of other users of the model.

- i. for model end-users, a friendly interface is desirable. It may help, for example, to highlight all input cells in a constant colour, and to use an appropriate and easily recognized combination of the above formatting skills.
- ii. for model designers, a modifiable interface is valuable. The same or another designer often seeks to amend, enhance or reorganize elements of the model in future versions. So it may help to provide last version information, and comments about complicated formulae or flagged cells.

**2.1.2 Technicalities & Changes.** There is also a need to handle changes that invariably emerge in dynamic investment situations. The spreadsheet modeler must think about initial project assumptions while using foresight and experience to design in the necessary model flexibility for more complex financial assumptions.

The team usually inputs changes at a later development stage. The delay may be just hours or a few days, or weeks and even months. The time depends on the speed and progress of the project in question.

At the start, the spreadsheet modeler may only be aware of some simple initial debt assumptions for an investment proposal. But he will usually need to ensure from the outset that the model caters for more complex calculations and accounting principles that deal with new assumptions imposed on the model. For example, as the investment proposal is fleshed out, a simple debt facility on Day-1 may turn into an additional debt facility, special drawdowns, changing interest payments, amortization assumptions, pre-payment fees, non-utilization fees, and so on.

## 2.2 Working Causes Human Error

Working in teams is also a source of human error.

Analysts without adequate capability may be tasked to build a tailored cash flow from scratch for a new project. Remedial oversight and audit by more senior managers is often absent.

There are usually an array of basic repetitive modeling tasks that need to be accomplished for any cash flow exercise e.g. setting-up a quarterly time horizon and an annual summary time horizon, a debt facility (if there is gearing), an initial investment outlay, net operating income line &c. So team leaders frequently refer to 'not reinventing the wheel' to justify using old and sometimes highly inappropriate templates with legacy errors of their own.

As part of this process, existing templates are commonly butchered without proper review.

Well-qualified professionals in their own field are not always able to express their expertise, assumptions and entrepreneurial vision within a spreadsheet cash flow context. Nor do they understand the sensitivity scenario risks or time-saving benefits that are afforded by well-constructed cash flow models. As per CNN

Money's recent headline: "*Apparently some really smart people have trouble mastering Microsoft Office*".<sup>7</sup>

Audit could deal with errors: but mostly it is not feasible.<sup>8</sup>

## 2.3 Commercial Pressures Cause Error

The above issues and errors are compounded by unavoidable pressures that arise naturally in daily business within a dynamic market. Commercial real estate investment is at least as brutally competitive as any other financial arena. So work environments tend to be pressurized.

Quality assurance is undermined and

productivity levels decrease when pressures lead to appropriate technical tools and skillsets not being applied to the task.

Specific issues that we have identified within firms include the following:

**Weak Teamwork.** Team discipline is sacrificed in most spreadsheet design in order to deliver results and meet market-led project or bidding deadlines. It is much

easier and more emotionally satisfying to identify deadlines that are missed and assign blame, than to realize that deadlines have been met thanks to poorly designed models riddled with random errors<sup>9</sup>.

**Work Devaluation.** Detailed analytic spreadsheet work is often considered an inferior position within the financial industry career ladder. So initial model set-ups in property funds, banking, private equity, and large family offices are usually conducted by less experienced analysts. Junior analysts sometimes arrive straight from college or MBA courses. They know rather little about commercial real estate, and have little or no experience in delivering models in a work environment.

### Spreadsheet Facts

- ~90% contain errors
- Slow to construct
- Variable quality
- Hard to understand
- Dangerous to modify
- Standards slip
- Intrinsically risky
- Lack scalability
- Not auditable
- Missing a dimension

**Poor Productivity.** Long working hours are common and diminish the employee alertness required to maintain safe modeling standards. This pressurized working environment exacerbates likely pitfalls, deferral of tricky issues and the accumulation of errors. Many potentially lucrative deals are simply not analyzed due to lack of time or staff availability. Deals are generally analyzed far too slowly and with too many hidden errors.

### 2.3.1 Work Priorities v Model Standards.

The current conventions and hurly-burly of everyday work in financial institutions lead to a low priority being assigned to disciplined cash flow modeling.

The resulting low standards tend to garner more attention from business leaders during times of crisis.

When a market turns down severely and profits are in doubt, top management becomes activated. If there is poor investment performance, they will seek to identify a cause. If a faulty model is identified, relief comes from blaming a particular individual or team and demanding higher standards.

The problem is that it is not at all obvious how these standards are to be achieved short of a massive and unthinkable injection of funds on super-qualified PhDs.

In addition to such ad hoc in-house corporate reviews, there are many universities, quasi-academic bodies and dedicated organizations that promote and publish best modeling practices for cash flow builders.<sup>10</sup>

However, the issue that often remains untouched is: how can you devise a solution that improves modeling standards without simultaneously hindering commercial performance in fast-moving financial markets?

Business deadlines are prevalent in the wider market. When selling property, government and private parties will set bidding and auction procedures with deadlines. Potential buyers then need to work very quickly to underwrite the investment proposal and participate

properly in the deal if they intend to be the successful.

It seems self-evident that the industry will not adopt any solutions to improve model discipline if it does not increase or at least sustain team productivity.

Every sensible analyst and top executive wishes to diminish risks and improve modeling discipline. But for commercial reasons, these important subjects remain a secondary matter compared to the need for a company to achieve shorter-term goals and remain in business.

## 3.0 Why is Dashflow™ a Cool Tool?

Dashflow™ is an iPhone iOS app created to deal with the frustrations of spreadsheets. It was developed to address both commercial priorities and modeling standards. An element of fun was also injected.

The final output is a fully-fledged model that works with complete internal integrity and self-referencing formula logic.

In use, the model output that emerges looks like it was created by a human analyst, employed at a top Wall Street or City of London firm. Unlike their models, an English narrative audit file can also be generated quickly.

Spreadsheet errors are prevented in accord with ICAEW's *20 Guiding Principles*.<sup>11</sup>

## 3.1 Features

**Benefits.** The first prototype developed for Intellect Automation Ltd revealed that it is possible to achieve dramatic time savings for businesses. Work that formerly took hours or even days, can be concluded in minutes, or even seconds.

The result is a massive increase in individual and team productivity, which should translate directly into profitability.

At the same time, standards are not compromised, risks are eliminated or greatly reduced, and a genuine audit of the results is possible.

**Method.** The emergence of iOS has allowed for the development of a dashboard-based Graphical User Interface (GUI) that uses finger gestures like tapping, pressing, swiping and pinching to create cash flow spreadsheets and kick-start more complex modeling tasks.

**Automation.** Dashflow™ automatically handles the numerous mechanical and logical processes required by the usual cash flow model. It can also automate other contextual needs like:

- production of an audit file to demonstrate regulatory compliance;
- input of lease data via OCR;
- prepopulating a loan term sheet;
- conversions between different accounting standards e.g. IFRS, US GAAP, Japanese GAAP etc.
- team-sharing.

**Speed.** The end result is that in 3 minutes, the user can build a professional model that could take expert users at least 3 hours, and probably days for the average user. The work of writing formulae, separating and highlighting inputs versus outputs, cash flow timing, cash flow logic, detailed breakdowns, a summary page, charts & simply disappears.

**Fun.** It works in a user-friendly and instantly interactive manner much like a game. The user can ‘drive’ a proposed cash flow by holding the smart phone with two hands at either end of the screen and adopt quick interaction with the thumbs similar to a hand position adopted for text messaging or game-playing.

**Mobility.** The size and convenience of a smart phone or tablet app, means users can effortlessly create cash flows anywhere—in a café, on a train or plane, at the office—and immediately share the results with others.

**Convenience.** Today, few analysts would enter a boardroom and attempt to change assumptions in a complex spreadsheet model in front of senior management. But Dashflow™ can be taken into a boardroom to manipulate investment assumptions and illustrate consequent cash flows quickly and simply with minimum hassle.

**Ease.** Unlike working in Excel, the dashboard means that there is no need to scroll across long rows, or switch between tabs and other sheets, or zoom in and out. Excel files are clumsy and clunky. They are intrinsically unsuitable for viewing from a distance around a big boardroom table.

**Immediacy.** Dashflow™ subverts today’s approach to sensitivity analyses. Rather than building a detailed model from the ground-up to explore a particular scenario at the end of the exercise, users can observe sensitivity analysis on the fly as assumptions change or as complexity

appears in the investment proposition.

**Support.** Even where model building may be ultimately required for special local purposes, it helps everyone to play visually with potential cash flow scenarios before deciding whether to make that time-consuming and expensive commitment.

**Learning.** Dashflow™ helps people express themselves quickly and

creatively imagine new investment scenarios. It educates new users by demonstrating in an animated visualized manner various concepts e.g. the relationship between time and investment value of money and the respective return parameters.

## Physical Interactivity

- Past: Use a pencil on the back of an envelope.
- 1979: **VisiCalc** — use arrow keys to move about a green font screen.
- 1985: **Excel** — use menus, computer mouse and keyboard on a Mac.
- 2015: **Dashflow™** — use gestures on an iOS mobile device.

## 3.2 Comparisons

Consider Dashflow™ as similar to Sibelius music software, but created for cash flow propositions. End users can ‘compose’ cash flow spreadsheets very quickly, while at all times maintaining numerical accuracy and

a consistent underlying model design discipline.

Sibelius allows users to “play” on a piano keyboard and convert it to well-designed composition, while maintaining music-pitch annotation accuracy and consistent stanza sheet design. This tool allows users to “play” with shapes and convert these to a structured financial model, with well-designed cash flow items.

The end result of working with such a dynamic and intuitive graphical interface is to dramatically save time for analysts, increase productivity levels in teams,

decrease risks for businesses, and enlighten everyone involved.

Two polar extremes dominate the market place for investment proposals today: specialized black-box software and spreadsheet modeling. Black-box software offers answers with no transparency as to its internal calculations. Spreadsheets, despite their intrinsic risks, are preferred because it is much easier to check specific assumptions. Dashflow™ combines the benefits of these two extremes to offer a genuinely new and effective solution to an age-old problem.

- 1 <https://en.wikipedia.org/wiki/Spreadsheet#History>
- 2 <https://secure.marketwatch.com/story/88-of-spreadsheets-have-errors-2013-04-1>
- 3 Panko, R. (1998) What we know about spreadsheet errors. J. End-User Computing, 10 (2). Panko, R 1998 J. End User Computing 10 (2) & <http://panko.shidler.hawaii.edu/SSR/My papers/whatknow.htm>; Also see: [http://john.raffensperger.org/ArtOfTheSpreadsheet/Chapter10\\_SpreadsheetErrors.html](http://john.raffensperger.org/ArtOfTheSpreadsheet/Chapter10_SpreadsheetErrors.html)
- 4 K. Bishop. Spreadsheet blunders costing business billions: <http://www.cnn.com/id/100923538>
- 5 Advantage for Analysts, 2006. A case for a new Financial Modeling Metaphor
- 6 <http://www.mrexcel.com/articles/CSE-array-formulas-excel.php> : “Use Ctrl+Shift+Enter (CSE formulas) to supercharge your formulas in Excel! Yes, it is true...there is a secret class of formulas in Excel. If you know the magic three keys, you can get a single Excel array formula to replace thousands of other formulas.”
- 7 See: <http://finance.fortune.cnn.com/2013/04/17/rogoff-reinhart-excel-errors>
- 8 PriceWaterhouseCoopers (2004) The Use of Spreadsheets: Considerations for S.404 of Sarbanes-Oxley Act.
- 9 Many organizations and publications promote good practices for spreadsheet management e.g. CIMA Chartered Institute for Management Accountants, Chartered Accountants of England & Wales, the Spreadsheet Standards Review Board (<http://www.ssr.org>) in Australia, the Harvard Business Review and Ivy League financial modeling courses. Relevant training occurs at Reading or Cambridge University.
- 10 EUSPRIG is a European research organization dedicated to dealing with spreadsheet risks. See: <http://www.eusprig.org>
- 11 See: <http://www.icaew.com/~media/corporate/files/technical/information%20technology/excel%20community/166%20twenty%20principles%20for%20good%20spreadsheet%20practice.ashx>

## About Intellect Automation Ltd

We are a business dedicated to bringing imagination, cooperation and fair dealing to the world of investment.

We design software that allows everyone with a basic understanding of a particular type of deal to develop and understand the investment proposition in a super-quick, easy, and correct way.

All software is initially designed for mobile platforms with gesture control so they can be used in a café, on a plane, at the office, or in a boardroom.

We want our products to be more than just easy and intuitive. They should be a joy to use and an opportunity for spontaneous learning and creativity.

Intellect Automation Ltd, Reg. No. 09922607

Reg. Address: 46A Overstrand Mansions, Prince of Wales Drive, London SW11, U.K.

Website: [www.intellect-automation.com](http://www.intellect-automation.com) Email: [info@intellect-automation.com](mailto:info@intellect-automation.com)