Report visualisation: From concept to deployment

A KPMG and CGMA Thought Leadership Report
Chartered Global Management Accountant

CGMA is the most widely held management accounting designation in the world. It distinguishes more than 150,000 accounting and finance professionals who have advanced proficiency in finance, operations, strategy and management. In the U.S., the vast majority are also CPAs. The CGMA designation is underpinned by extensive global research to maintain the highest relevance with employers and develop competencies most in demand. CGMA designation holders qualify through rigorous education, exam and experience requirements. They must commit to lifelong education and adhere to a stringent code of ethical conduct. Businesses, governments and nonprofits around the world trust CGMA designation holders to guide critical decisions that drive strong performance.
An introduction to report visualisation

Report visualisation, along with the advancement of multimedia technology over recent years, has become a very powerful means of sharing and providing insight around business performance, which can be easily digested by the recipient. Report visualisation is the process of presenting report formats that represent data and information in a pictorial or graphical format that helps the recipient to understand the significance of the content more easily than if presented in a traditional report format.

The human brain consumes information much more easily when presented with graphical representations, and so report visualisation concepts have become a key aspect of report design. The beauty of visual reporting is that patterns, trends and correlations are much easier to spot when presented graphically than in a table of data.

In today’s modern business environment, the volume of data is far larger than ever before. Therefore the art of report visualisation has become increasingly important as we become overwhelmed by both data and information.

In recent years technology providers have embraced the market and developed new tools to assist in the production of high-impact visual reports. In parallel, the quantum leaps forward in desktop and mobile technology have enabled visualisation to be truly interactive and dynamic.

This paper shares some of the developments around report visualisation and the key steps that should be adopted to harness such capability. Included are ‘Research Insights’ gathered from Chartered Global Management Accountants (CGMA designation holders) across a wide range of industries.
What to measure - data that matters
A key role of the management accountant is to support effective decision making by presenting relevant, timely and accurate information in a manner that enables informed dialogue and decision making.

For effective decisions to be taken, the information presented must focus on the right key performance indicators (KPIs) that drive true business performance.

Making decisions based on these drivers should result in focusing performance around delivery of business strategy.

#ResearchInsight All the interviewees agreed that presenting analysis of non-financial data is of much more value in improving performance than historic financial results.

The role of visualisation in this process is to present the relevant data in such a way that the message is quickly absorbed and understood by the reader so that action can be taken quickly, and time is spent on decision making rather than understanding performance.

Operating model
The demand for relevant reporting must also be satisfied by a robust delivery model that ensures a high level of reporting quality which can be absorbed quickly.
Reporting quality focuses on two key areas:

• Data and master data that are subject to robust control which ensures reporting integrity

• Standards in reporting that drive commonality across the whole organisation and aid assimilation to the consumer. For example, if ‘red’ is consistently used to display an adverse variance, then the reader is not having to ask the question every time.

Whether reporting is produced at a local business unit level, shared service centre or outsourced, these two key areas are fundamental to quality reporting.

How to present data to make a conclusion and take action

The overriding principle in deciding how to present data is that one size does not fit all.

Our research highlighted that there is still a place for traditional row and column table-based reporting, but this is used mainly for reference data.

The use of graphical reporting is much more commonly used to tell a story but there are also readers within the organisation that are ‘turned off’ by the use of graphs. This makes it important to use appropriate media depending on the target audience.

When deciding on the appropriate way to present the data, it is often best to start with an idea of what the end goal is i.e. what message are you trying to present (which may be dynamic).

Once you have defined the purpose of the report, then consider the metrics and the dimensionality that is required to provide insight.

#ResearchInsight Although most business users may find charts more user-friendly, tables of figures are still very useful to accountants as reference or supporting data.

Before embarking on creating the report, consider who the reader is as this will help determine the delivery channel you select. It might be relevant to create the same report with multiple reporting output styles to ensure the message is delivered with maximum effectiveness.

Report visualisation will remain a core skill for the management accountant to develop and evolve. The tools available are ever changing and improving as technology continues to develop at a rapid pace.
The following five key principles should always be considered.

1. **Ensure data is optimised for report visualisation**

Once you have identified the right measures that are to be reported, you will need to identify the relevant data sources, which might be more than one for each report. The key points to consider per data source are:

- Where is the data source?
- Can I physically extract the data?
- Can the data be refreshed in time to make the report relevant?
- How can I ensure sustainable integrity over the available data?

It is at this point that you should consider whether it is appropriate to create a data storage layer. Aside from providing a robust data extraction process and a single repository of data from multiple sources, this can provide a key role in optimising the data for report visualisation.

The first benefit is that within this data storage layer, we can clean the data and provide a common definition to measures. This is especially important if there are multiple data sources which have all been developed independently without regard for master data alignment.

The second area to consider is the creation of structure or hierarchies within the data that facilitates drill down to the reader. This is especially important if using tools such as mobile technology where the user is encouraged to drill to the next level with the touch of a finger.

For example, imagine a report on an iPad showing a map of the world featuring a big red variance for sales in Europe.

2. **Apply the relevant visualisation tool**

The principal factor in choosing the relevant report visualisation technique will undoubtedly be driven by what the user for the report feels comfortable with.

However, there are a few common guiding principles that can be used to help match the visualisation to the requirement:

- Variance analysis is often depicted by using waterfall charts, commonly known as bridges. The key benefit delivered is that the size of the steps in the bridge are to scale, so your eye naturally focuses on the significant movements first.
- In providing an overview of a business area, dashboards can provide a relevant summary. The key to delivering a useful dashboard is identifying what are the four or five relevant key drivers that can be reported on one page or screen. Dashboards provide a summary and often lead to a drill down to the next level, which is likely to be a different report.
- Trend analysis or time-based results are generally shown using line charts. Modern planning solutions can also use line charts as the visual interface to plan for future periods by establishing a baseline and then allowing the planner to drag the chart, which then models the underlying data.
• Where organisations are built up of business areas or regions, mapping charts are useful, especially when presented on an interactive interface such as a tablet.

• When comparing data sets that are built up from component parts, then a bar chart or side by side pie chart will bring the message to life.

• Consider the use of summary but insightful supporting commentary.

• Finally if you are producing reference material only, do not forget traditional row and column tables. These are still extremely useful, especially when combined with conditional formatting.

3 Choose an appropriate report layout

As visualisation skills become more and more important for the management accountant, he or she must think of designing a report from the perspective of the graphic designer too. Consider the following:

• Layout – a simple and clean layout will always deliver a more impactful report than a report with too much information. Clear headings should be used that help explain what data is being presented.

• If the report is ‘to be delivered digitally’, then the visible area of the page should match the screen, as scrolling is not desirable.

• Positioning – the reader’s eye naturally starts to read reports from the left-hand corner of the page and continues to the right or down. Therefore, if there is a key message, this should be positioned towards this area to gain optimum impact.

• Colours – the first area to think through with colours is whether the colours you have used make the report attractive to the eye, which engages the reader.

The second use of colours is to assist in telling the story. ‘Red’ and ‘green’ are used universally to depict ‘positive’ and ‘negative’, so consider conditional formatting if appropriate. Colours in related charts should always be consistent – for example, if a product or channel is shown in blue in one chart, it should be shown in blue in the next chart too.

• Finally, although colours enliven a chart, it is not a good idea to use too many as the chart will look messy.

• Scaling – make scaling appropriate to the data and be wary of hiding the story through scaling. If your report contains multiple charts, try not to mix different scales on the same page, as this can confuse the reader.

#ResearchInsight Our research shows that pastels are not desirable for business reports, most organisations preferring clean and sharp contrasting colours.

The five principles for effective report visualisation:

- Ensure data is optimised for report visualisation
- Apply the relevant visualisation tool
- Choose an appropriate report layout
- Optimise the reader experience
- Optimise visualisation to the appropriate delivery channel

Report visualisation: from concept to deployment
Report visualisation: from concept to deployment
Optimise the reader experience

Engaging with the report user is key to ensuring the message is transmitted effectively from the paper or screen. When reporting in paper, think about the size and weight of the pack and consider dividers to help readers switch between sections.

For online reporting, there are many more options available to deliver a better user experience:

- **Personalised** – personalised reporting is key to engaging with users. This can be as simple as offering ‘bookmarks’ or ‘favourites’, or as complicated as the reporting solution making intelligent reporting suggestions based on the reader’s history or security access.

- **Intuitive** – navigating searching around an online report should be intuitive and as familiar as searching the web or using a smartphone. Many reporting suites will include home buttons or searches similar to Google to assist in the familiar user experience. A few reporting software providers utilise ‘Gamer Influenced Design’ principles in designing a user experience consistent with a video game.

- **Interactive** – with touchscreen computers, tablets and smartphones more commonly being used for business, it is often desirable to use touch in an interactive report. Whether choosing the next report or drilling down to the next level, it is much more intuitive to swipe than it is to click the mouse.

- **Customised** – a certain group of report users, may want to customise their own reports, and this is facilitated by certain software vendors. They can then create their own user experience, but care must be taken to ensure the underlying data model is robust and does not allow the misrepresentation of data by custom-built reports.

#ResearchInsight I tell all of my team that when they present a new report, a table is the last resort if you need to get a message across.

#ResearchInsight The key learning from my years in finance has been that a clean and simple report will always be preferable to a fussy report. Trying to add too much information has the inverse effect in that the message is lost. Less is definitely more.

#ResearchInsight Whilst we will always produce standard reports delivered to the user, we also have made available a suite of self-service personalised reports which are very popular amongst certain users. The EVPs tend to like the standard suite but the VPs use the self serve.

Optimise visualisation to the appropriate delivery channel

Reports can be delivered via many different channels, such as desktops, laptops, tablets, mobile devices or paper. It is clear that a mobile phone is considerably smaller than an A4 sheet of paper and therefore logical that in order to produce a powerful report, the design will need to change.

Many software providers support functionality that automatically renders the report and layout based on the delivery device. This is termed ‘author-once / run everywhere’.

Whilst these tools can help, it is important to consider other aspects, such as the user experience.

For example, the smaller the screen, the less you can show on the start page. However, you can provide drill paths and filter options to dig into the next level as required.

You should also consider the urgency of the report requirement. Urgent notifications can be sent to mobiles but in order to fully analyse the detail, it might be acceptable to wait until the user is in front of a computer.

The previous visualisation principles become even more important when thinking of various delivery channels. Technology is just the enabler to appropriately satisfy these.
Case study 1:

A global industrial manufacturer
Problem statement:
The organisation had grown significantly through mergers and acquisitions and as a result had multiple reporting solutions delivering output that satisfied divisional reporting requirements only. The company had recently formed a group reporting function tasked with providing the CEO and CFO with the insight to drive the whole business. Previously, reports had been pulled together in MS Excel from divisional reporting which led to inconsistencies in data and definitions. These reports were in a traditional row and column tabular format, which required user interpretation.

Approach:
Working with KPMG, a summary set of KPIs was developed that linked divisional performance to satisfy the strategic goals of the organisation. These KPIs were then expanded into more detailed measures that could be reported on by the divisions to explain variances in performance. A mobile dashboard was created that started with a single screen reporting the six strategic goals of the organisation and then enabled the user to swipe into further information on a detailed measures (swipe left) view or a divisional (swipe right) view. From each view, drop downs were also created to intuitively navigate between different views. Conditional formatting and interactive graphs were used to draw the viewer to the issue quickly.

Benefits:
Providing a consistent view of the group and divisional performance based on common KPIs was a giant leap forward for the company. The interactive way of viewing performance was seen by all users as a much more intuitive method than sifting through paper reports. The conditional formatting along with the graphical techniques removed the need to analyse the numbers, allowing managers to take action more quickly. By being on mobile devices, managers now had instant access to financial performance at their fingertips.

Tools used:
Tableau
How to obtain value from data

Reporting evolution

Over a significant period of time, we have seen report visualisation evolve from dot matrix printed reports to application-supported reports to desktop publishing-based reports and to the present day, when we can facilitate highly visual, dynamic, customisable reports on mobile devices.

The concept of report visualisation is not new. In 1931, Harry Beck designed the London tube map. Beck devised a map of straight lines running vertically, horizontally or at 45 degree angles which was visually easy to understand but is only directionally correct compared to the physical locations of the stations.

Fast forward to the modern day, and the same principle is used by McLaren Formula 1 who depict each track as an oval, no matter where they are racing, because this delivers a simplified visual for the driver to understand. KPMG has teamed up with McLaren to exploit data analytical and visualisation methods developed for the racetrack to solve complex business problems in this area.

So what of the future? KPMG and Imperial College London are currently developing a Data Observatory. Core to the observatory is the visualisation space, which presents data in an enveloping circular wall of 64 monitors with 310 degrees of surround vision and a total resolution of more than 130,000,000 pixels with a view to developing the most impactful visualisation concepts.

Tools available in the market

Until recently, visualisation tools were part of large enterprise-wide Business Intelligence (BI) solutions requiring significant investment and specialist IT skills.

In recent years, cloud-based technology has opened up a new suite of products that can be owned and developed by finance.
Prices
The price of visualisation solutions has fallen dramatically, in a trend that will continue as more new entrants release products.

The market leaders
Gartner’s Magic Quadrant for Business Intelligence and Analysis Platforms is a globally recognised report comparing the visualisation vendors. The market has exploded with new entrants and as of 2016, Gartner were ranking 24 separate vendors of which the market leaders are:

Microsoft Power BI
Microsoft’s BI offering is one of the most cost-effective products on the market, is easy to use and integrated with the MS Azure cloud offering. Microsoft has increased the number of data sources it can integrate with as standard and now supports social media platforms such as Facebook.

Tableau
Tableau is the market leader and has been for a few years. It is easy to use and has comprehensive online support. Perhaps Tableau’s biggest strength is the number of data sources that can be connected via simple wizards, making it very popular within the finance function.

Qlik
QlikView and QlikSense are also easy to use and are stronger where the need is for complex analysis of data before visualisation. Qlik facilitates this with an in-memory engine, which allows readers to see patterns in data better than with traditional relational databases.

The new breed functionality:
1. **Data integration** - all of the leading solutions offer pre-built data connectors to multiple-source systems. IT may need to be involved to ensure there are no security issues to avoid systems talking to each other, but as soon as the connection is made, you can start visualising.

2. **Pre-built starter kits** are also included within the solutions. These lead to an accelerated development time and have been built with best practice in mind.

3. **User-friendly functionality** - combined with online help tutorials, this enables getting up to speed as fast as possible.

4. **Mobile reporting** - used to involve complex coding. All of the leading BI providers now enable the option to publish reports to mobile devices, whether tablets or phones. Whilst the technology renders to the correct format, care must be taken to ensure the report is relevant to each device.
Reporting and analytics come together

Big Data for everybody

When Big Data first arrived on the scene, it was driven by the IT programmer developing new technologies like Hadoop in open-source technology user communities.

Tools such as Qlik, Tableau and Microsoft Power BI are now all able to connect to huge data sources, including unstructured data, and have the processing power to look for patterns in the data and provide insights. Big Data analysis is now firmly in the hands of the management accountant.

#ResearchInsight Unstructured data has to be organised into structures by looking for common patterns in order to derive valuable insight.

Cognitive technology

Cognitive technology is where systems are able to perform tasks that only humans used to be able to do. It covers areas like computer vision, machine learning, natural-language processing, speech recognition and robotics.

In the context of reporting, cognitive technologies can anticipate the need for information and provide it before being asked. ‘Google Now’, for example, recognises repeated actions that a user performs on a device and presents information to the user based on these patterns.

The leading visualisation tools already have some cognitive technologies - for example, recommending a particular graph based on the data set chosen.

Predictive analytics

This area uses statistical techniques and machine learning on large volumes of data in order to make predictions about future events. More companies are using these techniques to drive financial planning, removing the ‘gut feel’ element of budgeting and forecasting.

Internet of Things (IoT)

This refers to physical devices that are able to collect and exchange data via the internet, such as a ‘Fitbit’.

These devices are massively expanding the ability to collect data from areas previously not thought possible.

Application design principles

1. **Standard functionality** – custom modifications to the coding on reports will lead to difficulties for ongoing maintenance and are often made on the basis of individual preferences, which may change over time.

2. **Templates** – use templates from the software providers if you can. These will be based on best-practice principles. If these templates do not satisfy your organisation’s requirements, then build your own templates centrally and make them available to relevant stakeholders.

3. **Design principles** – develop design principles to standardise reporting formats and ensure they are easily accessible from within the system. Corporate colours can be hardcoded within your standard templates.

4. **Clear navigation** – always think about your user journey. Reports must be easy to interact with or they will not be adopted.

5. **Emperor’s New Clothes** – just because you can publish to mobile or include the finest 3D graph does not mean that you should. Always challenge and if the reporting is to be used on a large scale, establish a Design Authority. Think about reports from the viewpoint of a graphic artist, rather than an accountant.

6. **Keep it simple** – this is the golden rule of reporting. Even when the functionality keeps growing, the simplest reports are generally still the best.
Getting started and lessons learned

In designing performance reports, most organisations become unstuck by not:

• Focusing at an enterprise level around what should be measured and why
• Placing enough emphasis on getting data integrity resolved
• Looking at the holistic picture on how reports fit within one performance management framework.

In essence there is little point in developing a report that looks good but drives the wrong focus on behaviours; to get visualisation right, the following building blocks need to be considered.

Start with pilots, Proof of Concepts (PoCs) and scale throughout the company

Critically, the best place to start tends to be at board level (or equivalent) within the organisation. As mentioned, initial focus is centred on getting the content right – i.e. the measures that will ensure resources are enabled and aligned around delivering the organisation’s strategic intent.

Once these key metrics have been defined, they should become the basis for designing of all subsequent metrics cascaded down through the organisation.

Only then should time be spent on developing a visually impactful board report incorporating a combination of graphs, icons, tables and summary commentary which articulates the performance of the organisation at a glance. To attain this will require iterative mock-ups, taking into consideration the preferences of different personality types in developing a house style. In parallel, great care and consideration has to be given to ensuring that an agreed report style can be delivered efficiently and can be automated to reduce production burden.

Be aware that the report is likely to need to evolve from an initial proof of concept into a sustainable report. Ensure that the design is managed, developed and governed accordingly.

Lastly, the report needs to sit within a performance management framework which is used as a formal mechanism to assess performance consistently across the organisation.

By adopting this approach, you have developed a style for the organisation which can be quickly evaluated and embraced on a sustainable basis.

#ResearchInsight We are currently mid way through a project to determine a design for future reporting. We are using consultants during this process who help us understand what we really should measure and report. For too long, our reports have evolved through legacy requirements and are out of date.
Make sure data governance is in place

Once top-level key metrics have been defined, emphasis should quickly gravitate to ensuring that data models and governance are designed and deployed to manage the integrity of agreed key metrics. This will require careful consideration to be given to:

• Data definition along with data consistency – i.e. put effort into building a sustainable data model so that report integrity becomes second nature
• Identifying data gaps and challenges associated with key metrics early and put in place data-migration and mitigation plans to improve data quality
• Developing master data management processes and governance models which are pragmatic and are not burdensome on the organisation to maintain
• Designing a common data model which is managed at one focal point across the organisation, but executed locally in line with common policy
• Maximising the use of data-management and governance tools to manage data consistency and integrity
• Ensuring that your data model design is flexible to allow for changes in the organisation’s operating model and environment.

By placing such emphasis on data, you are addressing the integrity of reports as part of the design and, as a consequence, ensuring that the organisation can rely on decisions made based on report content that is presented in a practical and informative way.

#ResearchInsight All our reports and data come from a centralised repository, which delivers a single version of the truth at all levels of reporting.

A tool is not the (single) answer

By now it should be clear that the selection of a best-of-breed visualisation tool will not on its own provide you with effective reporting.

Consider the following:

• Ability of the tool to produce and disseminate defined reports and defined functional requirements
• Ease with which such a tool can work seamlessly with legacy data warehouses, transactional systems and data management tools
• Ease of use and effort required to deploy
• Features and functionality available as standard (in particular graphic and commentary functionality)
• Cost effectiveness and vendor development paths
• Productivity benefits as a result of tool deployment.

As a result, the recommended approach is to conduct a formal assessment of a shortlist of potential vendor offerings against formally defined requirements.

In addition to this, the approach to design, data management, governance, process and sustainability needs to be deployed in parallel to the tool for you to maximise the impact on the organisation and truly enable informed decision making.
Case study 2: A large retail insurer
Problem statement:
The organisation had a history of unreliable performance against strategic plans. Their strategic planning had little linkage to operational targets and business performance reviews were focussed only on the current year. Hence, limited strategic discussion on actions to take now to achieve the three-year plan. They had minimal use of rolling forecasts across the divisions, leading to lack of forward-looking insight. Hence, the three-year plan was always out of date in the second year.

Approach:
Strategic KPIs were identified to manage overall group performance using a top-down approach. They were developed into a new performance management framework that linked strategic planning, target setting, business planning, forecasting and reporting and analysis, using consistent drivers of performance. A digital dashboard was created in Microsoft Power BI for the board to manage and review performance against strategic ambition. The digital dashboard now linked actual performance to effects on the rolling forecast, which reported the movements to plan using trend-based graphs that clearly showed the impacts on current and future years.

Benefits:
By having the right data model underneath the dashboards, actual performance was now linked to a rolling forecast. This meant business decisions were made that helped deliver results outside of the current year. The digital dashboard, and specifically the use of forward-looking trend graphs, allowed instant visualisation of the effect of decisions across all years, which is difficult to obtain in traditional tabular reports. Management is now able to react much faster to performance variations and take corrective actions that can deliver the three-year plan as well as current year.

Tools used:
Microsoft Power BI
Report authors

John O'Mahony
Director
KPMG

Andy Carfax
Principal Advisor
KPMG

aicpa.org
aicpaglobal.com
cgma.org
cimaglobal.com
kpmg.com/uk

July 2017