

THE DATA VISUALIZATION COMPETENCY CENTER™

BALANCING ART, SCIENCE AND CULTURE

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Executive Summary

Data visualization offers a tremendous opportunity to reach insights from data by leveraging our intrinsic hard-wiring to understand complex information visually. A well-designed, meaningful visual delivers immediate, actionable, and aesthetically-intriguing insights at a glance. With increasing self-service capabilities and functionality available in intuitive tools today, more business-oriented users are being enabled to independently create and share their visual discoveries.

Successful data visualization requires using the right kind of graphicacy to correctly interpret and analyze the data, as well as employing the right combination of design principles to curate a meaningful story. Poorly designed data representations can distort the message of the data, fail to guide the audience toward meaningful conclusions, or lose the attention of the stakeholder altogether. This creates risk: incorrect or inadequate visual communication can forfeit opportunities to take action on a new insight or cause the business to take action in the wrong direction. Therefore, the business must find a way to manage the risks of self-service data visualization, while still capitalizing on its potential to allow a broader, more diverse group of analysts to reach interactive insights at the speed of thought and communicate new insights and discoveries directly back to the business.

This report introduces the role of the Data Visualization Competency Center™ (DVCC). As an extension of the Business Intelligence Competency Center (BICC), the DVCC will support the use of effective self-service data visualization by providing best practices, standards, and education on how these information assets should be designed, created, and leveraged in the business. The DVCC has three core competencies that are explored in more depth throughout this report:

- Educate users on visual design principles and key cognitive elements affected by data visualization
- Provide best practices and proven standards for understanding types of data and how to visually present them
- Foster a culture of communication, collaboration, and collective learning that enables a review network for newly created data visualizations

Introduction



The human brain can remember approximately 10,000 visuals with an 83% recollection rate and further demonstrates the importance of proper and accurate data visualizations.

Data visualization is both an art and a science. A well-designed, meaningful visual delivers immediate, actionable, and aesthetically-intriguing insights at a glance. With increasing self-service capabilities and the introduction of user-friendly functionality, more business-oriented users are being enabled to independently create and share information visually, making data visualization a critical tool for the modern analyst.

However, successful data visualization goes beyond providing a visual representation of data. It requires using the right kind of graphicacy technique to correctly interpret and analyze the data, as well as employing the right combination of carefully distilled design principles to curate a meaningful story. Ineffective or poorly designed data representations delivered by users that lack formal data analysis and design education can distort the message of the data, or lose the attention of the stakeholder altogether. This creates business risk: incorrect or inadequate visual communication can lose the opportunity for the business to take action on a new insight or worse – cause the business to take action in the wrong direction.

Further, with the consumerization of business intelligence (BI), users have more tool choice and a bigger say in purchase decisions, and vendors can accommodate more pervasive tool deployments. Combined, these have a significant impact on the maturity of data visualization in the organization as well as how they are incorporated as an information asset while mitigating risks of self-service data visualization.

This paper introduces the role of the Data Visualization Competency Center™, and discusses how data-driven organizations can articulate a set of core competencies focusing on visual design principles, data visualization best practices, and by cultivating a culture of collaboration.

Business Benefits and Risks

Data visualization is one of the most significant technologies of the 21st century, providing an approach to reimagining BI and collectively introducing companies to a new way of seeing and interacting with data. With a higher premium on self-service, data visualization tools allow analysts to reach interactive insights at the speed of thought, reduce the burden on IT, and leverage sharing abilities to communicate new insights and discoveries directly back to the business. Further, the ability to rapidly generate meaningful data visuals is one way that organizations are earning actionable insights needed for immediate business value. And, with the availability of more visualization tools than ever before, best practices and clear business use cases are becoming solidified.

With more enablement and access to data through optimized self-service tools, **users that lack formal education in data analysis** may introduce the risk for the business to take action on poorly designed visualizations that misinterpret or misrepresent data.

A data visualization democracy within the organization may result in **an oversaturation of visual assets**.

Alongside the list of benefits and opportunities provided by self-service data visualization there is also a set of emergent business risks that demand attention.

Without awareness of visual design principles, **unbalanced visuals created without consideration for color use, pattern recognition, or other visual design cues** may unintentionally distort the meaning of the data – or lead to the generation of chart junk or eye candy devoid of true value.

Competing user priorities, compounded by the consumerization of tools, may **bloat the tool ecosystem** in the organization, causing confusion and inconsistency.

** Above is an example of how effective communication is with visual tiling and coloring.*

Introducing the Data Visualization Competency Center™

As data visualization continues to take an increasingly important seat at the data table, now is the time to introduce the Data Visualization Competency Center™ – the DVCC – to take BI further, provide best practices, and fingerprint data visualizations as unique digital assets in the business.

The Data Visualization Competency Center™ should be seen as an extension of the Business Intelligence Competency Center (BICC). Similar to how the BICC is a cross-functional organizational team with defined tasks, roles, responsibilities, and processes designed to support the use of BI across the organization, the DVCC should likewise focus on how data visualization is designed, created, and leveraged. And, like the BICC, the knowledge held in the DVCC should be balanced with how it is embedded into the business to avoid the “ivory tower” effect that may cause the business to reject a competency center.

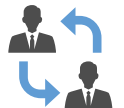
The purpose of the DVCC is threefold.



First, this competency center should provide education on visual design principles so users will understand the role of design and the key cognitive elements affected by data visualization.



Second, it should leverage data graphicacy best practices to facilitate guided data discovery through recommendations and proven standards for understanding types of data and the best ways to visually present them.



Third, a competency center focused on the effective use of data visualization should focus on cultivating a collaborative learning culture that enables a review network for newly created data visualizations before they are provided to the business.

Each of these areas will be discussed in the sections that follow.

Principles of Design

When thinking in terms of design, don't mistake beautiful data for effective data. Visualization purists advocate for minimalistic, data-heavy graphics stripped of gratuitous elements. However, used correctly, data visualizations that are simple, balanced, and focused – and that use visual enhancements (like hue, saturation, size, and color) judiciously – offer tremendous opportunity to leverage our intrinsic visual hardwiring.

While this brief isn't intended to be an all-inclusive guide on visual design principles, let's call attention to a sample set of visual design issues. First, is color. Color activates the visual cortex of the brain – a process called perceptual pop-out – and is one of the first cognitive processes enlisted when analyzing visual imagery. The wrong colors can mislead, confuse, or misinterpret information. Color, too, should not be relied upon to convey meaning. Likewise, it should not be used for decorative or non-informational purposes. Instead, use color sparingly and understand the importance color selection.



Beyond color, consider the layout of visual elements according to the visual processing horsepower of the brain. Organize visuals in a manner that facilitates natural eye movement – or, reading gravity. If this concept is difficult to grasp, think of it as the narrative flow of dashboards: how analyses can be grouped together based on the logical sequence of layered data understanding. This is data hierarchy, which places high-level visualizations to the left and detail visualizations to the right and bottom.



Principles of Design

“...visual design hinges not on embellishment, but on removing and simplifying until nothing stands between the visual’s message and its audience.”

Finally, use white space and density to avoid visual clutter and reduce unnecessary visual elements, like redundant chart labels or overused boxes or lines to separate data. Here, consider Gestalt principles that emphasize simplicity in shape, color, and proximity and look for continuation, closure, and figure-ground principles. Ultimately, understand that visual design hinges not on embellishment, but on removing and simplifying until nothing stands between the visual’s message and its audience.



These three questions are helpful when curating your visualization:

- **It is approachable?** The design should be straightforward and easy to understand by its intended audience.
- **Does it tell a story?** Visualizations should transform data into knowledge – effective visualizations are one-visual-to-one-story ratio.
- **Is it actionable?** The visualization should provide guidance through visual clues that direct the audience’s attention to a clear action.

“Self-service data visualization capabilities are giving users more power and flexibility. We now need a framework to guide and support the users to use the datasets, features and tools the right way. This is where the Data Visualization Competency Center can help.”

- Vineeth Raja, Director, Corporate Programs & Information Services at Sigma-Tau Pharmaceuticals

Best Practices in Visualizing Data

“...though data visualization does not equal analysis, a good visual begins with understanding data.”

While design is an integral part of effective data visualization, analysis comes first. And, though data visualization does not equal analysis, a good visual begins with understanding data.

There are many types of data and ways to visualize them – and there are two key best practices to keep in mind when visualizing data. First, understand the data you want to visualize and, second, know what kind of information you want to communicate. At a basic level, data can be classified into three primary groups.



Qualitative data – often used interchangeably with categorical data – is a measurement expressed by natural language description (for example: favorite color = orange). This type of data can be further broken down into nominal data – categories where there is not a natural ordering (gender, state, sport, etc.), and ordinal variables, where a category does have order (size, attitudes, etc.) but cannot be aggregated.



Quantitative data - expressed in numbers and always associated with a scale measure – these are metrics that can be counted, ordered, and aggregated. Other factors – like data cardinality – also affect classification of data.

For each type of data there is a diagnostic of visualizations best suited for specific analytic needs. Among these are: contribution analysis, time-series analysis, correlations, contributions, and so forth. For each of these, there are appropriate ways to visualize data and intended visual takeaways. Line Charts, for example, are used to track changes or trends over time and show the relationship among variables. Bar Charts are used to compare quantities of different categories; Scatter Plots to show joint variation of two data items; and the love-to-hate-it Pie Chart to compare parts of a whole. Many other advanced visualization types – like heatmaps, tree charts, and histograms – span the continuum of exploratory and explanatory graphics.

Best Practices in Visualizing Data

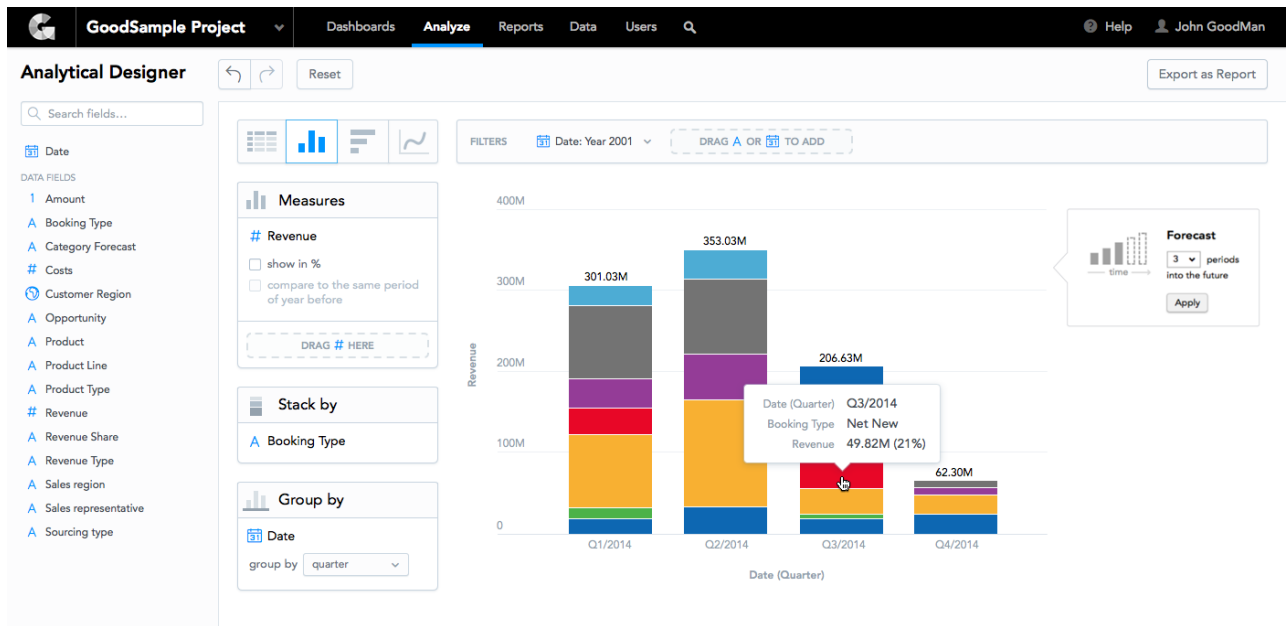


Figure 1. This image shows a guided data visualization using GoodData's Analytical Designer.

To develop a core competency, the DVCC should leverage mechanisms to provide guided data visualization as guardrails for users without (or with limited) data analysis background. This includes the use of collective intelligence and/or recommendation engines alongside established best practices to “self-check” graphic selections and to ensure that the best visualization option is selected for the data and the insight goal in mind. Truly guided visual discovery will also be an education enabler by providing learning opportunities for non-technical analysts to understand their analysis step-by-step.

“Like data governance, which has certain standards and policies, data visualization should also have a set of standards for design, development, and storytelling – these are the core competencies of the DVCC.”

- Cecile Horsky, Sr. Manager, Automation & Data Assurance at Walgreens

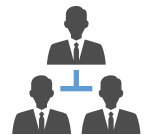
Develop a Collaborative, Collective Culture

“...successful data visualization should be able to be understood by its intended audience from a position of personal insight and experience.”



Beyond an analytic tool, as a communication mechanism, data visualizations highlight the connections between data. However, used in isolation these are no more useful than are data silos, and we should not overlook the need to collaborate with subject matter experts and engage in group critiques before publishing new – or revised – visuals. Remember, in addition to a clear articulation of the data and insight, successful data visualization should be able to be understood by its intended audience from a position of personal insight and experience – this is the ability for the visualization to tell a meaningful story.

The benefits of collaboration have long been a part of organizational leadership strategies. Collaboration fosters continuous improvement and collective learning, and it provides an embedded feedback tool by which to elaborate and expand on ideas across the organization in a meaningful way. Organizations that have a genuine passion for data are more likely to cultivate a culture of collaboration to uncover more, better, and faster data correlations and reveal new answers and insights from their data – which upgrades a core competency to a competitive advantage. This is driven by the willingness to ask questions, engage in discussion, and approach data visualization in a way that furthers collaborative learning within the organization. Further, from a data management perspective, it's a well-accepted truth that for any analysis tool to be truly useful to an organization it must be updated constantly to account for changes, and it must be protected from falling out of sync when a number of collaborators access the same data. This, too, applies to the advent of data visualizations as unique information assets in the business.



The DVCC should provide an environment that fosters a collaborative culture and engages the organization as a community. Mechanisms for peer feedback – like the ability to leave comments, favorite or like designs, and share insights – provide the opportunity for users to identify and address issues with data visualizations before presenting them to the business, and to put

Develop a Collaborative, Collective Culture

the audience first in storytelling by crafting data narratives with goals in mind. This is also where collaboration provides a framework for quality – by giving users (and data owners) the opportunity to sanity check new visualizations. Ultimately, blending design and graphicacy allows users to engage in visual dialogue on discoveries and insights. Finally, leveraging mobile technologies to stay connected and collaborating across devices further engages users in immediate actions through alerts and notifications, too.

Tools for the DVCC

Like its three areas of focus, tools for the Data Visualization Competency Center™ can be broken down into three key tools that will support and enable the mission of the DVCC:

- Recommendation and collective learning engines that focus on use cases in the business to develop internal standards, best practices, and collaborative abilities
- Interconnected discovery environment to capture feedback and provide guided analytics to business analysts
- Monitoring environment to understand how users are using and interacting with visualization and visual discovery, and uncover educational and performance-optimizing opportunities

“The DVCC is a concept that completely resonates with what we see in the market and in our approach to making self-service data visualization core information assets – we are effectively becoming a DVCC.”

- Nathanael L’Heureux, VP of Product Management at Oversight Systems, Inc.

Conclusion

As self-service data visualization for visual discovery and insight continues to take an increasingly important seat at the BI table, data-driven organizations must be equipped with the resources they need to capitalize on the value and opportunities of data visualization while simultaneously mitigating the potential business risks associated with self-service. All visualization tools are not created equal, and many offer a bevy of abilities to click and create stunning data visualizations at will without guiding analytics and visual discovery. Likewise, business analysts or other data users and business application developers have varying degrees of visual design and data analysis skills and education, and can learn from a standardized set of best practice and design principles to facilitate the curation of meaningful, accurate visualizations. And, all users across the organization can benefit from an environment that facilitates sharing and collective learning while providing a review network to fine-tune newly created data visualizations before they are shared back to the business.



The Data Visualization Competency Center™ supports the self-service data visualization analyst. With its mission of providing education and guiding visual discovery in an environment of collective learning, the DVCC will help to insulate the business from data visualization risk while arming business users with a good sense of visual design and corporate design standards, an understanding of analytics and how to best visualize data, and a collaborative environment that fosters sharing, storytelling, and networking of visual assets across the organization. Ultimately the DVCC houses the essence of governed data visualization, but replaces the red tape of policies with a culture of education and collaboration.

About the Sponsor: GoodData

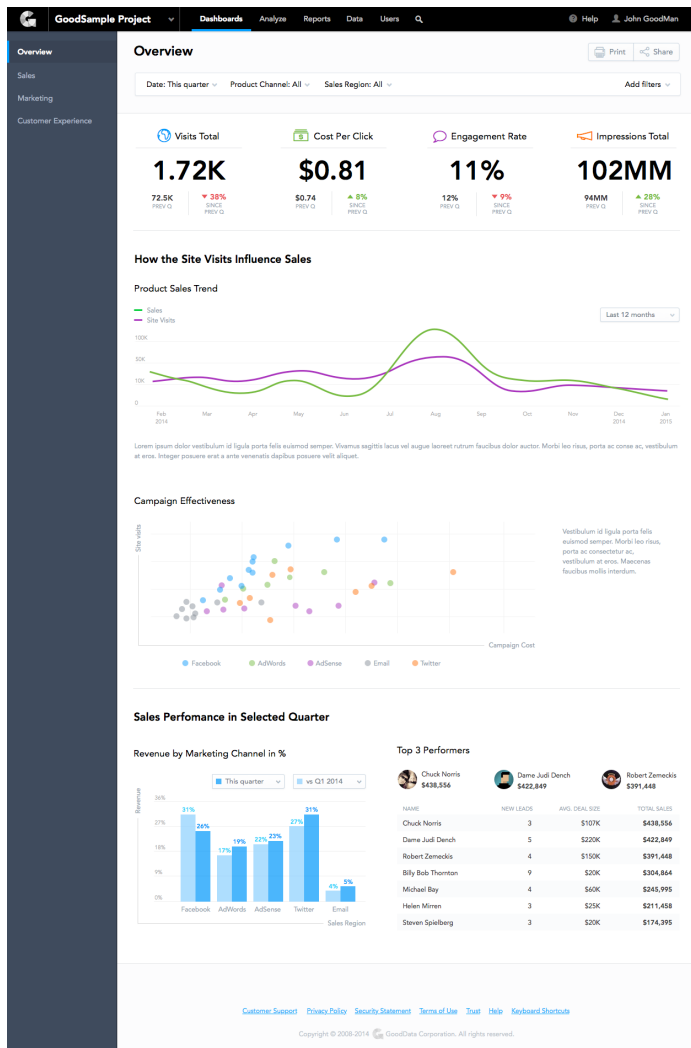


Figure 2. GoodData's dashboard aligns to the design principles core competency as discussed earlier in the research.

For industry leading Insights as a Service provider GoodData, an intuitive, self-service user experience in data visualization is table stakes. Instead, GoodData believes in going beyond traditional business intelligence to guide users to insights through the use of collective learning. Its propriety recommendation engine mines the accumulation of the company's experiences, industry best practices, and millions of user interactions to propel organizations to analytic maturity and business success. This is the heart of GoodData's Guided Analytics, a discovery interface with a drag and drop visualization canvas that recommends next steps through data as it recognizes trends at each phase of users' analysis.

A solution that is built to support the Data Visualization Competency Center™, GoodData offers four types of guided discovery to support non-technical users, and also allows for advanced configurations for ultimate flexibility and customization in both visual design and graphicacy technique. In either environment, GoodData supports embedded collaboration abilities, such as giving users the ability to 'favorite' or add comments on a shared data visualization – whether it is shared on the desktop or on a mobile device – and the opportunity for immediate action through alerts and offline-sharing capabilities. GoodData also provides its customers with GoodSuccess, a monitoring dashboard to provide insight into how users are utilizing the platform.

"The idea of being a DVCC is why we chose GoodData – it's quick and easy to build, and it also provides end-user flexibility to interact with a pre-built set of well-designed visualizations." – GoodData Customer

About the Author

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Lindy Ryan is the Research Director for Radiant Advisor's Data Discovery and Visualization practice and leads research and analyst activities in the confluence of data discovery, visualization, and data science from a business needs perspective.

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GoodData is an industry leading Insights as a Service provider, pushing beyond traditional BI by guiding users through the use of Collective Learning, much like popular B2C vendors do for recommending movies or next purchases. GoodData's Insights Network mines the accumulation of the company's experience, best practices, and the millions of user interactions to propel organizations to analytic maturity and business success.

Learn more about GoodData at the [blog](#) and [website](#) and follow [@gooddata](#) on Twitter.

About Radiant Advisors

Radiant Advisors is a leading strategic research and advisory firm that delivers innovative, cutting-edge research and thought-leadership to transform today's organizations into tomorrow's data-driven industry leaders.

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