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# DASHBOARDS THAT DELIVER

How to Design, Develop, and Deploy  
**Dashboards That Work**

WILEY

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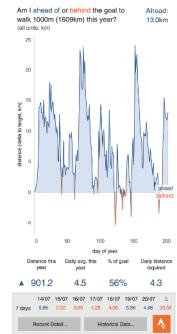
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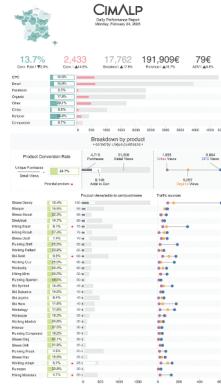
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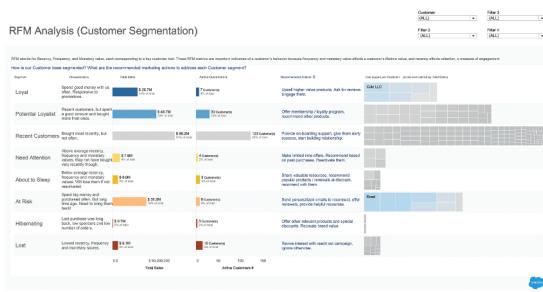
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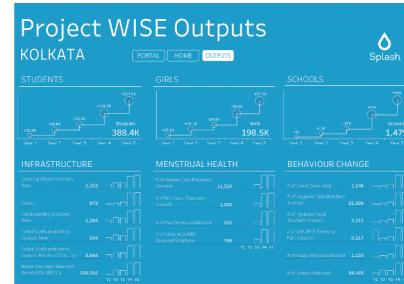
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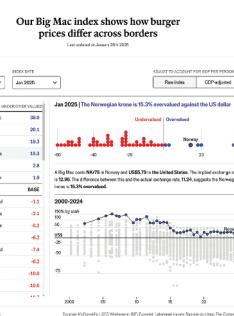
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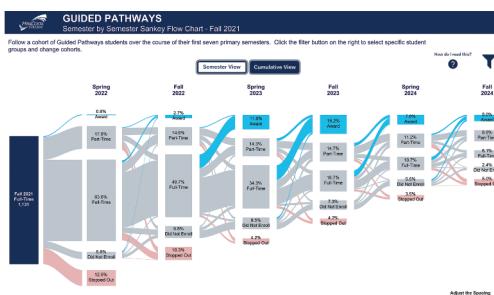
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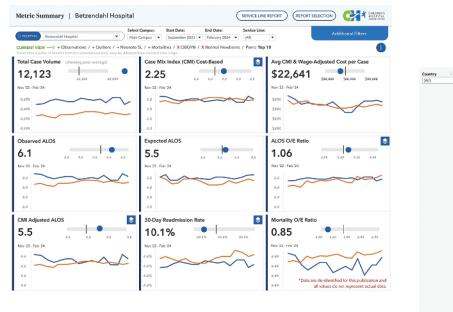
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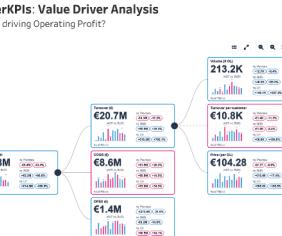
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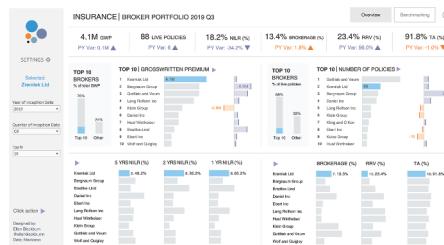
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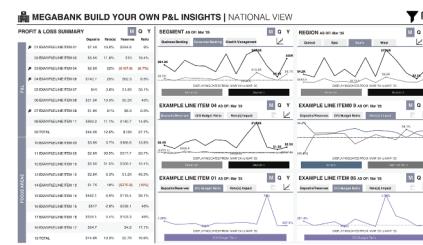
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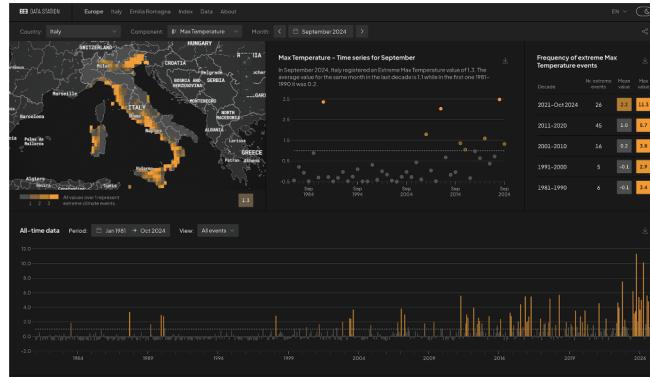
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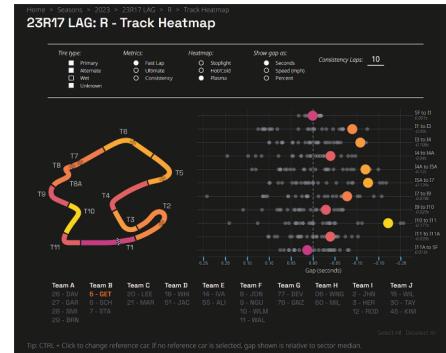
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## Chapter 1

# Dashboards Matter

*Steve Wexler,  
Jeffrey Shaffer,  
Andy Cotgreave, and  
Amanda Makulec*

## What Is a Dashboard?

If you were to ask 10 people who build dashboards and 10 people who use dashboards to define the term *dashboard*, you would probably get 20 different definitions.

Here's how we defined the term in *The Big Book of Dashboards*, and we'll continue to rely on this definition:

A dashboard is a visual display of data used to monitor conditions and/or facilitate understanding.

Yes, it's a broad definition. As with our first book, there will probably be some protests about it. Andy covers these probable objections in Chapter 30, "What the Heck Is a Dashboard?"

Nick Desbarats, author of *Practical Charts* and an expert in dashboard design, created a taxonomy of 13 different types of data displays that all fit under the umbrella term *dashboard*. Each one has a distinct use case and design.

He makes a good point. Think of a vehicle. Literally, imagine one right now. What did you come up with? Truck? Train? Sports car? Bus? Helicopter?

Dashboards are the same.

We don't think your stakeholders need to understand this dashboard taxonomy or the names of all the different display types. But you and your stakeholders must be in complete agreement as to what the deliverable you're creating will look like and how it's going to work.

We cover this alignment of expectations in depth in the discovery chapters (Chapters 5 and 6).

## Don't Be One of the 71% of People Who Fail

As we were writing this book, we conducted a survey of more than 450 dashboard creators and users and asked them this question:

To what degree do you agree with the statement "most dashboards fail."

71% indicated that they agree or strongly agree with this statement (Figure 1.1).

That's a lot of failure.

## 71% of People Surveyed Agree That Most Dashboards Fail

Strongly Agree | Agree | Disagree | Strongly Disagree

n=465 (+/- 4 point margin of error with 95% confidence level)

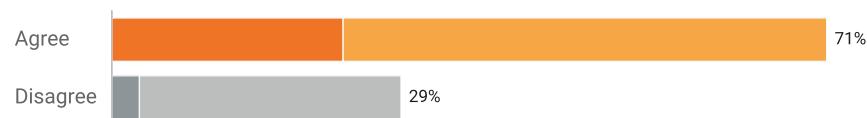


FIGURE 1.1 Percentage of people who agree or disagree that most dashboards fail.

### If There's So Much Failure, Why Create Dashboards?

If 71% of dashboard creators and users indicate that most dashboards fail, why bother to make them?

It's because companies that are effective at dashboarding outperform companies that aren't.

That was the finding of a 2022 MIT Sloan School of Management study, which stated

that companies with top-quartile dashboard effectiveness significantly outperformed bottom-quartile companies on five internal and five external measures of performance.<sup>1</sup>

This aligns with our own experiences. The four of us have each helped build dashboards that have completely transformed organizations for the better.

But just what do we mean by failure? In our survey, we said failure occurs when the intended users don't adopt the dashboard at all or stop using it before it fulfills its purpose.

There are many reasons why people won't use a dashboard. Maybe the charts were too confusing. Perhaps the metrics on the dashboard were of no interest to the stakeholders. Maybe the performance was too sluggish, or the data was obsolete. Maybe users didn't even know there was a dashboard.

Reflect a bit on the last dashboard project you worked on that didn't have the impact you hoped, and then answer the following questions:

- How closely did you work with your stakeholders? Were they only involved peripherally, or were they active collaborators?
- Did you agree ahead of time on a way to measure whether your dashboard was successful?

<sup>1</sup>dtdbook.com/link1

- Did you set up a system for modifying the dashboard as users' needs changed?
- Were the business leaders behind the project charismatic champions who pushed for widespread adoption?

If you answered *no* to any of these questions, then that beautiful dashboard you and your team created was probably weighted toward failure.

We don't want you to be part of the 71% that fail. That's why we wrote this book.

## But How?

"Know your audience."

"Design for your user."

"Get feedback early and often."

*Okay great, but how?*

If you create dashboards and occasionally read blogs, books, or LinkedIn carousels of well-intentioned advice around building better dashboards, you may have seen at least one of those recommendations.

No objection to those big ideas, but if you're new to dashboard design, how exactly are you supposed to do any of those things? And if you do find ways to *do them*, how do you know when you have enough feedback or have gone through enough iterations to click Publish on your new dashboard?

This book was born out of a gap in the dashboarding world. We love to admire dashboards that inspire an "ooh-ah" response for their elegance and spark an "ah-ha" by effectively answering a question. But we seldom dive into just how these dashboards get built. Books and blogs talk big picture ("Know your audience!") or get into the weeds of how to do *one thing*, often within a particular set of tools. But the list of resources that walk through, step-by-step, on how to deliver on these user-centered dashboards is...limited.

Filling that information gap – which will help you avoid dashboard failure – was another reason we wrote this book.

## The Big Questions We Address

We wrote our first book, *The Big Book of Dashboards*, to answer this question:

*Given this business predicament, what kind of dashboard should I create?*

We tackled this question by presenting 28 different scenarios, each with an accompanying dashboard that addressed the challenges of each scenario.

In *Dashboards That Deliver* we offer 15 new scenarios and address another critical question:

*How do I make sure people use the dashboards I create, and get value from them?*

For that question, we'll delve into the process of building dashboards. Part I will dive deep into a framework we've created based on our own combined 50+ years' experience, along with interviews

with dozens of people who build dashboards for organizations of all sizes. It's a process that addresses what you need to make dashboards that people will want to use, that will make people think differently, and that will make people act.

### Should You Read *The Big Book of Dashboards* First?

You do not have to read *The Big Book of Dashboards* before reading this book. In fact, you don't have to read it at all (although we certainly would like you to). While complementary, both books stand on their own.

However, if you are brand new to data visualization, then we recommend either reading the first section of *The Big Book of Dashboards* or reading one of the myriad primers on data visualization. We share a list in Chapter 8.

We wrote this book so that you can learn from our successes and failures as you embark on developing new dashboards and learn from other experts across the field who contributed their thoughts in our interviews and dashboard scenarios.

If you're a dashboard developer, we know you'll find practical advice over the next 34 chapters around how to understand your audience, fail fast, and deliver a great product. We also encourage you to use this framework in your conversations with

your stakeholders around ways to build connections between the data team and dashboard users.

If you're a data leader or team member, we hope you'll find ways to take a step back, take stock of your current delivery process, and think through how some of our ideas can help you deliver on the promise of impact every company aspires to with their data.

We all benefit from tools that help us analyze data more efficiently. Whether you call them dashboards, data apps, or "algorithmic cockpits" as we saw referenced by one AI company, they still have the potential to transform how we use data in our work.

### This Book Is Tool Agnostic

The book is agnostic about what tools you use to create dashboards. You won't find step-by-step instructions about how to make anything. This goes for artificial intelligence (AI) tools as well. As we'll explore in Chapter 32, AI will play a big part in dashboard design, beyond exploratory data analysis, and its capabilities are changing rapidly.

Will AI replace many if not all the human factors that go into making a dashboard succeed? We'd never say never, but at the time of this writing you still need humans who know what good looks like to direct and drive the decisions. So, no matter the tool and no matter your reliance on, or avoidance of, AI, we'll show you what you should build, why you should build it, and the process that should go into designing, developing, and deploying it.

### Downloadable Dashboards and Additional Resources

For downloadable dashboards, additional examples, information about workshops, and other resources, please visit [DashboardsThatDeliver.com](http://DashboardsThatDeliver.com).

### A Path Toward Fewer Failures and More Successes

The four of us have probably failed more than many of you in designing and launching different dashboards, and through those failures, we've refined

and improved our own approaches. We've learned a lot from those failures, and we want to do what we can to help you avoid the missteps and failures we and many other practitioners have made.

In *Dashboards That Deliver*, we give you scenarios and coping-with-the-real-world essays. But more importantly, we arm you with a comprehensive, comprehensible, and customizable process – a process that will help you succeed.

## Chapter 2

# The Dashboards That Deliver Framework

*Amanda Makulec and  
Andy Cotgreave*

## Why Have a Framework?

You're on vacation, in your rental car, and it's time to take the family home. What do you do? Ask Google Maps for directions back to the airport, stopping at a gas station on the way? Or pull out and drive in whatever direction you fancy?

We suspect most of you would choose the GPS option. You can plan your time, set expectations with your kids on when they'll get a break, everyone in the car knows how far you've got to go. If you need to find a rest area with your favorite fast-food restaurant on the way, you can make the change en route.

You're a dashboard developer, and someone's asked you for a dashboard. What do you do? Create a shared plan, with checkpoints along the way? Or just dive into your dashboard development tool and build whatever takes your fancy?

We hope that after reading this book, you'll choose the first option.

As our research shows, a lot of dashboards fail. Too often it's because dashboards are spun up with chart choices based on the preferences of the creator, rather than the user, who feels like an outsider in the process rather than being part of the team. Without a framework, the team doesn't have a clear idea of where they're going, nor can anyone see how close they are to a finished product.

Based on our experiences and research for this book, we've defined a framework you can follow to

build dashboards that deliver. Thinking in phases from the framework will help you:

- Build and maintain momentum throughout your dashboard's development, working toward success criteria for a dashboard.
- Share and delegate tasks among your team while setting expectations with your users.
- Build a culture and shared language of data and dashboards that helps people use data for decision-making.

## Our Guiding Principles

In developing our framework for *Dashboards That Deliver*, we identified three guiding principles that focus on mindset, not technology:

1. **Adaptability and flexibility.** Our framework must be adaptable to different team sizes, timelines, and business contexts. You should be able to borrow and adjust the parts that serve your needs.
2. **Dashboards as applications.** Building a dashboard has many similarities to software development, particularly as dashboards include increasingly sophisticated features. The framework should use established techniques from that world, including Agile and user-centric design methodologies.
3. **Improvement over perfection.** You don't need to overhaul your team or process to improve dashboard development within an organization. Don't let the pursuit of an ideal process stop you from using parts of the framework to make incremental improvements to your work.

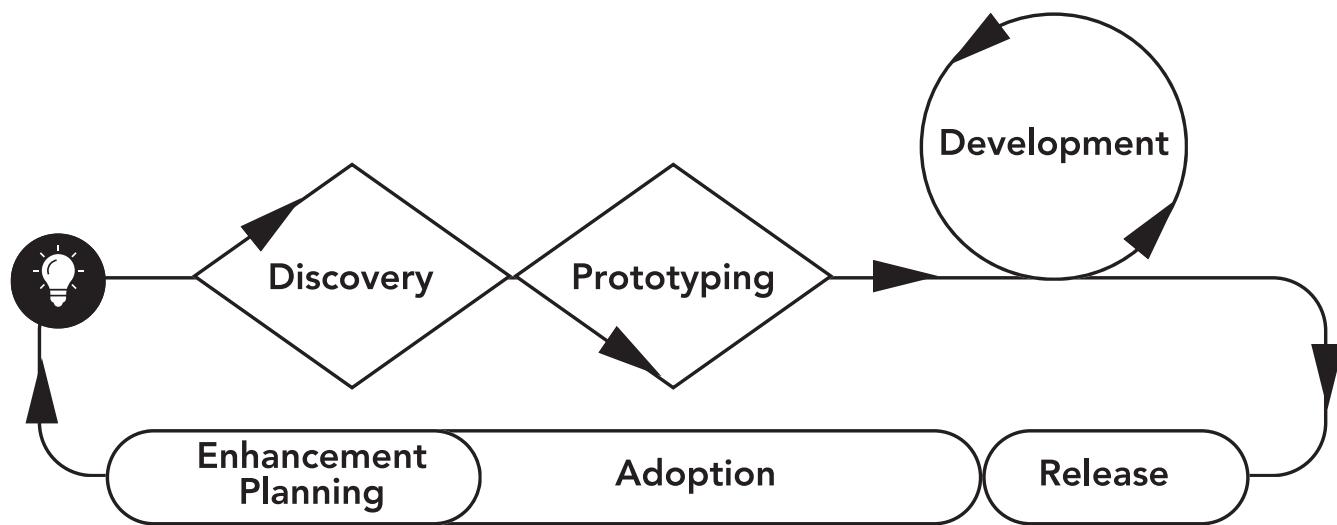


FIGURE 2.1 Dashboards that Deliver framework.

## The Dashboards That Deliver Framework

Our framework (Figure 2.1) has seven phases:

1. **Spark:** Recognize the catalyst for building the dashboard.
2. **Discovery:** Define the audience and purpose for building the dashboard through engagement with users and mapping the specific use cases for the dashboard. Clearly define the presentation medium, like a laptop screen, a PDF, tablet, or even a 30-foot long display. Then, be specific in breaking down big goals into specific requirements. Define what success looks like for the launch of this dashboard.
3. **Prototyping:** Brainstorm different design approaches to address user needs, including

developing early design concepts and finalizing the mockup. Get feedback from users before moving to development.

4. **Development and User Testing:** Build your design in your dashboarding tool. Get usability feedback from users via dedicated feedback loops.
5. **Release:** Launch the dashboard for end users, with a schedule for data refreshes and maintenance.
6. **Adoption:** Create a training plan and promote continued adoption. Solicit user feedback and monitor usage.
7. **Managing Enhancements:** Define the plan for managing enhancements and set boundaries around how often you will make updates.

The amount of time you spend in each phase will vary depending on complexity and your team size. You may spend time iterating in one phase or running through the whole cycle multiple times over the life of a dashboard.

But don't get stuck in one phase waiting for three levels of sign-off just to check a box stating you got the requirements "right": you need just enough discovery to avoid going off in the wrong direction, just enough prototyping to get something real into the users' hands, and continuous ways to get feedback from your users.

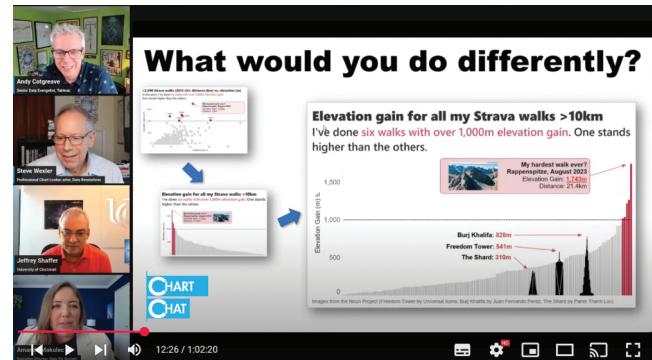
While we cannot guarantee success, we want to arm you with an approach that will greatly reduce the likelihood of failure.

## A Practical Example: A Chart Chat Dashboard

In Part 2 – Scenarios we'll explore 15 different dashboards and how they applied the framework.

Instead of waiting until the end of this section to dive into a practical example, let's start with a hypothetical case study of how we would apply our own framework if we were co-designing a dashboard.

Since 2018, we've hosted a monthly livestream called Chart Chat (Figure 2.2). Like all good content creators, we want analytics! We need a consolidated view of our data, rather than having to scrabble around all the platforms (YouTube, Eventbrite, LinkedIn, etc.) to get an idea of what's going on.



**FIGURE 2.2** Chart Chat is our monthly video series about bringing data to life.

Sounds like a good opportunity for a dashboard, right?

Let's walk through what following our framework could look like in practice:

**Spark:** Each month we look for different ad hoc analytics on Chart Chat from the previous month, posting quick updates in our shared Slack channels or flagging on planning calls. Because we each manage different parts of Chart Chat – Steve needs to pull registration data, Jeff pulls YouTube analytics, Andy explores different ways to market and promote, and Amanda tallies data from Streamyard – there was no combined view. We decided we needed a dashboard to consolidate our data.

**Discovery:** We start by thinking through the analytics tasks we will use the dashboard for, rather than diving directly into what the available data tables will look like. Based on our analytics needs,

we map out two personas (Figure 2.3) who represent different sets of needs:

- The Planner is responsible for promoting registrations.
- The Optimizer identifies popular topics and segment types from previous episodes.

Defining personas allows us to make the needs and pain points a bit less personal. Plus, each of

us may step into either role, depending on the month. For each persona, we can brainstorm more detailed analytical questions and requirements (Figure 2.4).

The Planner needs data on traffic sources to our registration page and registration trends to assess if we're growing our audience. The Optimizer needs to know which type of content is best performing. For example, do episodes with guests do better than when it's just the four of us?

We define success during this phase. First, simply being able to see the data in one place is a success, as it saves much wasted time each month collecting the data from multiple sites. A second, longer-term measure, will be an increase in registrations and views based on insights from the dashboard.

**Prototyping:** Considering the two users and their needs, we map out a wireframe with a three-page structure:

1. **Summary Metrics.** This page combines data from across the watch funnel (i.e., from registrations to live attendees to post-show on-demand views)
2. **Registration Trends.** This is a detailed view of registration trends and details for each episode.
3. **YouTube and LinkedIn Live Analytics.** These show details of views, watch time, engagement, etc.

The figure consists of two light blue rectangular cards, one above the other. Each card features a circular profile icon on the left containing a white line-art illustration of a person's head. To the right of the icon, the persona's name is written in a bold, sans-serif font. Below the name is a block of text describing the persona's needs and goals. The top card is for 'Yuha The Optimizer' and the bottom card is for 'Amy The Planner'.

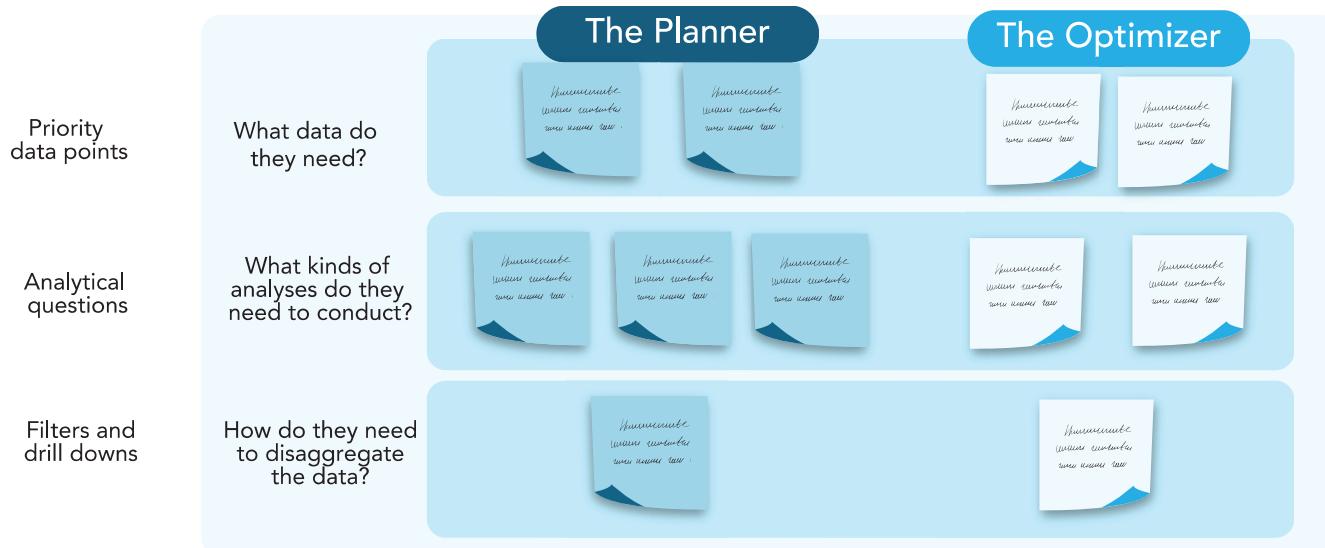
**Yuha The Optimizer**

As a content creator  
I need to see content performance  
In order to grow engagement

**Amy The Planner**

As a livestream planner  
I need to track registrations  
In order to customise social campaigns

FIGURE 2.3 Persona cards for our Chart Chat dashboard.



**FIGURE 2.4** Mapping user needs across two personas.

We need to iterate with the mockup multiple times and construct a dataset that suits our needs. We could leverage APIs, Gen AI tools, and more to get the data into the shape we need. Depending on how the ideas shape up, we may also need to add metadata for episodes such as if there was a guest.

We go back and forth a few times on the mockups, debating the necessity of including the data on views by segment, and decide that it's likely not going to be terribly insightful to see that level of detail. We do, however, care how long people stick around within each episode. We also realize we need data on the performance of social media

promotions. Figure 2.5 shows the progression of the first page of the dashboard.

**Development and User Testing:** At this point we have mockup for each page of the dashboard. The sketches have key performance indicators, specific chart types, annotations, and design directions. Now we can map out who has access to and can source the different data we need – including considering where we can automate that data refresh and what would need to be done manually. We agree to hand off the development to Andy, knowing that the debates and iteration with the mockup have us in a good place.

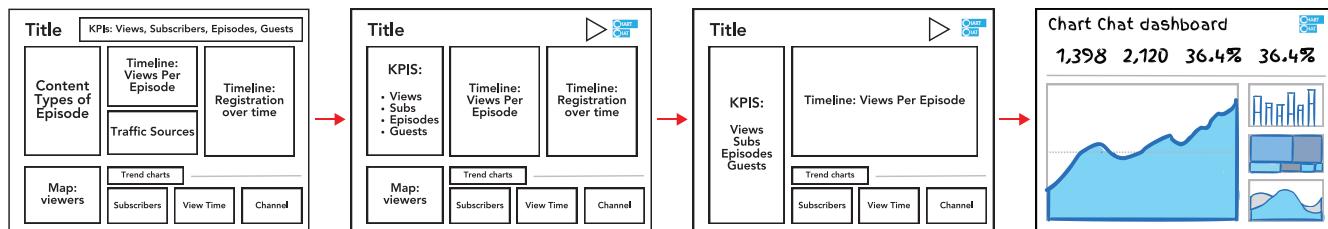


FIGURE 2.5 A progression from wireframe to prototype for the main page of the dashboard.

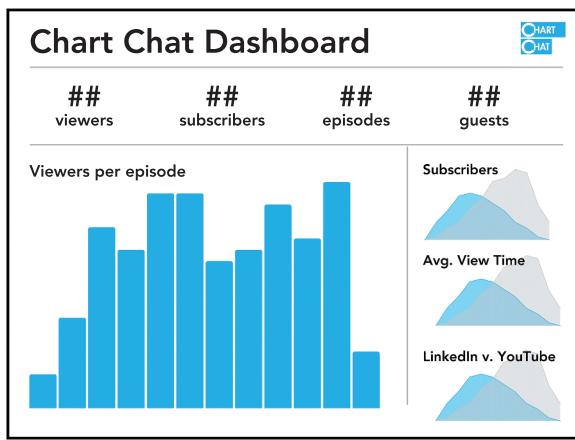


FIGURE 2.6 The final look for our main page.

**Release:** Once the dashboard is developed and tested, including quality assurance checks for accuracy, we agree on a cadence for refreshing the data and consolidating documentation and notes. See Figure 2.6.

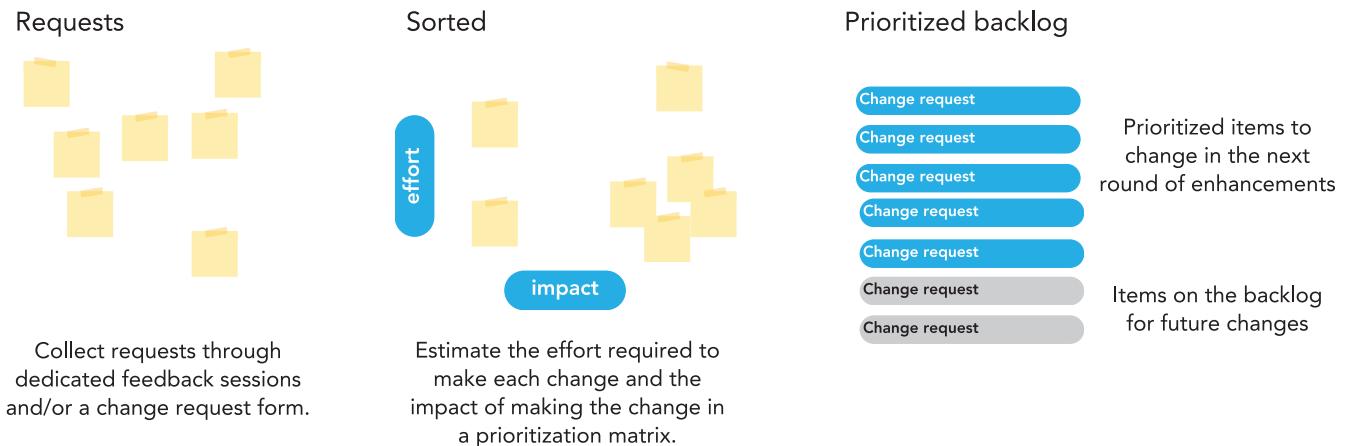
**Adoption:** Since we're our own primary users, adoption is more straightforward than in some environments. We can share the dashboard over email or Slack. We'll need to make sure to measure something related to how it gets used to inform decisions,

and identify a period – perhaps three months, since the livestream is monthly – at which point we'll evaluate if we're finding the dashboard useful and if we should continue.

**Managing Enhancements:** Luckily, we're all pretty adept at using the same tools, so we have some flexibility on who will make updates. It's important we set up a shared space to log ideas for changes, particularly as we evolve new use cases for the dashboard, like informing a new sponsorship request. Then, we can estimate the effort and impact each request will take and create our prioritized backlog of changes, as illustrated in Figure 2.7. Here, we're adopting the language from Agile with a backlog referring to a central list of tasks to complete, not an indication that you're behind on completing work.

We decide to make changes every three months and pull up the dashboard on our prep call each month to check how the numbers are faring.

Following our framework, we'd have a dashboard tracking the success of Chart Chat. Had we not used



**FIGURE 2.7** Steps in compiling a backlog of changes to implement.

our framework, how would it have gone? We'd probably each build something in isolation, focusing on our own personal needs, rather than those of the group. We may have gotten a great Chart Chat episode out of sharing and critiquing our different concepts, but it wouldn't have been nearly as focused or efficient.

Finalizing a single dashboard without a unified goal would be a nightmare. If you've ever seen an episode of Chart Chat, you'll know that we are all willing to debate (argue over?) every tiny detail of every chart. Apply that to a dashboard with no clear goal, and we'd be arguing forever. Plus, any attempt to merge different designs would probably have failed due to different goals, designs, and data models.

Using the framework helps us, and will help you, maintain a focus on the goals of your users.

## Methodologies That Inspired Our Framework

Our approach isn't an earth-shattering new approach to dashboard design. Instead, it looks to the most relevant principles from software development, design, and our own experiences, combining tactics and approaches that we've seen work.

We make specific references to three methods in our framework: Agile, user-centered design, and the design double diamond. Those methodologies all value user engagement, feedback, and rapid prototyping (to enable quick feedback from users).

Let's unpack those three methods in a bit more detail, including how they informed this book.

## Agile Software Development

Software developers have dealt with plenty of the same issues we have as dashboard developers. They learned through experience that hypothesizing about what a customer wants, going behind closed doors, building a solution, and then launching a final product often didn't work. Developers shifted away from stage-gated, waterfall processes toward a method that prioritizes small increments and continuous improvement.

**Agile** is a mindset centered on breaking projects down into smaller pieces guided by a shared set of values. There are four core tenets, summarized in Figure 2.8.

Agile values these...

more than these...

- |                                     |   |                             |
|-------------------------------------|---|-----------------------------|
| <b>Individuals and interactions</b> | > | <b>Processes and tools</b>  |
| <b>Working code</b>                 | > | <b>Documentation</b>        |
| <b>Customer collaborations</b>      | > | <b>Contract negotiation</b> |
| <b>Responding to change</b>         | > | <b>Following a plan</b>     |

FIGURE 2.8 List of values from the Agile Manifesto.

This isn't to say the latter items *don't* have value but instead that they are less important. Each tenet emphasizes the benefit of *collaboration with users* and a *working product* – tenets that are as valuable for dashboard development as they are for software.

Practically, Agile teams break down big projects into smaller pieces, delivered incrementally. Agile ways of working include clear team roles, defined collaboration approaches, and prioritizing making work visible often through a shared backlog and routine retrospectives.

If you've had some experience with Agile, you've likely heard references to scrum and kanban – both specific methods for implementing an Agile approach. Scrum defines a series of several phases of work, commonly known as *sprints*, with a focus and commitment to tight feedback cycles and continuous improvement. Kanban focuses on having a tightly managed backlog of tasks grouped by status – backlog, in-progress (WIP), and done – where teams work to minimize WIP or the number of WIP tasks at a given point in time. Instead, teams focus on closing out tasks to deliver incremental parts of the final product.

We've found value in our own projects adapting some of these ways of working to dashboards. Getting into the weeds of what methods to use when is

beyond the scope of this book though; while we'll share some broad recommendations around tricks and tools that could be useful in adopting this framework in Chapter 3, part of the work of a dashboard designer is to set your working norms with your team.

## User-Centered Design

**User-centered design** focuses on empathizing with and understanding your audience. Applied to dashboards, the approach gives developers the tools to dig deeply to understand the challenges users face, and how your dashboard will solve them.

An example is the design thinking process defined by d.school, a design institute at Stanford University. It defines five phases, as outlined in Figure 2.9 and covered in the following chapters.

Many of the techniques we outline Chapter 6, "Discovery Techniques," are rooted in user-centered design, which has a deep toolbox of methods for understanding user needs. It helps to have more creative approaches than just asking, "What do you want us to put on this dashboard?" But design thinking is more than a set of techniques; it's a method rooted in continuous engagement with and feedback from our users.

## The Design Double Diamond

Also borrowing from the world of design thinking, both discovery and prototyping are framed as a pair of diamonds in our framework – a reference to the "double diamond" framework popularized by the British Design Council in 2005. The model focuses on the principles of divergence

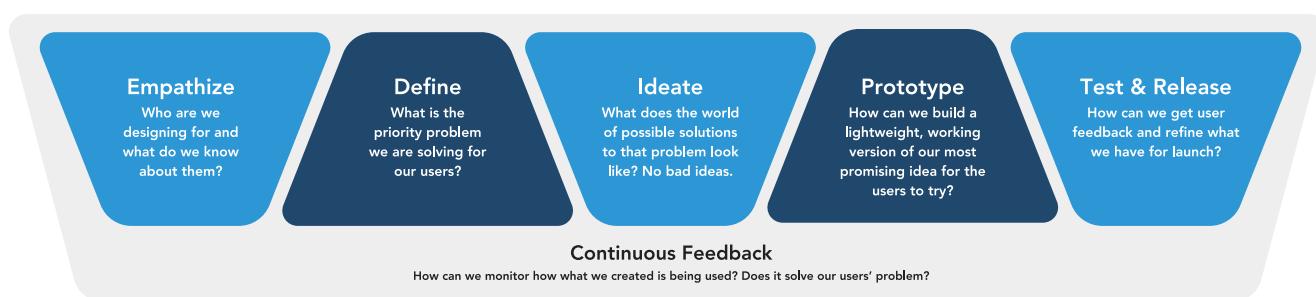
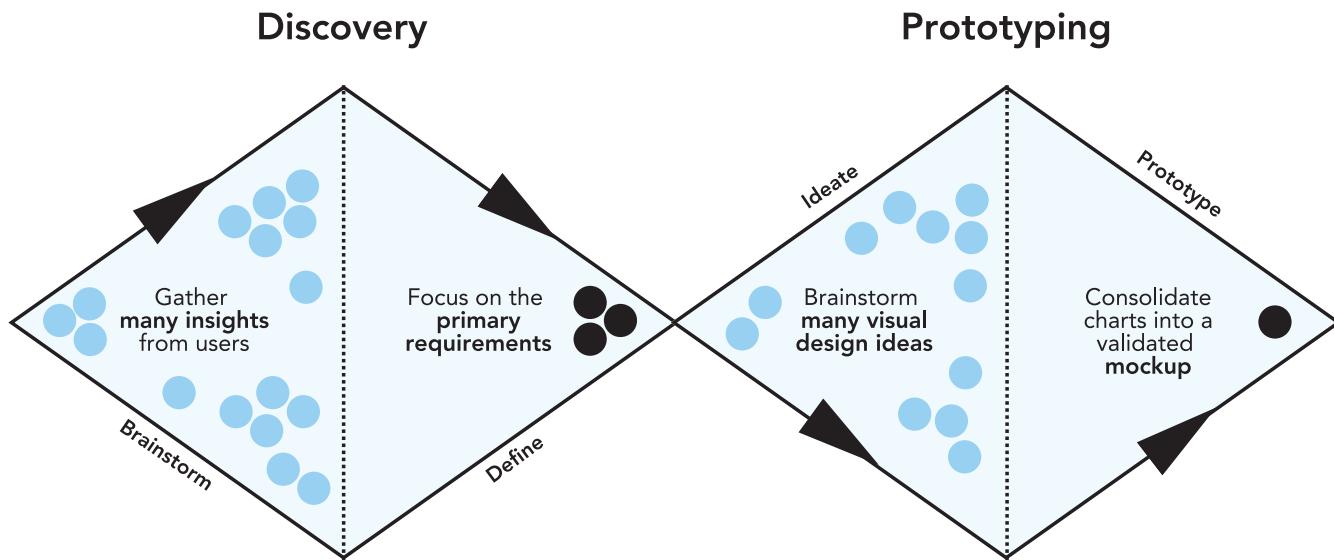


FIGURE 2.9 Process and feedback look within a user-centered design approach.



**FIGURE 2.10** Design double diamond framework for dashboard discovery (gathering insights and focusing on priority requirements) and later, prototyping adapted to dashboard development.

(brainstorming many possible problems and solutions) and convergence (then narrowing into focus on solving a specific problem for a user in a specific way).

You'll use this same approach in your dashboard process: gathering many insights, trying out lots of ideas, and then narrowing down to a final prototype, as illustrated in Figure 2.10.

## Find Out More About Development Methodologies

**AGILE**'s core goal is to get working software in the hands of users. The 4-point Agile Manifesto and further 12 principles are useful for dashboard developers to understand. You can find full details of Agile at [dtdbook.com/link2](http://dtdbook.com/link2).

Stanford's d.school has a User-Centered Design toolkit that provides details on

how each stage of their process works. See [dtdbook.com/link3](http://dtdbook.com/link3).

The British Design Council's Double Diamond is a visual representation of the steps taken in design projects. You can find more resources at [dtdbook.com/link4](http://dtdbook.com/link4).

# Chapter 19

## Children's Hospital Association Dashboard

*Lindsay Betzendahl with Kathy Rowell and Dan Benevento from HealthDataViz, a Sellers Dorsey solution*

**Organization:** NACHRI, known as the Children's Hospital Association (CHA).

**How This Dashboard Delivers:** Leaders can monitor their KPIs over time and compare their performance with other hospitals, allowing them to quickly identify areas where they need to take action, consolidating information from across departments into one consolidated suite of dashboards.

**Audience:** Executives and analysts at children's hospitals across the United States and Children's Hospital Association staff.

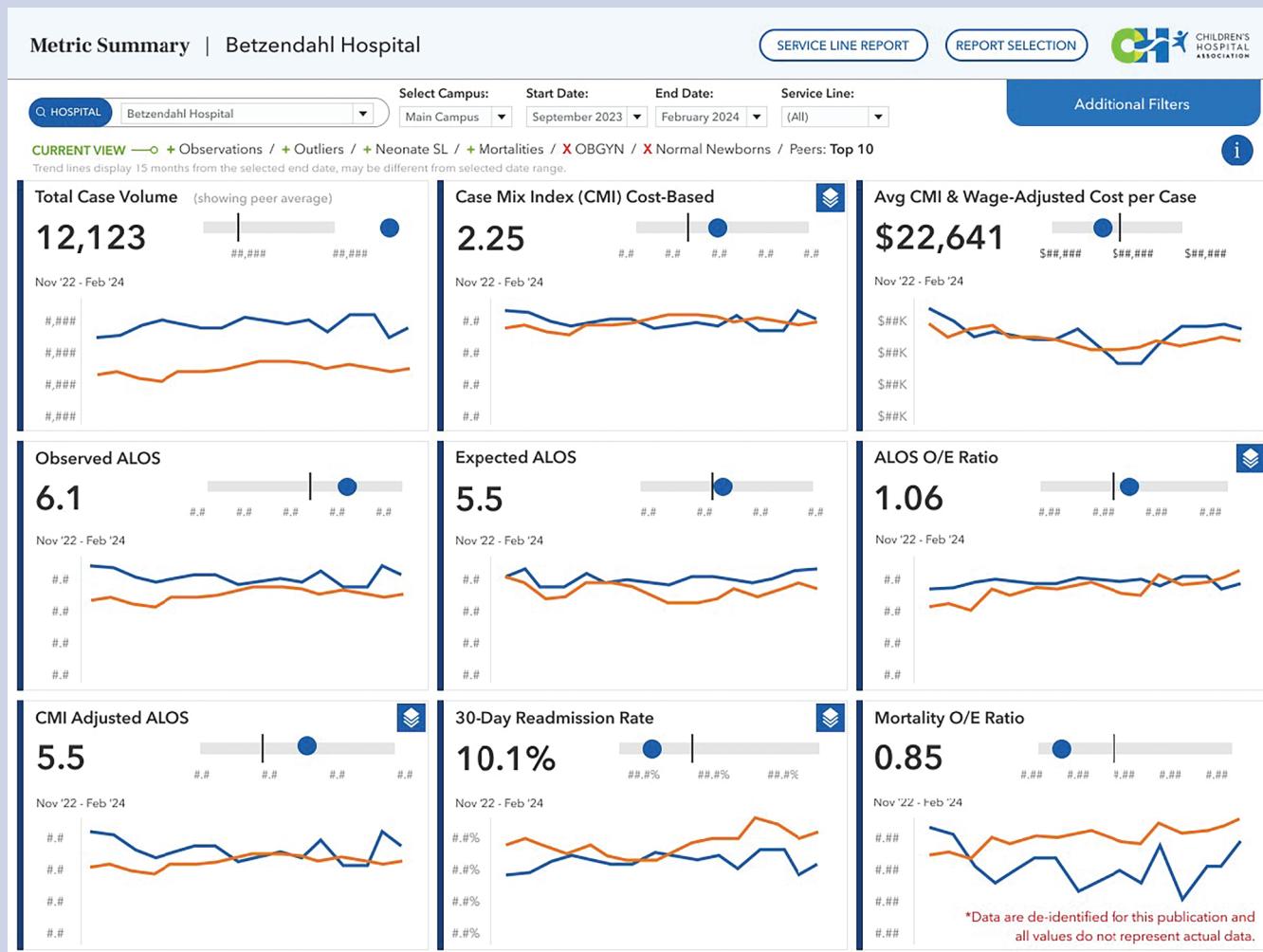
**Team:** Lindsay Betzendahl with Kathy Rowell and Dan Benevento from HealthDataViz, a Sellers Dorsey solution.

**Tools:** Tableau and Figma.

**Timeline:** 15 months.

**Note:** All values in the dashboard are anonymized and do not represent real values.

**Chapter Author:** Amanda Makulec



Children's Hospital Association summary metrics dashboard (image property of CHA with sample data for demonstration only).

## Big Picture

You are an administrator at a hospital that is a member of the Children's Hospital Association (CHA), which includes 200 children's hospitals, health systems, and related organizations that care for children in their communities and beyond. One of the services provided by the CHA is analytics, including benchmarking performance compared to peer institutions.

While many analytic tools lump together general (adult) and pediatric facilities, the CHA's offering only includes data for children's hospitals. This means administrators can better assess performance relative to peer institutions and focus solely on data specific to children's care and medical treatment. The suite of dashboards includes 21 different reports, providing a comprehensive snapshot of hospital performance.

## Specifics

You need to:

- Quickly access KPIs from across departments
- Compare how one hospital system is performing relative to peers of similar size or with other similar characteristics
- Analyze performance by specific disease area to assess what areas may be most impacting overall performance on health system KPIs

## Related Scenarios

- You are a national sales manager for a large retail chain and need to compare store performance across a group of key performance indicators.

- You are a school district administrator monitoring KPIs across the elementary schools in your district with the aim of identifying high-performing schools, which may have model programs for other schools to adopt.

## How People Use the Dashboard

The suite of dashboards includes 21 separate views addressing a wide range of user needs. Let's walk through the two summary views that users encounter first: the Key Opportunities dashboard and the Metric Summary dashboard.

### Key Opportunities Dashboard

The Key Opportunities view for executives gives a snapshot of four key performance indicators. For each, we see the most recent value, trends over time, and a comparison with peer hospitals (Figure 19.1).

This quick reference dashboard also orients the user with:

1. *Filters* at the top of the page prompt users to narrow the view to their hospital system, campus, and date range.
2. *Text components* provide breadcrumbs highlighting what has been included/excluded in the current display, along with summary context about the number and type of patients in the report based on selections.
3. *Four cards* with the same repeating structure, which provide KPI values, comparisons to peer median and percentile range (gray bar, showing

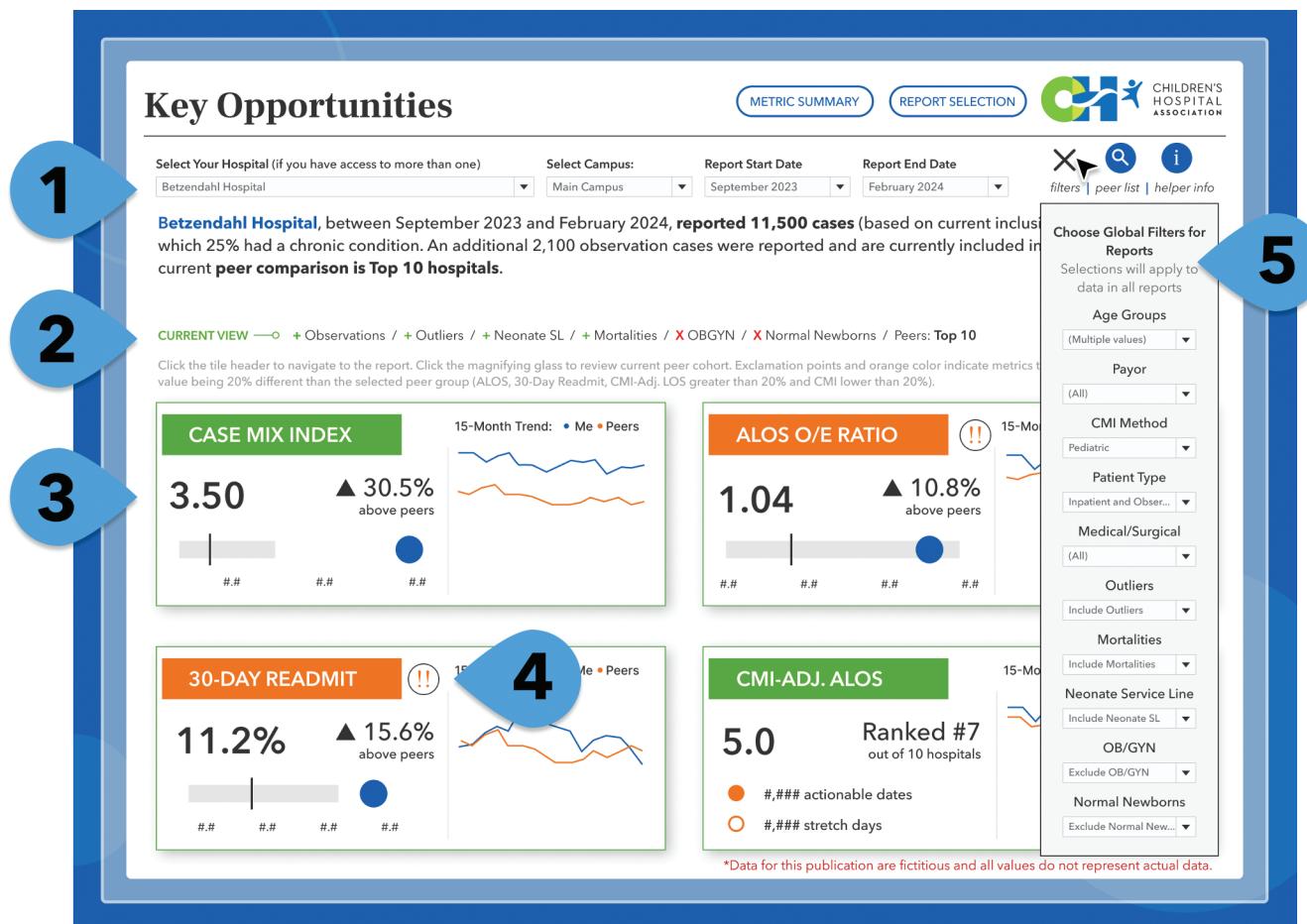


FIGURE 19.1 Key Opportunities dashboard (image property of CHA with sample data for demonstration only).

a percentile range (e.g., 10th–90th), vertical line showing the median, and blue dot, showing the selected hospital's data), and trends.

4. Color-coded metric names and an alert icon to focus the user's attention, alerting them to where there may be cause for concern.
5. A collapsible filter menu to apply across all views in the dashboard minimizes visual clutter

while still maintaining the availability of the global filters.

In addition, the dashboard has buttons that let the user navigate to other pages, such as the Metric Summary dashboard (discussed next).

The page also serves as the entry to the suite of reports where hospital users can initially set important global filters and define peer comparisons.

## Metric Summary Dashboard

The Metric Summary dashboard expands on the first view with metrics pediatric hospitals commonly monitor (Figure 19.2).

The display includes summary values compared with peers (the floating bar chart) and 15-month trends. The design mirrors the setup on the Key

Opportunities dashboard; users learn how to read a "card" for a metric once and use that mental model throughout the dashboard (Figure 19.3).

The cards on the Metrics Summary include multiple features to aid the user:

1. Filters placed in the same location across the top as on the previous screen.

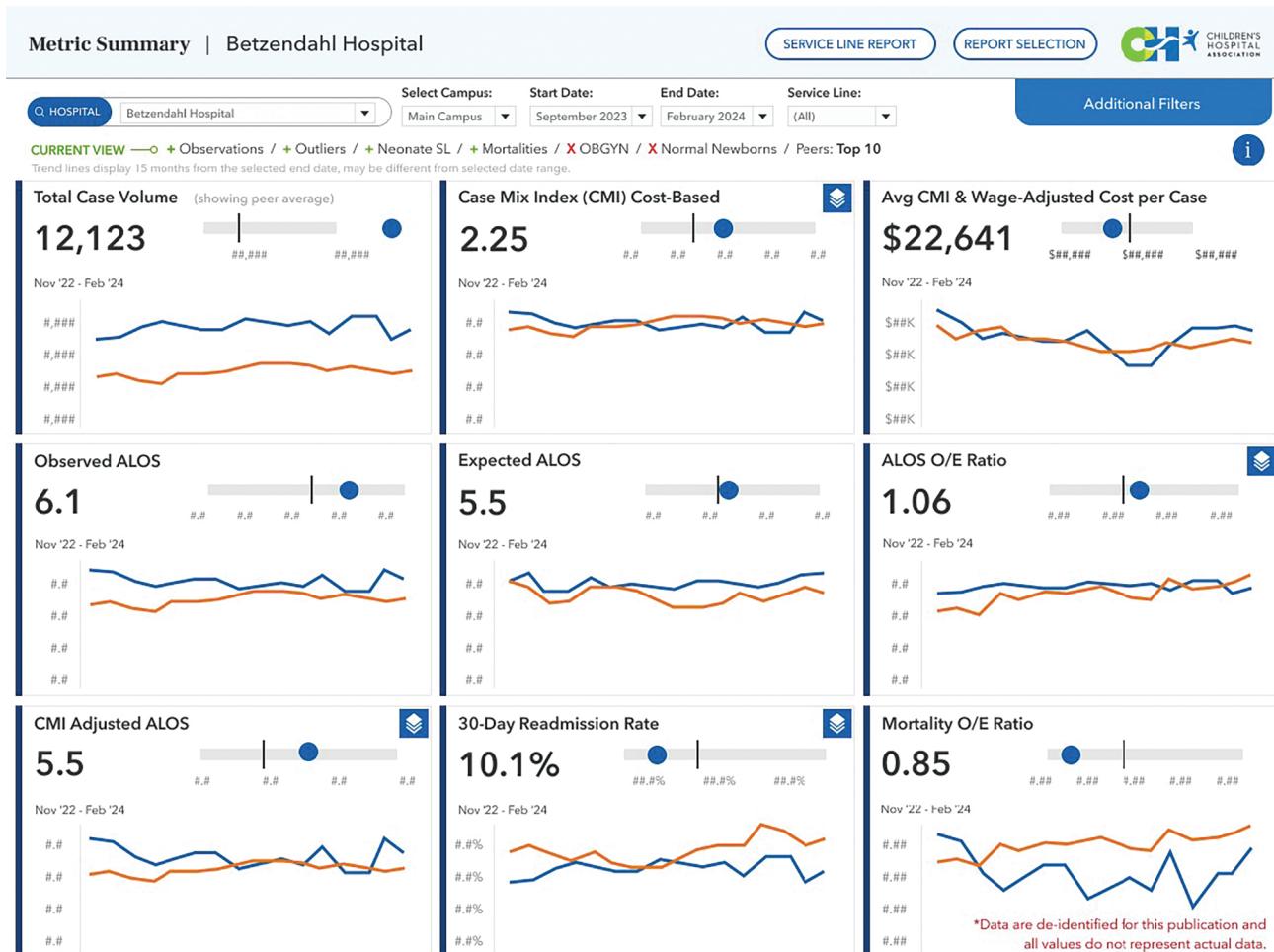
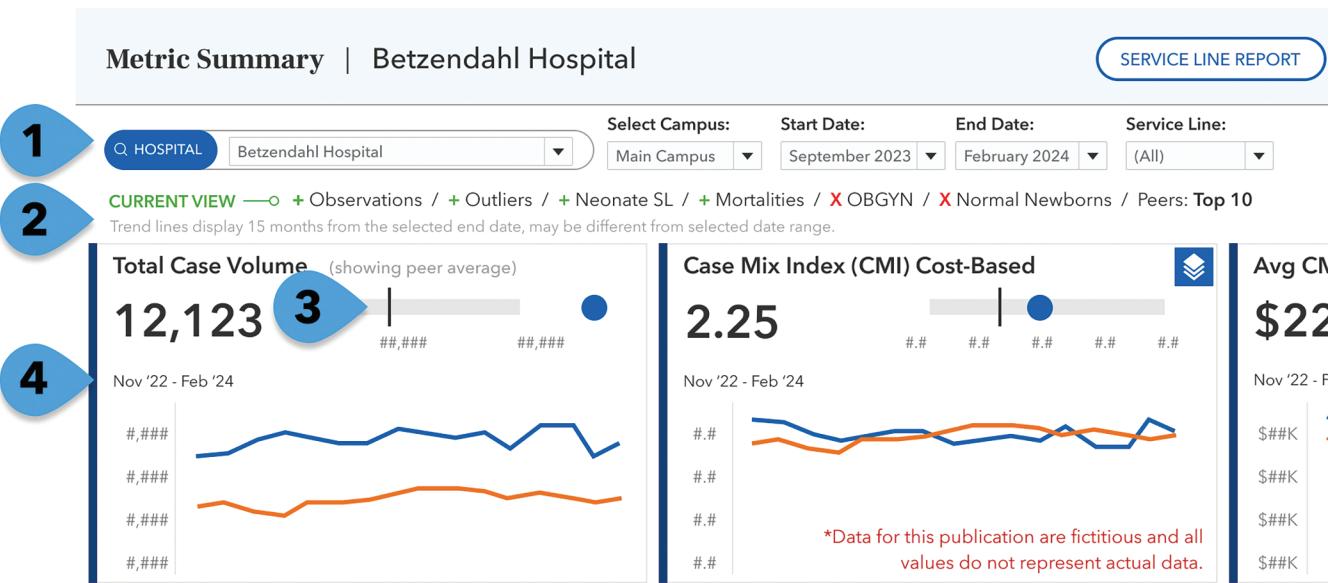


FIGURE 19.2 Metric Summary dashboard (image property of CHA with sample data for demonstration only).



**FIGURE 19.3** Snip from the Metric Summary dashboard highlighting specific components (image property of CHA with sample data for demonstration only).

2. *Breadcrumbs* reminding users of the filter selections applied to the view, including double-encoded icons that show both what is included (green plus sign) and what was excluded (red X).
3. *Benchmarking chart* with clearly labeled value for peer average to compare against as a reference line and against a percentile range (gray bar) for peer hospitals (e.g., 10th–90th)
4. *Time period* showing the selected start and end dates noted in the filters and the rolling 15-month period for the trends above the line chart, as the period for the trend chart is fixed.

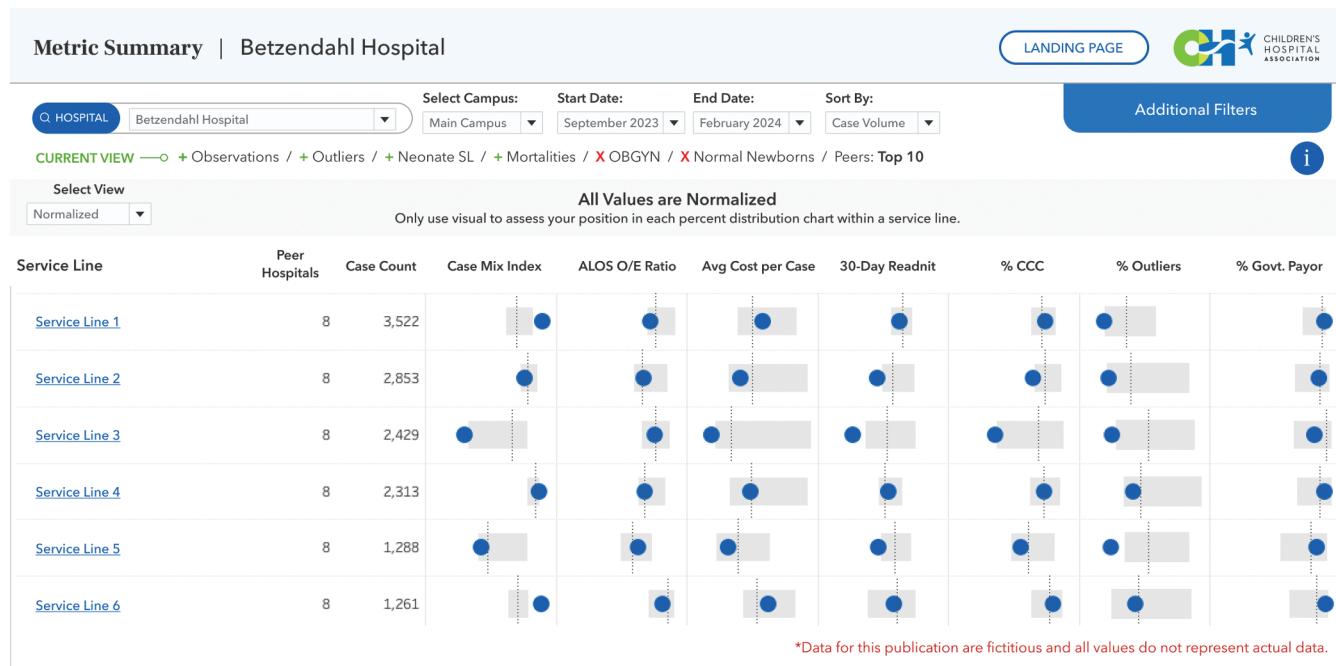
Each of these seemingly small interactive elements ensures users are clear on what data is being included in the view. These clues are particularly

important since global filters that are applied on the Key Opportunities page persist throughout the dashboard.

## Detailed Views

From the overview dashboards, users can drill into specific metrics across 19 additional dashboards. The service line selection comparison dashboard is one example that drills into data to answer: “How am I doing compared to another group?”

The source data is based on individual patient encounters each mapped to a primary service line like respiratory care. Using the dashboard, administrators can identify service lines with the greatest opportunity to improve hospital performance.



**FIGURE 19.4** Service Line comparison view (image property of CHA with sample data and service lines for demonstration only).

These data dense displays provide the details needed for actionable insights. The service line comparison (Figure 19.4) uses the structure from the KPI cards with gray bars showing a comparison range and a blue dot for the selected hospital, scaled across multiple metrics and service lines. In addition, the matrix includes the number of peer hospitals analyzed for that service line, represented in the gray bar, and the total case count for the service line for context.

A toggle allows users to view the data either normalized or as a numeric view. Some of the metrics have much larger ranges than the others, so plotting them all on a common axis would obscure the view.

Normalizing the metrics ensures comparisons can be made across all metrics simultaneously.

While we don't showcase all the views within the dashboard, the other detailed pages come back to the same question as the service line view: How are you doing compared with your peers?

## Why This Works

### Big Picture First, Zoom and Filter, Details on Demand

One of the design team's key goals was not to overwhelm the user when they first open the dashboard. Instead, they used HealthDataViz's Guided Analytic

Framework to create layers of detail and enable exploration.

Navigational flow and drill-down capabilities ensure users can continue to ask questions of the data and easily move into deeper analyses after reviewing the KPI cards. This follows Ben Shneiderman's mantra for dashboard design: big picture first, then zoom and filter, then details on demand. While the KPI cards in the primary views may seem simple on the surface, they act as a meaningful entry point into the analysis.

### Always Centering the User

Across the dashboard, the selected hospital is often compared with peers or a custom comparison group.

Let's look back at the Service Line comparison, which the users love (Figure 19.4). Each of the design decisions was rooted in a specific user need or preference—even one that might run counter to our instincts as designers.

A data viz developer would likely ask why there aren't alerts for being outside of the expected range or peer comparison. Is this a missed opportunity for data-driven alerts for quicker speed to insight?

The decision to keep the colors simple was deliberate. There isn't a clear indication if individual points are cause for celebration or concern because across the different measures, a low number can be good, bad, or neutral, depending on expected values. For example, a low case mix index (which represents the complexity and severity of a hospital's patient

mix) could be due to issues like coding incorrectly. Alternately, a smaller share of children with medically complex conditions could be driven by population or social determinants of health that aren't good or bad—they just are.

### Meaningful Benchmarks

The question of "how are we doing compared with..." is a more complex question than it appears on the surface. Creating benchmarks for comparison turned out to be one of the biggest challenges, as everyone had different ideas for how to set meaningful points of comparison.

#### Creating Meaningful Units of Analysis

**G**ETTING the right data structure was key to enable benchmarking within the dashboard.

Consider the wide range of expected values for a metric like length of stay (how long a pediatric patient is a patient within the facility). More complex conditions or those requiring ongoing care, like pediatric cancer, may expect to have longer lengths of stay. Then, when creating comparison groups of other hospitals, consider that patient mix may vary between hospitals. Hospital A could have many more long-term care conditions compared with Hospital B, which primarily provides outpatient services may have very different lengths of stay even if both hospitals are performing well.

Some ideas considered included:

- Your hospital versus other hospitals as an industry, without considering more nuanced slices of different types of systems or patient load
- Your hospital compared with a section of peer hospitals that have specific shared characteristics, like geographic location or facility level
- Your hospital compared with peers based on an analytical model to identify other facilities "like me" based on attributes and characteristics like patient volume, patient demographics, and location

Letting hospitals choose their peer group while also respecting the privacy and security of health information can be a challenge that requires creativity to balance performance of the dashboard against the ability to offer the user a customized experience.

## Right Tool for the Job

"We've figured out the right tools for the audience and for each task," said a member of the CHA team, reflecting on how the Tableau workbook was being used in practice. The dashboards are accessible for verified members and are ideal for rapid analysis of hospital performance.

Sometimes users still want access to the underlying data. That could have been implemented in Tableau, but it would have been extremely complex and would have raised security and privacy concerns. The team developed the Tableau UX to pass the

correct parameters to CHA's legacy reporting tool, allowing users to extract the data they needed.

## Process

### Discovery

The spark for the CHA dashboard was a recognition that the existing reports had become outdated and could be dramatically improved, not just aesthetically, but in the layers of analysis they could offer to member hospitals.

While users loved having access to the quality and performance metrics produced by CHA over nearly 10 years, the legacy reports were cumbersome to access and navigate. CHA hired HealthDataViz, a Sellers Dorsey solution, to collaborate with its data analytics team to design and develop a new suite of dashboards.

The team focused on reimagining how to display the data valued by users while much improving navigation, comparison analysis opportunities, and custom analytical capabilities. The HealthDataViz team focused on thoroughly understanding users' needs: what questions they were likely to ask, what their role was, what their priority data needs were, and other user preferences.

The team interviewed 12 people who represented different user perspectives. Then, they synthesized insights from the interviews into personas and core requirements for the new dashboard. See Figure 19.5 for two examples.

# CHA PERSONAS

TARGETED BULLET POINT DESCRIPTIONS



Member Children's Hospital CEO



Michael

- Requires **single page summaries** of high-level key opportunities that can be printed and quickly understood with narrative and explanations
- Needs to easily access to plain language metric definitions and clearly understand and agree with CHA peer grouping methodologies
- Metrics should **highlight areas** that help him ensure the financial viability of the hospital (cost data, payor mix), understand the quality of care (ALOS/readmissions/mortality) **where to focus resources, and opportunities** for new programs through peer comparisons
- If interacting with the report, the **interactivity needs to be easy** and simple to flow through, with clear and logical drill paths that do not get complicated, though likely won't drill to granular data
- Insights need to be **comprehended within 90 seconds**

Member Children's Hospital CQO, CMO, CNO



Patricia

- Frequently needs **data to monitor performance (trends)** on key quality indicators that she can **compare to other similar hospitals** across various specific programs/service lines
- Needs to **identify opportunities for improvement** and be able to **identify drivers** of the performance (payor, APR-DRG, service line, age group, outliers, etc) in order to develop plans to improve
- While she more likely gets reports from her staff, staff need the ability to uncover the answers to her questions and **identify the "why"** behind the data (contributing factors) in the key metrics, which often requires **focused reports**
- Insights need to be **comprehended within 5-8 minutes**

Persona descriptions condensed by Lindsay Betzendahl, HealthDataViz

FIGURE 19.5 Persona examples created during discovery, summarized by designer Lindsay Betzendahl.

The five personas represent the range of user needs, including both CHA internal stakeholders and users at member facilities. Two of the personas are shown in Figure 19.5, including:

- **CHA:** Senior Executive, Subject-Matter Expert/Client Liaison.
- **Member hospital:** CEO (single page summaries, highlights), C-suite (CQO, CMO, CNO), analyst (gets to a more focused, detailed need for information).

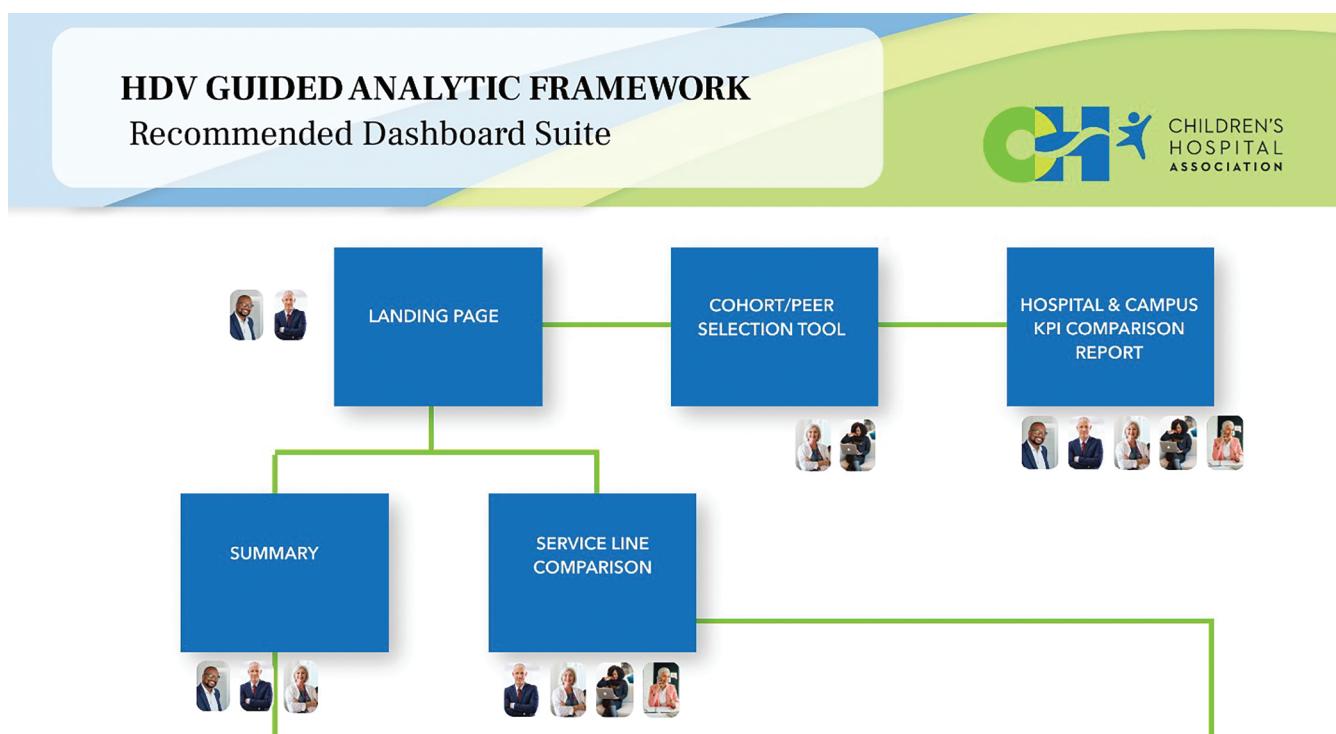
In addition to mapping illustrative personas, the team mapped how users accessed data with the legacy tools, allowing them to identify existing features

that worked well, and specific pain points the users were experiencing with the legacy reports.

## Prototyping, Design, and Development

The team moved into iterative prototyping, starting with simple wireframes and working toward more polished mockups. Throughout prototyping, the five personas served as touch points to check that the designs matched user needs.

As a starting point for a new way to organize the information, the team mapped a very high-level wireframe. The schematic started with a series of connected boxes (Figure 19.6), each of which eventually



**FIGURE 19.6** Section of early wireframe showcasing the hierarchy of views and which personas are served by each one.

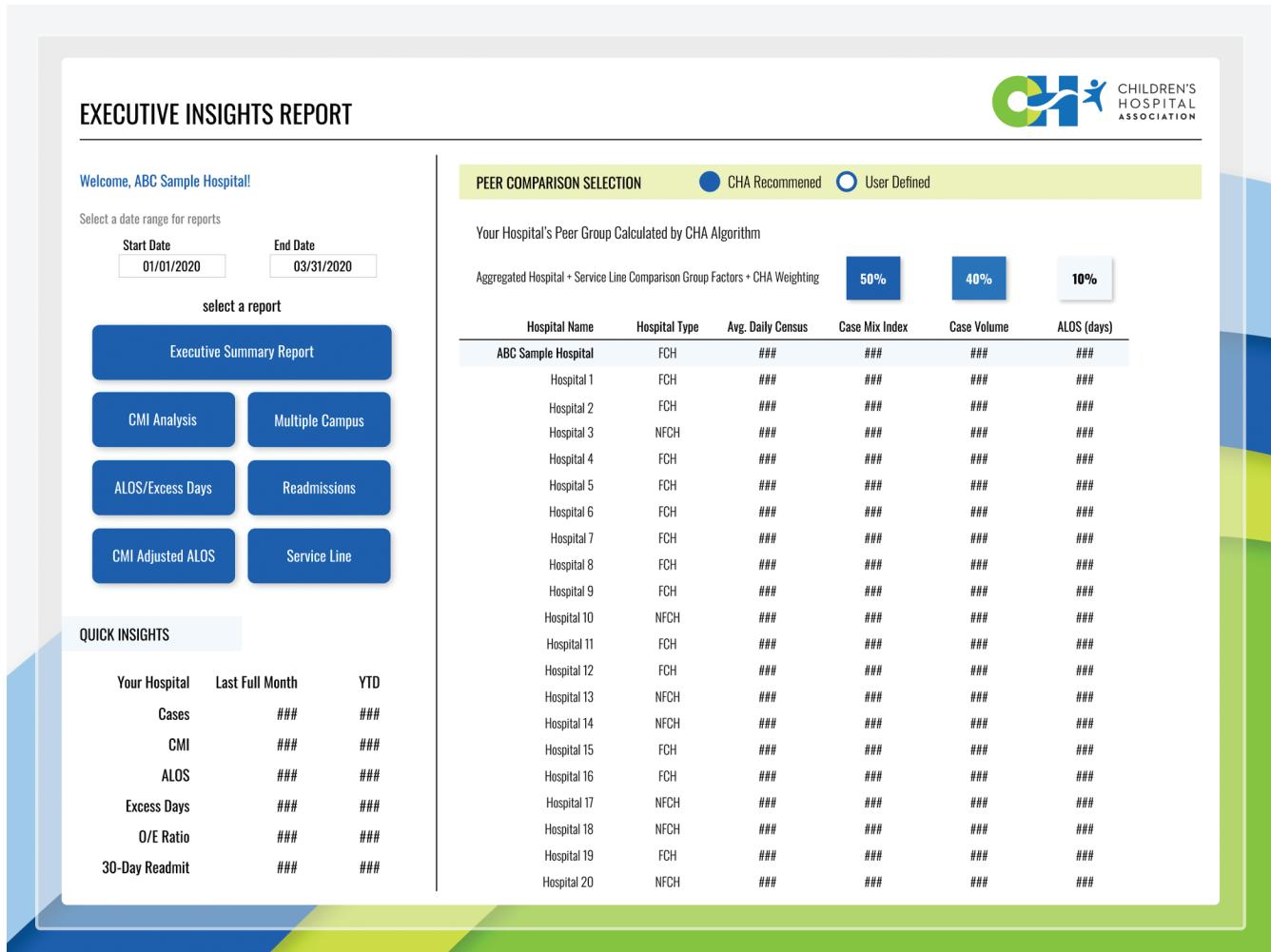


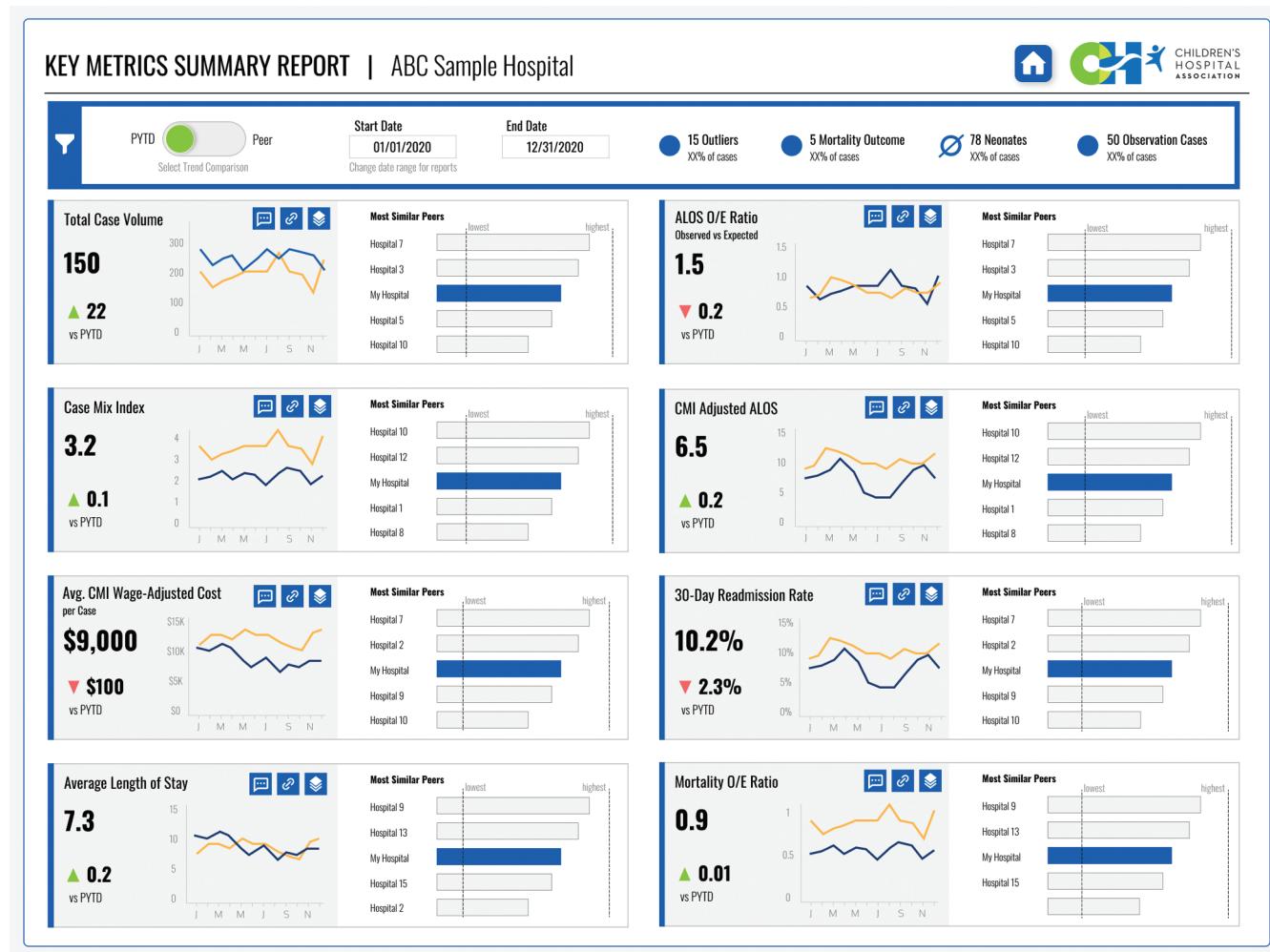
FIGURE 19.7 An early prototype design in Figma.

became one of the dashboards in the larger suite. Starting with the wireframe allowed the team to map where different user personas would find value in the suite of different views without getting into the weeds of chart choice and color palettes.

Early concepts mocked up in Figma started the user journey on the metric summary page. The initial data-dense designs included detailed tables to maximize the volume of information, along with a panel of navigation buttons (Figure 19.7).

In the next iteration of the mockup, the design team evolved the comparison concepts to be more visual with fewer metrics than were in the original table view (Figure 19.8).

In this iteration, we see the shape of the first dashboard release start to take shape. The additional bar charts didn't make the final cut; they show a more specific comparison of the selected hospital to peers.



**FIGURE 19.8** Mockup of Key Metrics Summary Report (image property of CHA with sample data for demonstration only).

## User Testing

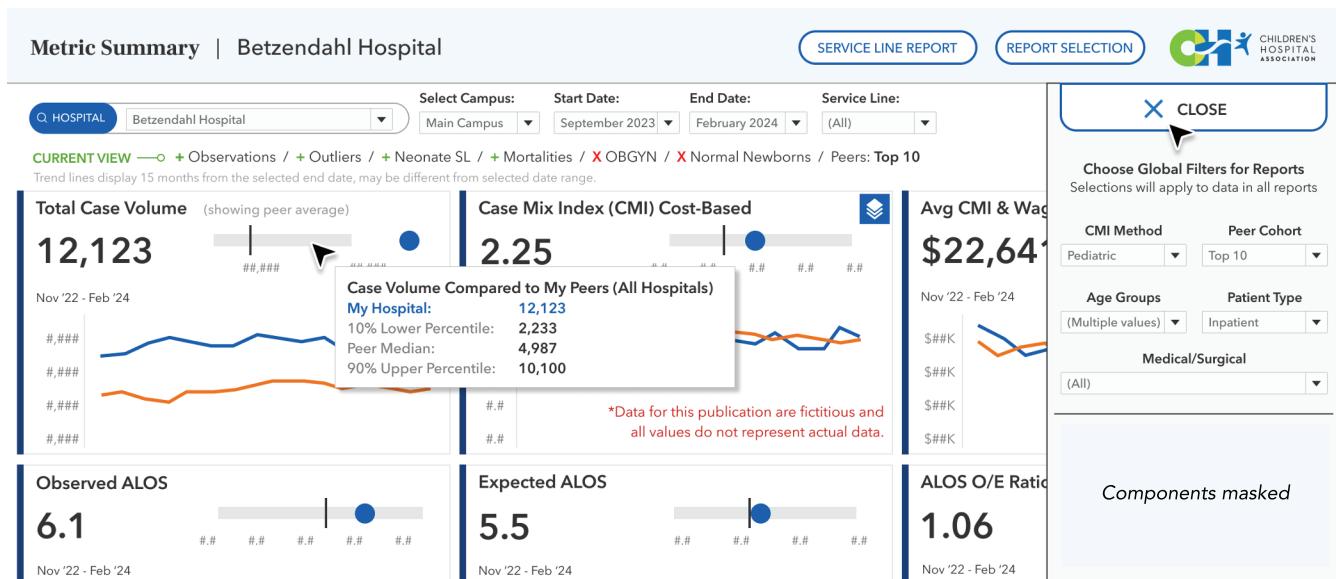
While designing the dashboard, each of the final views went through user testing for feedback on chart choice, design, and navigation.

Sometimes user testing identified disparate opinions, leaving it to the designer to decide whether to include or exclude a feature. For the CHA dashboard, the collapsible filter panel on the overview pages had mixed reviews. Some people didn't like the added clicks required to open and close the panel, but having it visible all the time meant the team couldn't display as many charts as they would like. This was the case for all the dashboards. Considering the benefits and the gripes, the team

decided the collapsible menus would stay, as illustrated in Figure 19.9.

Sometimes user testing also identifies unmet needs at a larger scale. With a working dashboard in hand, CHA and HealthDataViz realized that the dashboards didn't meet the needs of the Executive persona defined in discovery, who may be overwhelmed with the nine KPI card view as a starting place for analysis.

Instead, the team needed to build something even simpler as the start for busy executives, which is where the Key Opportunities view explored at the start of this chapter was born (Figure 19.1). What that means: just four KPIs and the breadcrumbs to navigate to more details if needed.



**FIGURE 19.9** Example from the Metric Summary showing the user navigation for closing the menu (Image property of CHA with sample data for demonstration only).

## Performance Considerations

Sometimes user testing isn't just about design; it's also about performance. On the CHA dashboard, some pages would take 30 seconds or longer to load. This is where the team had to assess if that load time was acceptable and what effort would be required for even incremental improvements.

The dashboard has a massive volume of data with complex security, and the workbook itself is well designed but remarkably complex. Looking at the dashboard stats, the Tableau workbook has:

- 3 data sources
- 21 dashboards
- 311 worksheets
- 340 fields
- 623 calculated fields
- 34 parameters

Key features that feel simple and seamless are technically complex. These included data-driven colored headers to alert users of metrics that aren't performing well, dynamic narratives, breadcrumbs showing current filter selections, and complicated user security requirements. Blend the functionality with a clean, welcoming, and aesthetically pleasing design and you have one very challenging project.

Ultimately, the team recognized that while performance and responsiveness could improve slightly, any changes would be high-effort. The rendering times weren't so slow that they would put people off from using the dashboard, but maybe longer than some

users would expect due to the load time for rendering data from across all hospitals for comparison statistics.

## Measuring Success

Measuring the success of this suite of dashboards started with usage statistics and monitoring per user views – with some reservations. While the detailed tracking data on usage allows for mapping out current paths through the dashboard (which is helpful for identifying points where individuals get stuck), the team didn't want to fall into the trap of assuming that *lots of views* were all that mattered.

CHA recognized that occasional but important moments for accessing these tools matter more than usage stats. For example, when a hospital needs to plan for next year's budget and needs quick access to KPIs, one use would be a success.

Some of the best testaments to the dashboard's success aren't the quantitative measures, but instead in how often leaders at children's hospitals actively use the dashboard in meetings and related spaces.

For example, a CHA hospital wanted to have a strategic conversation with counterparts primarily serving adult patients. During the meeting, the leader of the children's hospital accessed the system, found the metric they needed, and had a meaningful conversation about the different challenges the hospitals and their patient populations face.

As analytics folks, their team was accustomed to looking at a lot of numbers. While the usage data is helpful there, "making sure people have the right

information to have the right conversations” is the greatest measure of success for the team.

## Managing Enhancements

After launch, the team held monthly meetings to identify problems with the dashboard and review issues and enhancement logs. When talking through what to do next on the dashboard, prioritization is a constant challenge that requires balancing “big lifts” with “easy fixes.”

Since the dashboard went into production, the team has had at least four major releases and has added new views and data sources.

Over the series of releases, the HealthDataViz team provided mentorship support as the in-house team took ownership of releases and updates, hosted internal Tableau trainings, oversaw quality assurance checks, and wrote updated documentation. As a result, this information-rich dashboard has had a successful handoff to the team, allowing them to manage improvements on their own.

## Author Commentary

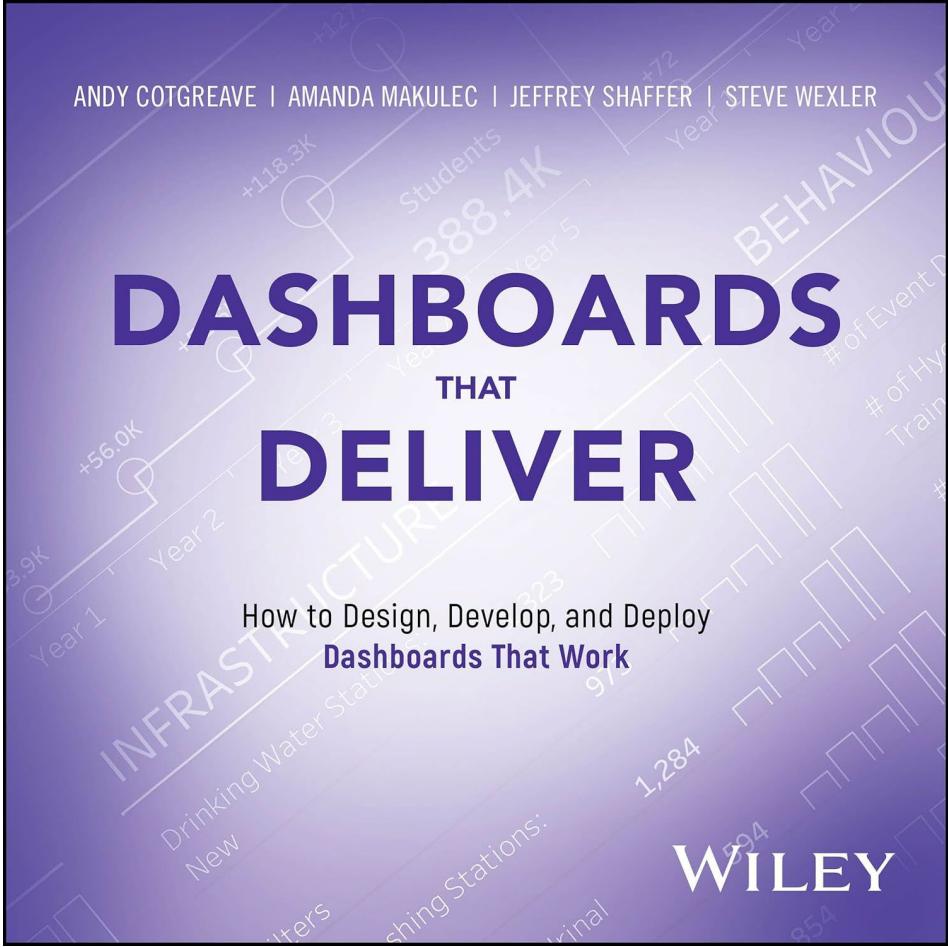
**STEVE:** There are three things that jumped out when reviewing this scenario. The first is that there are so many techniques and approaches here that can be applied to virtually any organization and industry. How can you read this scenario and not think, “Ooh, I could use that.”

The second is how HealthDataViz’s process mirrors so much of our recommended framework: spark, discovery, personas, user journeys, rapid prototyping, thoughtful testing, and managing enhancements.

The third is how the designers made the organization using the dashboard the focus of the dashboard. I can practically guarantee that people will use this dashboard and use it repeatedly.

**ANDY:** This chapter challenged our vocabulary. Lindsay and her team built 21 different views of data for Children’s Hospital Association. What should we call each one? Is that 21 pages? 21 dashboards? And what do we call the collection of all of them together? Is the whole thing a dashboard? Or a report? Or even a suite of dashboards? In our experience, if we asked 10 people to answer these questions, we’d get 10 different answers. I address this in more detail in the essay “What the Heck Is a Dashboard?” in Part III.

In a nutshell, even after decades of business intelligence, nobody has created a definitive answer. I doubt they ever will. I encourage you to find a common language in your organization, but don’t get stressed by what others might call the objects you build.



ANDY COTGREAVE | AMANDA MAKULEC | JEFFREY SHAFFER | STEVE WEXLER

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