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Embedded Analytics

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Engage
your users

Build a plan
for success

Understand the
value of decisions



Andrew Moore

Sisense Special Edition

About Sisense

Sisense is an AI-driven embedded analytics platform that accelerates product innovation by equipping product and development teams with a complete suite of no-, low-, and pro-code tools. The company's solution embeds context-aware insights and analytics into data products in a modular, flexible, and scalable way. The company was founded in 2004 in Israel and employs a globally distributed workforce with offices in New York City, London, and Tel Aviv. Composed of Sisense Fusion Embed, Sisense Cloud, and Compose SDK, Sisense's flexible analytics platform has 21 patents to date and has enabled over 2,000 customers to infuse actionable insights into their customer experiences.

Deeply committed to data privacy and protection, Sisense received the ISO 27701 Privacy Certificate.

To learn more about how Sisense accelerates product innovation, visit www.sisense.com.



Embedded Analytics

Sisense Special Edition

by Andrew Moore

**for
dummies®**
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Introduction

Delivering analytics is now an integral part of every product roadmap. Product and engineering teams everywhere are adding analytics to their apps and products to increase competitiveness, provide better user engagement and satisfaction, and increase revenue.

But just putting a button on your application that links to a business intelligence dashboard is no longer enough to drive user engagement. Separate tools and technologies that users have to learn are a recipe for poor adoption. Your customers and users expect analytics to be in-context, provide granular insights, and be embedded in their workflows and the tools they use daily. Analytics has to be infused into their daily experiences.

However, product and analytics teams must choose wisely because not all embedded analytics platforms are created equal — weighing every factor from integration with continuous integration/continuous delivery (CI/CD) processes to composable software development kits (SDKs) to how it all scales with growth.

About This Book

This book provides everything you need to choose the right embedded analytics platform for your organization. You discover the features and characteristics to look for in order to make the best decision for your product and your customers.

If you're a director or vice president of software engineering, product manager, or software engineer looking to embed analytics into your product, you've come to the right place.

Icons Used in This Book

In this book, I use the following icons to grab your attention. Here's what the icons mean:



REMEMBER

When I point out core information that you should take away from a topic, I flag it with the Remember icon.



TIP

The Tip icon gives you additional information, shortcuts, or advice that you can use about a given topic.



TECHNICAL
STUFF

The Technical Stuff icon marks extra information related to data products. This information isn't essential to understanding the topic at hand, but it gives you some additional context that you may find helpful.



WARNING

The Warning icon calls out things that you should pay attention to or things that are important to consider so you can avoid costly mistakes.

Beyond the Book

This book can help you discover more about embedded analytics and data products, but if you want resources beyond what this book offers, here's some insight:

- » sense.dev: Check out an embedded developer portal and find out how to choose the right embedded approach by using the Compose SDK to build data-driven applications or the Embed SDK to embed dashboards into web applications. You also learn customization options to integrate with your tech stack.
- » sense.dev/playground: Get hands-on with an embedded analytics playground and explore how to add analytics and customize it to your product by using iFrame, JavaScript, or SDKs.
- » www.sisense.com/platform/infusion-apps: Learn how to infuse analytics into everyday tools, such as Office 365 or Google Workspaces, so users can get insights where they work every day.
- » www.sisense.com/success: Find out how other companies are using embedded analytics to improve their customer experience and deliver in-product insights to their product teams with minimal developer effort.

- » Realizing why traditional business intelligence is broken
- » Engaging your users
- » Looking beyond the charts

Chapter 1

Moving Beyond the Dashboard

Business intelligence (BI) is the technology used by organizations for data analysis and management of all business information. BI helps organizations and teams make better, more informed decisions.

In this chapter, you discover the basics of BI, a little history, and why traditional BI is fundamentally broken. You see how embedded analytics can fix the state of BI and help you engage users by giving them a better way to discover meaningful insights and answer crucial business questions that can help them drive better business results. You also discover why this unmet need for analytics in organizations now provides product and engineering teams with an opportunity.

Understanding Why Traditional BI Is Broken

Traditional BI is urgently in need of transformation. BI was supposed to help business users and analysts in organizations improve outcomes, but most still rely on gut instincts to make

decisions. A wide gap exists between analytics tooling and its potential to drive improved outcomes. While BI technology has taken several steps forward, it has at the same time managed to jump backward in usability, which hurts adoption.

Let's do a little time travel back a few decades to get a clear picture. In the 1980s, BI took off within the emerging IT-centric systems of record. People with business questions went to specialists who ran databases and asked for reports. Then, usually, a painful, iterative dance of "That wasn't exactly what I was looking for; I need *this*" ensued until you eventually ended up with, hopefully, something useful. Fast-forward to the early 2000s when BI technology evolved into a visual-based data discovery that offered a simple proposition: Instead of waiting for IT to figure out what you were looking for, you made your own charts by using a simple drag-and-drop user interface.

This visual-based data discovery operated on the premise that most business questions aren't hard to answer if you know what you're looking for. If you understand the question, you should be able to drag and drop dimensions and measures until a chart gives you the answer. These dashboards and self-service BI tools are meant to make analytics quick and easy, but there's a big problem.

Analytics has to be easy to use and adopt, because according to industry analyst firms, 80 to 90 percent of knowledge workers lack the technical skills, data literacy, or access to use BI tools effectively. Today's self-service BI tools are created with the needs of data specialists in mind. These users require more advanced features and capabilities to support their use cases. Self-service BI has become too complex and challenging for its target user, and we've gone back to the IT-centric approach to BI.

What if, instead of analytics as a separate tool used by the few, it was incorporated into workflows in applications that people use every day to drive decisions? In this case, opportunity exists for product and engineering teams. Users are hungry for analytics that they can use in their daily work, and they're looking for it in the apps and tools they *already* use every day.

Discovering Ways Embedded Analytics Delivers Value

Embedded analytics arms business users with an easy-to-use way of answering the critical business questions they have, exactly at the point of decision. And it allows product teams to give their customers what they want. In this section, you look at examples of how embedded analytics can effectively engage users.

Boosting manufacturing insights

Say you're providing a manufacturing app. A key area of focus for manufacturing customers is the utilization of the production floor. What if you could provide your users with insights in utilization directly in the app? That capability would provide you with a competitive advantage over your competitors and help boost user satisfaction.

For a factory that runs 24/7, every production stop can undermine revenue and profitability. Providing your users with analytics could help them understand trends, main root causes, and other insights to focus on the most crucial improvements they need to make. By providing downtime analytics, your users could predict the mean time between failures so they can proactively schedule preventative maintenance before expensive downtime occurs. And that's a win-win.

Providing in-app customer churn analytics

What if you're providing a customer service app or perhaps a financial app? You might want to provide your users with analytics around at-risk customers, those likely to churn, perhaps empower them to model customer churn and client retention directly in your app. You might even want to add this functionality in a higher edition of your app, to drive more revenue for your company.

Using an embedded analytics platform, you could quickly add custom churn insights to your app to help your customers minimize and identify potential causes of churn. It could enable your

users to use your app's embedded analytics to get more value from your application, such as the following:

- » Relate churn to customer cohorts identifying which of their customers are driving churn rates
- » Increase their customer growth and retain loyal customers who could be at risk of leaving
- » Identify the timing of business decisions related to customer churn

Aiding better decision-making in a supply chain app

Companies looking to get better control of their supply chain may depend on information that can identify which distributors are positively or negatively affecting the overall delivery rate. Imagine you provide the software for them; you have the opportunity to provide the analytics for that exact need. For example, distribution and delivery performance analytics can help your customers know the relationship between the number of shipments and on-time delivery for distributors to optimize selection by avoiding those carrying excessive volume.

Thinking Outside the Pie Chart

Generations of technological innovations, including better data visualizations, cloud analytics, and self-service tools and analytics-focused cultures in workplaces, have failed to deliver on their promises and yielded an analytics adoption rate of only about 30 percent. Yet in survey after survey, respondents rate using data analytics to drive decision making as vital to their company's success. Companies need to give their users data they can use to make critical decisions to stay competitive, yet adoption rates are low. The solution? Make the analytics invisible.

Add analytics inside your app

Traditional BI tools weren't designed to be embedded inside apps, and they're not designed to be used by product teams to incorporate analytics inside their apps for their users to use.

Cramming a traditional BI tool inside an app is like trying to drive a car offroad. You can do it, but it's not going to be a great experience, and something may break. Instead, you'd buy a 4x4 vehicle that's designed for the job.



WARNING

So, what are the risks of trying to embed traditional BI? The biggest is that the look and feel of your app will be different for your users. Your developers will likely not have the right depth and breadth of application programming interfaces (APIs) to get full control (which means it feels choppy for your users).

Embedded analytics platforms enable your product team to embed customized visualizations that look like your product, and they provide APIs that enable your product team to integrate the analytics experience into workflows of your app. Having an embedded analytics platform means your users get to use analytics (and all the value of it) without needing to learn a whole new tool, and they get what they need to analyze their data in your app, directly from your app. That's how you make analytics invisible.

Work with data inside common productivity tools

You can infuse analytics into your users' daily experiences in more than one way. Think about the tools your users use daily. These tools may include Google Sheets, MS Teams, Slack, Office 365, Teams, and so on. What if you could plug into these tools too, so you could help your users better analyze from the tools they're already familiar with?

Your finance team probably loves Microsoft Excel, so what if it could use that to analyze its valuable data within your app? And what if sales or service teams who work in Slack or Microsoft Teams could ask natural language queries around the data, too? What if your customers' chief financial officers or vice presidents of finance could incorporate some live data directly from your app in a Google Slides presentation to the management team or board?

If your users use these productivity tools — and it's almost certain they do — and if your embedded analytics platform provides plugins into them, you can connect insights with your users in the way they work. For a specific way to incorporate analytics into your tools, check out the nearby sidebar “Infusing analytics into your users' daily spreadsheets and slides.”

INFUSING ANALYTICS INTO YOUR USERS' DAILY SPREADSHEETS AND SLIDES

Users can incorporate infused analytics by utilizing Sisense Infusion Apps to add analytics to these tools. And if you're a product organization, it's a quick win to deliver to your customers, too. Sisense Infusion Apps for Excel 365 deliver a fully rebrandable add-in that facilitates direct access to data in Excel. Customers can ask questions by using Natural Language Query (NLQ) and access the latest data by using shared predefined views or a personal bookmarked view,

Infusion Apps also exist for Google Slides and Sheets, so, whether your customer has power users in Sheets or managers who want to incorporate live, fresh data from your app in their Slides presentations, you've got them covered.

Your users already have so many icons and alerts lighting up your desktop and phone. The last thing you want is an entirely separate experience elbowing in for their attention as well. To get your users to take advantage of the insights derived from analytics, the experience must be seamless and invisible and ideally infused in the tools they use daily.

You can find out more info at www.sisense.com/platform/infusion-apps.

Empower your users to analyze data with NLQ

When you think of data analytics, you may often think of users clicking around charts, graphs, and dashboards to build their queries. But users can also build queries by using NLQ, and with a properly equipped embedded analytics platform, providing NLQ to your users can be delivered fast.

You can use an embedded analytics platform such as Sisense to add NLQs to your product. If your users have additional questions or want to understand a metric very quickly, they can click the Simply Ask button to open an NLQ interface to make a query in plain English and get the answer back in the form of a widget.

Some features of Sisense NLQ include

- » **Auto-complete:** As users type a question, they get personal suggestions that auto-complete fields and values, filter, and more, so they can get analytics results faster. They get these suggestions delivered in context by using Sisense's Knowledge Graph that continuously learns from the relationships created between the entities and their personal preferences.
- » **Synonyms:** Sisense NLQ comes with a dictionary of common synonyms that are automatically applied to the NLQ data model entities such as column names and values. Your users could ask "what's my income," and if *income* isn't part of the model but *revenue* is, the engine will translate *income* into *revenue*.
- » **Spelling:** Sisense NLQ presents your users with spelling mistakes and suggestions for corrections.
- » **Ambiguity:** Sisense NLQ supports ambiguity resolution by providing a ranked list of measure or value appearances in different tables or columns in order to identify the correct measure and value.
- » **Forecasting and trends:** Sisense NLQ forecast and trend models allow your users to ask predictive questions of the data in natural language.

Power up your user engagement with exception-based analysis

What if you could alert your users to changes in important metrics or trends? This capability is an important way to foster engagement because your users will get periodic business event-based notifications that always keep your app top-of-mind with your users. Embedded analytics platforms can include monitoring and alerting to help your product teams deliver this kind of functionality quickly and efficiently.

For example, Sisense Pulse continuously analyzes the key performance indicators (KPIs) that you've set up in your app and uses models developed by the Sisense internal data science team. When Pulse detects outliers, it automatically alerts users via a combination of email, the Sisense mobile app, or an alternative delivery

mechanism like Alexa or smart bulbs — all without any threshold or rule configuration.

Cut out the data-prep headaches

Your embedded analytics platform needs to provide strong flexibility to work with data. That way your users can avoid all the spreadsheet jockeying and VLOOKUP functions that create major headaches — which will all end up on the requirements list for product teams.

One way to skip the brain strain is to ensure that your platform provides built-in augmented data preparation functionality. For example, Sisense includes an AI-powered feature, called Group Similar, in an augmented data preparation tool that automatically unifies similar values in each column (for example, U.S. and United States). The technical term for this process is called *deduping*, which is an easy way for users to create groupings in a few clicks without the need to compose individual Structured Query Language (SQL) expressions or relying on product teams to build the functionality themselves.

IN THIS CHAPTER

- » Choosing between buying or building
- » Starting out with analytics
- » Ensuring success
- » Integrating analytics with your data pipelines

Chapter 2

Building Data Products with Embedded Analytics

In this chapter, you look at using embedded analytics to build data products and how to make the decision on whether to buy or build your own analytics tools. I also list some pitfalls you may encounter when adding analytics tools for your products.

Considering Buying or Building



REMEMBER

Whether your business is technology-enabled or non-technology, you should consider all available options. You need to consider many factors when deciding whether to build or buy an analytics application, including return on investment (ROI) and time to market (TTM). To help you, here are some questions to ask:

- » **How much interactivity and personalization will my users want?** Buying an embedded analytics platform can provide the functionality that gives your customers the

autonomy to customize and augment the metrics they need quickly and easily. If the answer to this question is “mostly static visualizations and little interactivity,” building your own analytics may pay off. However, building in-house takes time and energy, and user requirements can quickly grow and change over time.

- » **What level of scalability and depth do I need?** If you have a large number of customers, buying an embedded analytics solution typically allows you to scale your deployment across your customer base and with more usage. Your development team will spend less time optimizing queries or having to monitor and manage performance. If you anticipate providing deep analytics capability to your users, such as slice-and-dice interactivity, a broad range of visualizations, and capabilities like trends and regression analysis, an embedded platform will also likely provide a better fit because your product team will get those features out of the box.

If you anticipate delivering only relatively static or shallow analytics functionality now and in the future or don’t anticipate heavy usage across your customer base, building from scratch may be worth a closer look.

Be careful if you’re building, so your product team doesn’t get buried in developing analytics functionality, and it pulls too much engineering resource from your core product roadmap.



WARNING

- » **How important is artificial intelligence (AI)?** You want to buy if AI is or will be critical to maintaining your competitive advantage. Analytics tools like Sisense come with cutting-edge data and analytics capabilities, including AI and machine learning (ML), which your product team can tap into, freeing up your engineers to deliver faster and get more done.

Integrating AI and ML capabilities is complicated when building in-house solutions. You may not consider AI to be critical today, but your competitors probably do, putting you at a potential disadvantage in the future.



WARNING

Building in-house involves hiring the right talent, building, testing, deployment, and maintenance. Your development team is a talented bunch. But how much time do you want them to spend building, improving, and maintaining a dynamic analytics solution? Ultimately, the choice to build or buy is up to you and your needs.

AVOIDING THE “QUICK DEMO” FALLACY

If you’ve decided to build your own analytics, you may find it easy to build a starter dashboard with a few charts that run queries against a database and look great to demo to your users. But what happens when there’s a new question that comes up from customers? Will you have the resources to go back and build those new requirements into your product? What happens when the data size and complexity grow? How will the team maintain performance with complex queries? As always, customer requirements are consistently changing and growing. How will you support all these challenges?

Research and development are expensive. Delivering a world-class data experience with fast execution and rich, interactive interfaces takes a team of developers. Even just a handful of developers working full-time on a project can be extremely costly — not to mention the often-growing costs of maintaining the product after its release.

Avoiding Pitfalls in Starting Out with Embedded Analytics



WARNING

One of the biggest risks in choosing an embedded analytics platform is choosing one that doesn’t allow enough customization. Not all are created equal in terms of how much your team can customize the look and feel to match your app. Some analytics tools are just plain hard to customize. No matter what you do, it’ll always be obvious to your customers that the analytics have been glued into your app. In some cases, the software development kits (SDKs) are limited, or some tools are using third-party rendering components for many of their visualizations, which reduce the level of customization control you have.

Your embedded analytics platform has to be customizable enough that it enables your team to match it to the exact experience of your product, and that in turn requires that it must provide incredibly strong and flexible SDKs.



TIP

Ultimately, you want ways to start fast but with enough flexibility to deliver a fully embedded experience. Look to get up and running with minimal effort and no scripting knowledge by ensuring the analytics platform can embed dashboards and widgets with an iFrame HTML tag or that your analytics platform provides a JavaScript library to enable embedding with minimal code. Ensure you have access to a whole JavaScript library to embed individual widgets and filters and completely customize the look and feel of the analytics elements to ensure it all blends into your application. Dig into the JavaScript/TypeScript library to understand the amount of control. Look for React Components that you can easily tap into.

Avoid spiraling team effort

When looking for an embedded analytics platform, you need to consider many things. One thing that's often overlooked is who'll create queries, charts, and models — and how much time will it take?

If you're not careful, you could end up with a solution requiring engineering team involvement at every step. Whenever you want to change your analytics model or make a new query or chart to add to the product, you'd need to wait days or weeks while engineers make the changes. This solution may work if you have a small team and don't need frequent updates, but it can be disastrous if you're trying to keep up with fast-changing market requirements.



TIP

Instead, look for an embedded analytics platform that makes it easy for new queries and models to be created by non-engineers. Clicks-not-code development for the data model, widgets, visualizations, metrics, and charts give you more speed and efficiency in the long run, help ensure you can continually improve your in-product analytics, and provide a more relevant user experience. Better yet, you can avoid going round and round fulfilling one-off analytics requests, which creates bottlenecks in engineering workflows and delays in answering your important questions.

Don't forget governance and security

When you open data for analytics, concerns about data security come along for the ride, too, so you want to ensure your embedded

analytics platform provides a comprehensive framework for strict and granular governance across the application and your data sources. For example, ensure that your embedded analytics platform provides centralized user and data-level security that flows through every experience to reduce security risks. Notably, Sisense makes security easy to manage for product teams, and it's built directly into the platform.



REMEMBER

Avoid hitting a customization wall by drilling into all the SDKs and customization options your embedded analytics vendor provides so you have complete control for today's and tomorrow's requirements. Ensure it can all work with the web frameworks you're using, like React, and that your development team will be able to ramp up quickly with it.

Ensuring Success by Ensuring Flexibility

One of the most common drags on customer satisfaction around embedded analytics is when users can't ask their own questions about the data. It leads to frustration and users going outside the app into spreadsheets — perhaps exporting the data and hacking something together in Excel with creative pivot tables. Or perhaps they discontinue using your analytics completely or end up placing endless enhancement requests to you or the product team to provide more self-service, crushing your team's productivity.



WARNING

Many business intelligence (BI) platforms have a fixed view on how to and who can interact with data and what the interaction should look like. In many cases, one size fits no one. Your product's users with zero programming experience should be just as successful in asking questions in natural language or drag and drop as developers who are more comfortable in a code-first environment such as Python, SQL, or R.

You need a platform that offers engaging, explorable analytics to empower your users to answer their own complex questions more quickly. Choose a platform that enables self-service, drag-and-drop analytics components that are usable even for the most nontechnical users. And by augmenting analytics with AI and ML, your users can have the capability to go beyond the dashboard and descriptive data visualizations. Your users can achieve predictive and prescriptive analytics, making sense of any data with

automatic insight, and highlight the potential impact of these insights.

And by using natural language generation, you can ensure your users don't have to wonder what a visualization is telling them. Instead, your users can have the key insights and understanding of the cyclical patterns of the underlying data, so their next question is more informed. For example, capabilities such as Sisense's AI-driven Explanations give your users the ability to understand trends across their data and what factors contribute to those trends.

The more questions your users can answer on their own the more data becomes part of the decision-making process, leading directly to actionable insights.

Augmented analytics that have forecasting capabilities provide functionality for your users so they can anticipate upcoming events. You can take these features and infuse them into your users' workflows, so they have the right information just when they're making decisions.



REMEMBER

When data is a direct part of making decisions, your users' decisions will be more accurate, better informed, more effective, and made more quickly. And when your users make more informed decisions, they can recognize and measure the ROI and, ultimately, recognize more value from your product.

Integrating Analytics with DevOps and CI/CD Pipelines

You already have a robust continuous integration/continuous delivery (CI/CD) process for your product development, and you're using strong source control and version management. But here's the thing: If you're adding analytics to your product, you must ensure that it all plugs into your development operations (DevOps) process, so you can build as one team. If building analytics, developing metrics and visualization, and tying it into your product are all separate from your development processes, beware.

Increasing coordination in your analytics development

If your teams are like many product teams, more than ever distributed teams are all working on different parts of your product. And it will be no different when you integrate analytics stacks. Data flows and dependencies can grow by the day, causing an emerging release control headache — especially as you evolve your data model in tandem with your analytics.

If you get your version and release control wrong, you have a recipe for broken analytics, which is exactly why you need an analytics platform that integrates with your DevOps processes and CI/CD pipelines.

Dashboards, reports, metrics, and mappings have become first-class objects as important as your software source code, so they need the same kind of version tracking and control as you've always done with source code. If you don't have strong version controls and integration with your CI/CD pipeline, the proliferation of assets and dependencies make it too easy for a report to break or return incorrect results when a change is pushed to a data type in the underlying data model or when an update to a data warehouse schema is released and an analytic model no longer maps to the updates. When you have multiple analytics developers, things can get painful quickly if there's no way to combine everyone's contributions into one unified repository or see who's contributed a change. A lack of version control is one reason why analytics teams often try to avoid too much collaboration, for fear of breaking changes.



WARNING

With so many teams developing analytics assets, and so many other changes going on, teams can easily get out of alignment — and that can mean a broken user experience and diminished trust in the accuracy (and value) of data.

If you're at a software company tasked with embedding analytics in your application or you're on a data analytics team, ensuring strong version management and control around your assets is crucial to your ability to efficiently scale, ensure quality, and have the visibility to resolve issues quickly when they arise — increasing your team's capacity to innovate.

Integrating between embedded analytics and Git

The solution to managing your analytics assets is to move to a robust source code management (SCM) platform like Git. Using a SCM platform is the best way to easily trace, review, undo changes, manage branches, and control changes to your dashboards, reports, and data models, and ultimately keep your release processes aligned and in sync.

Git has been used for many years for version control of software source code, but it can be used with any type of assets, such as data models or dashboards. Unfortunately, most analytics technology is still pre-DevOps and Git, and it simply doesn't play nicely with industry standard tools. For example, some analytics tools include rudimentary and propriety built-in version control separate from Git. Teams then don't use them at all with the CI/CD processes so analytics assets can get out of sync with the release cadence, which causes all kinds of headaches.



TIP

Look for embedded analytics platforms that work closely with source control tooling to ensure a smooth development process. For example, Sisense Fusion integrates version control with Git natively without imposing additional restrictions or simplifying capabilities so you can integrate the complete asset chain with your software development life cycle, DevOps, and CI/CD processes. For example, with Sisense-Git integration, you can develop new capabilities, commit changes, submit Pull Requests, and revert changes — the same way you do with the rest of your software.

Your product and engineering team can develop and embed analytics built in Sisense while checking updates and managing changes in Git instead of using a proprietary source code versioning tool. The integration of Sisense and Git brings analytics into alignment with standard software development practices.

Teams building analytics and dashboards can test their individual changes and integrated releases more easily and fully in safe development and staging environments and push to production when ready. Release managers can ensure that analytics delivering works with their automation and release processes so they can standardize processes across the environment.

- » Building a plan for growth
- » Determining your scaling strategy
- » Incorporating sophisticated query optimizations

Chapter 3

Planning For Scale

Your analytics project's key to success is determined by how well it can scale up to handle more customers and users with larger data sets. Execute well, and you reap the benefits of stronger adoption, customer satisfaction, and fewer operational fire drills for your team. In this chapter, you examine topics that help you plan for scale.

Planning for the Needs and Costs of a Targeted User Base

Demand for analytics is set to grow at a rapid pace with big data and analytics software adoption doubling by 2026. So, whether you choose to build your own analytics capabilities or use an embedded analytics platform, plan for your customers and users to consume more of your analytics than you expect. Your success means handling more users, more complex data sets and use cases, and more performance demands — *and* delivering it all efficiently so you can scale.

Reaching large user populations

Most business intelligence (BI) technologies, from basic charting engines to sophisticated cloud data warehouses, are designed for online analytical processing (OLAP) use cases — a few users running robust queries across large amounts of data. But reaching larger user populations with rich data experiences can significantly strain your back-end data infrastructure and development team. You need to consider and plan for the needs and costs of your target user base.



REMEMBER

Analytics are only as good as the user engagement they receive. And in a world where multi-second response times can lose an audience, performance is crucial. Performance is critical for user engagement. If performance is slow, it will hurt adoption. But success is not only measured in terms of how quickly a query turns into results but also the sustainability to achieve it, which is the effort behind the scenes to deliver performance and maintain it as the data, dashboards, and users scale.

Avoiding being buried in query optimization

You may be tempted to go down the road of hand-tuned queries to support customer use cases, but you'll likely soon find that you need to re-engineer them every time a schema changes, a chart is updated, or data volumes and query demands change (see the later section “Choosing Platforms that Incorporate Sophisticated Query Optimizations” for the challenges of hand-tuned queries). Some embedded analytics platforms incorporate sophisticated query optimization and technologies for supporting high levels of performance and concurrency that can help reduce the burden on your development team.



TIP

When evaluating analytics platforms, look at the queries it generates and ensure that your engineering team and analytics designers can troubleshoot, verify, and audit outputs. Make sure the generated queries are optimized for your database, whether you are using Amazon RedShift, Google BigQuery, or another database.



REMEMBER

The time your engineering team spends troubleshooting, verifying, and auditing query outputs is time lost that could be spent on value-producing activities such as delivering new functionality and creating new analytics and dashboards that delight your customers and grow your revenue.

Achieving sustainable performance enables your organization to scale without adding cost, overhead, or query complexity. Analytics nirvana is achieving incredible analytics performance without compromising readability and transparency, so everyone is confident in the results.

Determining Your Tenancy Strategy

There's one question that product managers and development teams often don't consider enough when looking to embed a cloud analytics platform in their products: "How do we scale when we reach hundreds or thousands of customers?"

Using multi-tenancy to scale

To scale embedded analytics successfully, you must consider several things. The ability to monitor uptime and availability is critical as the number of customers grows. And as your customer counts grow, ensure that rolling out upgrades and updates remain just as easy as it was for your first one. Also, efficiently use cloud and server resources across customers and easily pool and scale more resources.

If you're delivering an application in the cloud to your customers, no doubt it's multi-tenant, but make sure that any embedded analytics platform you use is also multi-tenant at its core, too. With that assurance, you can easily manage your customers, monitor overall performance, and efficiently perform upgrades.



TECHNICAL
STUFF

When you think of multi-tenancy in cloud computing, think of an apartment building where multiple tenants share space in a single building owned by a landlord. All the tenants share the same infrastructure of the building, which creates huge efficiencies. With cloud computing, instead of sharing common building infrastructure such as plumbing and electrical service, tenants share the same application instance. Everyone is running on the same version. One system exists for the provider to update and monitor, and there's no need to carve out a separate installation for each customer so it's easy to add (and remove) customers. As a provider growing your customer base, you're not growing your operational costs at the same rate.



REMEMBER

Multi-tenancy is a great approach for delivering cloud products at scale. This architecture delivers multiple benefits:

- » **Efficiency:** Simplify managing upgrades and maintenance. Applying fixes or updates only requires you to make a single upgrade, while single-tenancy requires a separate upgrade for every customer.
- » **Cost:** Allocate shared computing and storage resources across customers, resulting in significant savings. In single-tenancy, each customer must be provisioned resources, making it difficult to align resources with customer uses.
- » **Observability:** Your operations team can easily monitor the health and uptime of a single deployment to quickly triage uptime issues. But with single-tenancy, monitoring and tracking issues in hundreds of individual customer instances requires a large operations team or a significant investment in tools.

For providers, it adds up to delivering software with higher gross margins and providing better customer satisfaction. When customers are on the same version of software, the support experience is better, and operations teams can better monitor uptime, delivering increased availability.

Knowing what to look for in multi-tenant embedded analytics

If you're a software vendor looking to embed an analytics platform in your application (which is probably already multi-tenant), ensure that it supports multi-tenancy so your customers can run securely in one deployment. Unfortunately, most analytics providers treat embedding analytics as a part-time gig because their real focus is building an analytics platform for companies to use internally and not for product teams to embed in their apps and deploy to their many customers.

Many analytics providers offer limited multi-tenant features such as tenant-level-only administration and workspace separation, but monitoring the overall environment is still difficult. Others only offer server-wide administration, making it challenging to administer at the individual customer level and hard to customize for specific customers.



TIP

Sisense Fusion's multi-tenancy allows you to handle all your customers from a single, consolidated interface and deployment. You can monitor the health of the entire deployment across all your customers. Because all your customers are on one Sisense Fusion deployment, performing upgrades and updates is much simpler.

Sisense has built-in complete logical data and access isolation for each tenant, so you can run all your customers in a single deployment, separating their data, dashboards, data models, and customizations securely. You can easily add or remove your customers on demand.

Sisense gives you these management benefits, but it also has been careful to make no compromises in control. You still get granular control, customization, and monitoring of each tenant, adding up to more robust tenant-level data, asset partitioning and flexibility, and a multi-tenant model's efficiency, observability, and cost-effectiveness.

Simply, true multi-tenancy should be top of your list when evaluating embedded analytics platforms because it has profound operational implications as you scale.

Choosing Platforms that Incorporate Sophisticated Query Optimizations

Nothing hurts the user experience more than poor performance. Waiting for dashboards or dashboard components to load or reports to run deadens analytics success. No matter if you're embedding analytics in your products or delivering them to your team, your users may lose interest and question the quality of your product and the integrity of the data you provide.

Discovering challenges of hand-tuned queries

The Structured Query Language (SQL) queries generated by some analytics tools read like hieroglyphics. If you try to optimize the SQL with complex data models, you soon encounter a tortuous experience with code that's difficult to read, debug, and test.

Poorly written queries can become costly in terms of database load and, in many cases, require an intermediate solution between the analytics tool and the database to improve performance.

Taking the load off your development team

Your analytics team has better things to do than spending its time tuning, testing, debugging, and optimizing database queries. Your team's time should be devoted to creating more dashboards and insights, and ultimately value for your organization.

Your team's goal is to achieve strong query performance to delight customers and drive engagement without bringing those in charge of delivery to their knees in never-ending manual query optimization and decoding obtuse SQL statements. Getting your team to its goal requires overcoming many issues. Data volumes and data complexity are greater than ever and compounded by the fact that many data warehouses exist, each with their own SQL nuances.



TIP

If an analytics engine is included with your embedded analytics platform, it can provide a powerful way to automatically optimize query performance. For example, the Sisense Analytic Engine provides both easy-to-achieve query performance and query transparency and explainability. Analytic Engine is like your personal SQL wizard designed with the goal of improving dashboard load times and ensuring strong performance — all while making it simple for you to review a highly readable query, not complex SQL, which yields more confidence in the output.

Analytic Engine unlocks the full power of your data warehouse, without your product team having to get buried in continuous SQL optimization, while your analytics users automatically get faster and more responsive query performance.

However, it doesn't need to come at the cost of hard-to-understand SQL. For example, in Sisense, you see a readable query expressed in JavaScript Object Notation (JSON) format expressing the exact meaning and showing dimensions, aggregations, and filters in play.



JSON is a standard file and data interchange format using human-readable text and format to store and transmit data objects. For example, consider the following simple code:

```
{
  "datasource": "Training",
  "metadata": [
    {
      "dim": "[Customers.country]"
    }
  ]
}
```

Behind the scenes, Analytic Engine converts code to highly optimized database-specific SQL by using a vast range of strategies and cues to generate the best possible query. Analytic Engine collects information from widget fields, filters, and reference data; compares different query plans, their cost of execution, and the best way to apply joins and filters; and improves the execution of calculated measures.

Analytic Engine can result in five to ten times faster queries, even with complex data security rules in play. Figure 3-1 shows the resulting faster queries.

Example Customer Dashboard	Load Time (sec)	Max Query Duration	Average Query Duration (sec)
Old Way	55.41	3.48	0.68
With Analytic Engine	19.55	0.65	0.24
Acceleration	64.72%	81.32%	64.71%

FIGURE 3-1: Analytic Engine dramatically improves query execution time.

Results like these eliminate the need for wading through arcane SQL database optimization and other techy tweaks. Every query starts out as clearly defined relational algebra, so you start with a highly readable query for every database that Analytic Engine turns into great SQL.

- » Being intentional with analytics
- » Planning around your use cases
- » Understanding the value in decisions over reports

Chapter 4

Ten Pieces of Advice for Effective Embedded Analytics

This chapter touches on some important tips for you to plot the best path to embedded analytics, it gives you advice to avoid pitfalls, and it provides strategies to reap the best benefits from your initiative. Take note of this advice:

- » **Be intentional about what success looks like.** Understand what success looks like for your users so you can set up your data model, workflows, and visualizations so your users can ask the questions that are most relevant to them.
- » **Plan the data model based on your customers' analytics needs.** After you have your customer requirements and use cases mapped out, plan a data model based on these use cases.
- » **Beware of the Swiss Army knife.** When evaluating analytics solutions, be wary of products that promise everything to everybody.
- » **Ask vendors to share their scaling metrics that match your use case.** When evaluating analytics vendors, you must

ask them to compare and match their scaling metrics to ensure their product can scale to your customer use cases and data requirements.

» **Ensure your product team can customize your embedded analytics.** The product should

- Match your look and feel and workflows
- Offer fast ways to embed, such as iFrames
- Provide modern software development kits (SDKs), supporting languages like TypeScript, and web frameworks like React

» **Think through your plan for descriptive, predictive, and prescriptive analytics.** Your data can only record what's already happened.

Don't run out of headroom in your embedded analytics platform when it comes time for you to add more advanced artificial intelligence (AI) and machine learning (ML). Learn if the platform you choose can deliver capabilities such as anomaly detection, forecasting, and recommendations that you can deploy to your users in the future.

» **Decisions are more valuable to users than reports.** Your reports and analytics are only as good as the insights that they provide.

» **Ensure you have your operational bases covered.** It's easy to focus on visualizations and forget about integrating delivery into your DevOps processes or using multi-tenancy to grow across your customers.

» **Telling a story by using data is harder than it looks.**

Capturing data is the easy part. Your product has probably stored massive amounts of data, but what do you do with it? The hard part is using this data to tell a compelling story that guides your users to correct decisions.

One way to achieve strong user engagement is to tie analytics directly into your users' workflows (instead of simply embedding entire dashboards).

» **With analytics, data is front and center, which means security is too.** Security is always paramount, but when your users are clicking around and exploring data, ensure that you have all the controls in place.



WARNING



TIP



Build intelligent analytics into your products

Convert data into revenue by embedding AI-powered analytics with pro-code, low-code, and no-code capabilities. From Git integration to robust APIs and SDKs, Sisense Fusion is built for embedding —working with dev teams and the technologies they rely on.



Learn More

sisense.com

Choose the best embedded analytics platform

Welcome to *Embedded Analytics For Dummies*, Sense Special Edition. If you're an engineer looking to embed analytics into your product, this book helps you choose the right embedded analytics platform for your needs. You discover the features and performance you need to make better-informed and scalable business decisions.

Inside...

- Move beyond the dashboard
- Choose between buying and building a platform
- Determine your scaling strategy
- Incorporate query optimizations
- Plan use case models
- Apply tips for effective embedded analytics



Andrew Moore is a leader in software engineering with 25+ years of experience working on contact center automation, management tools, discrete-event simulation, and air traffic management. He also leads a team of engineers that's developing software to transform teaching and learning around the world.

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