

BEAM and UX Design

By combining proven BEAM business-oriented data modeling techniques with a user-focused design methodology, you can quickly design a data warehouse that is flexible, usable, and high performing.

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Summary

There are two schools of thought in data warehouse design: the bottom-up (or data-driven) approach and the top-down (or report-driven) approach.

The bottom-up approach focuses on the available data rather than input from end users. Because developers start with complex models that attempt to incorporate all the available data, but fail to answer real-world business questions, this method often leads to a warehouse that takes a long time to deliver any business value.

At the opposite end of the spectrum, **the top-down approach begins with the reporting requirements of the business to prioritize and deliver the warehouse.** However, business users typically find it difficult to articulate detailed requirements beyond their current reporting needs. As a result, the warehouse may deliver value initially but eventually becomes inflexible and does not scale to meet future needs.

This paper will outline a framework that combines the best of both approaches while avoiding their drawbacks. The first part of the framework is the data requirements gathering/data modeling technique BEAM (Business Event Analysis & Modeling) described in the book Agile Data Warehouse Design by Lawrence Corr. The second part employs techniques from the UI/UX design discipline, which puts the focus on end users to help create functional data applications that support business decisions.

This paper will discuss how combining these two techniques in an Agile way to deliver fast and lasting value to the business designing a data warehouse.

BEAM Overview

BEAM is an Agile methodology for gathering Business Intelligence data requirements by concentrating on the underlying business activity that needs to be measured.

These business events are discovered and documented by modelstorming with business stakeholders and domain experts. BEAM is ideal for this form of non-technical interactive data modeling/brainstorming as it uses simple language constructs (verbs, nouns, adjectives and adverbs) and provides a systematic 7W (who, what, when, where, how many, why, and how) script for exploring interesting analytical data sets. The process begins with a deceptively simple question: “who does what?” and continues through the other 5W question types.

The answers to these: a subject, verb, object, and its related nouns, are initially captured in tabular form (BEAM Event Table) drawn large on whiteboards or multiple flipcharts using example values to record the data requirements as understandable “event stories” with a strong readable narrative. Once an initial single event has been completed a BEAM facilitator will ask “who does what next?” or “who does what before this event?” to capture related events and support cross-process measurement. The multiple event answers to these questions are recorded on a BEAM Event Matrix: a business-friendly cross tabulation of event verbs by common nouns, similar to a Kimball dimensional bus matrix. Stakeholders use this matrix to prioritize events that support their current reporting requirements. The highest priority events and their common nouns are modeled in further detail using the 7W script and further Event tables as candidate facts and dimensions.

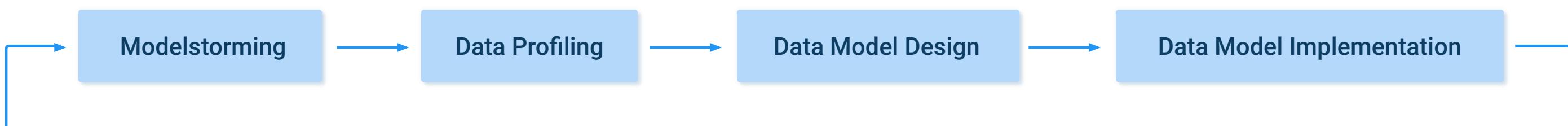


Figure 1: The BEAM process starts with “Model Storming” sessions with stakeholders, then data profiling, data model design, and data model implementation. The sequence is repeated for each new business process or event that must be measured.

UI/UX Design Overview

Even when business users have a good understanding of their business objectives and their data, they struggle to map data to objectives so as to drive results.

Therefore, they end up with BI applications that are unintuitive and have low user adoption. By leveraging user-centric UI/UX and Design Thinking best practices to gather BI application requirements, we can create applications that drive impactful business decisions. The process has six phases: understand, define, diverge, decide, prototype, and validate.

UX Design Process in Six Phases

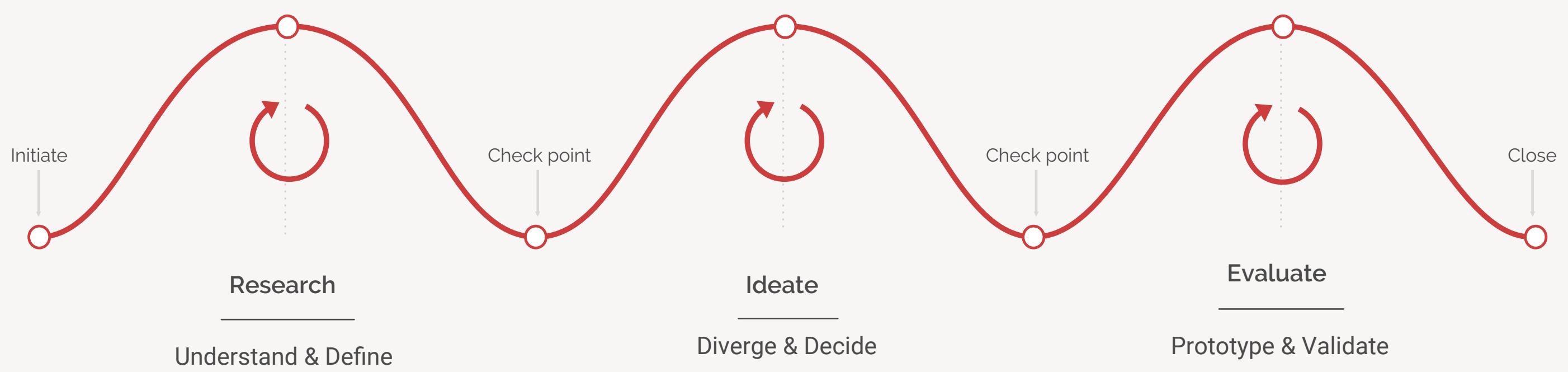


Figure 2: The six phases of the UI/UX design process: Understand, Define, Diverge, Decide, Prototype, and Validate.

First, we look to **understand** the business by conducting one-on-one user interviews with representative end users. Next, we **define** personas based on these user interviews. Persona cards list business goals, activities, and key questions/metrics for representative users.

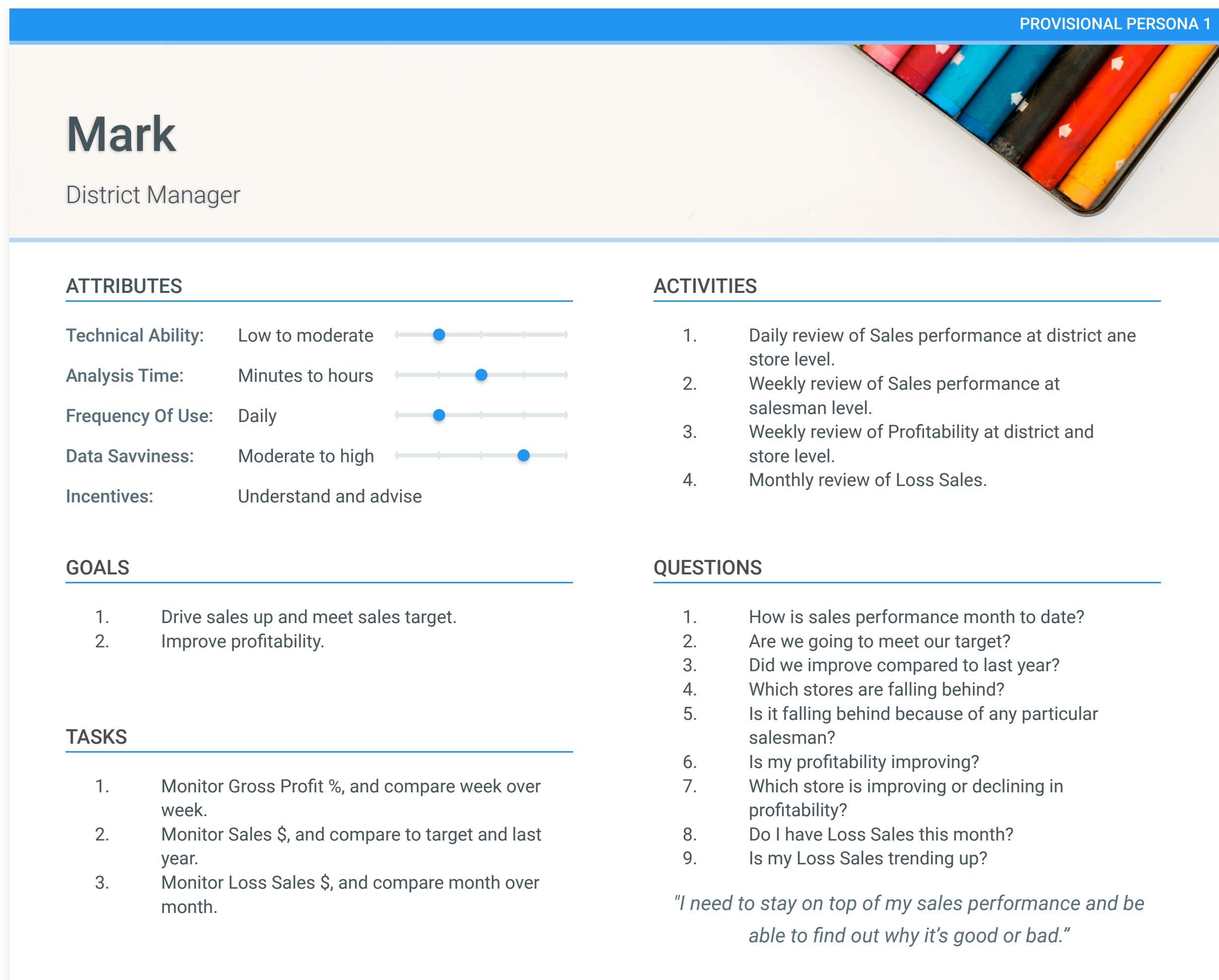


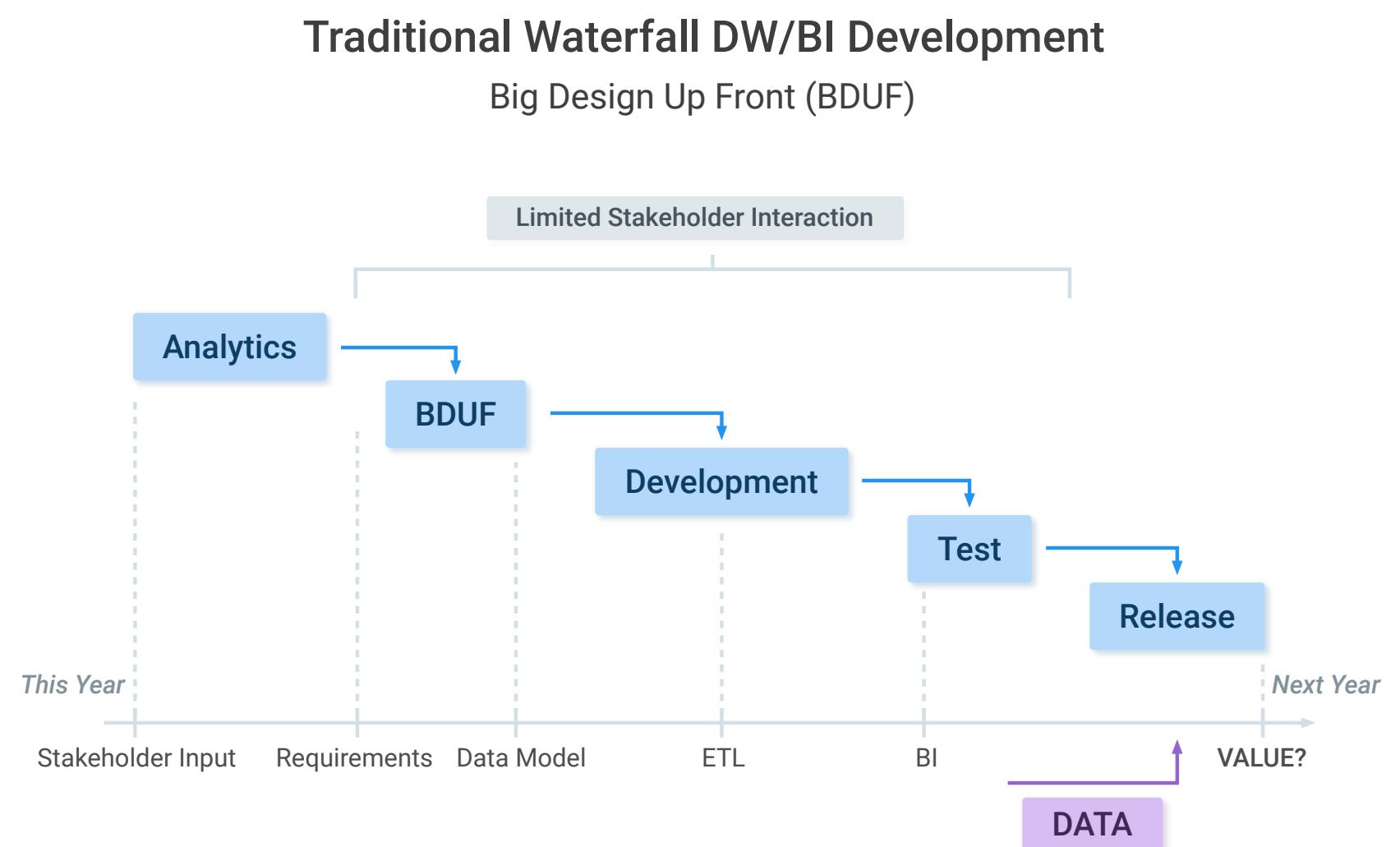
Figure 3: A persona card is created based on the information gathered in the understand phase. It is a representative persona of an end user which includes their goals, activities, tasks, and questions.

Then during the **diverge** phase we do whiteboarding sessions with a group of designers to create visualization concepts that answer the key questions in the persona cards. Next, we **decide** on the best solutions by grouping concepts from the brainstorming sessions into views (or a screen/dashboard), mapping personas to views. We take the low-fidelity sketched views to the stakeholders to discuss. Once the views have been decided upon, we create a high-fidelity **prototyped** solution. Then we **validate** the solution with stakeholders which we iterate until a solution is agreed upon.

Problem: BDUF vs. JEDUF

One of the problems often encountered in BI development is the speed of delivery to business users.

Often the business comes to IT with a question that they are trying to answer, and IT spends months developing a solution. Long analysis, design, development, testing, and release phases follow with the goal of delivering a comprehensive solution that answers every imaginable question. This approach, often referred to as Big Design Upfront (BDUF), is illustrated to the right. By the time the business receives the solution, they have already answered the question by other means or their priorities have shifted to the next hot topic. As this happens repeatedly the business begins to lose confidence in IT for supporting their BI needs which often leads to shadow IT initiatives.

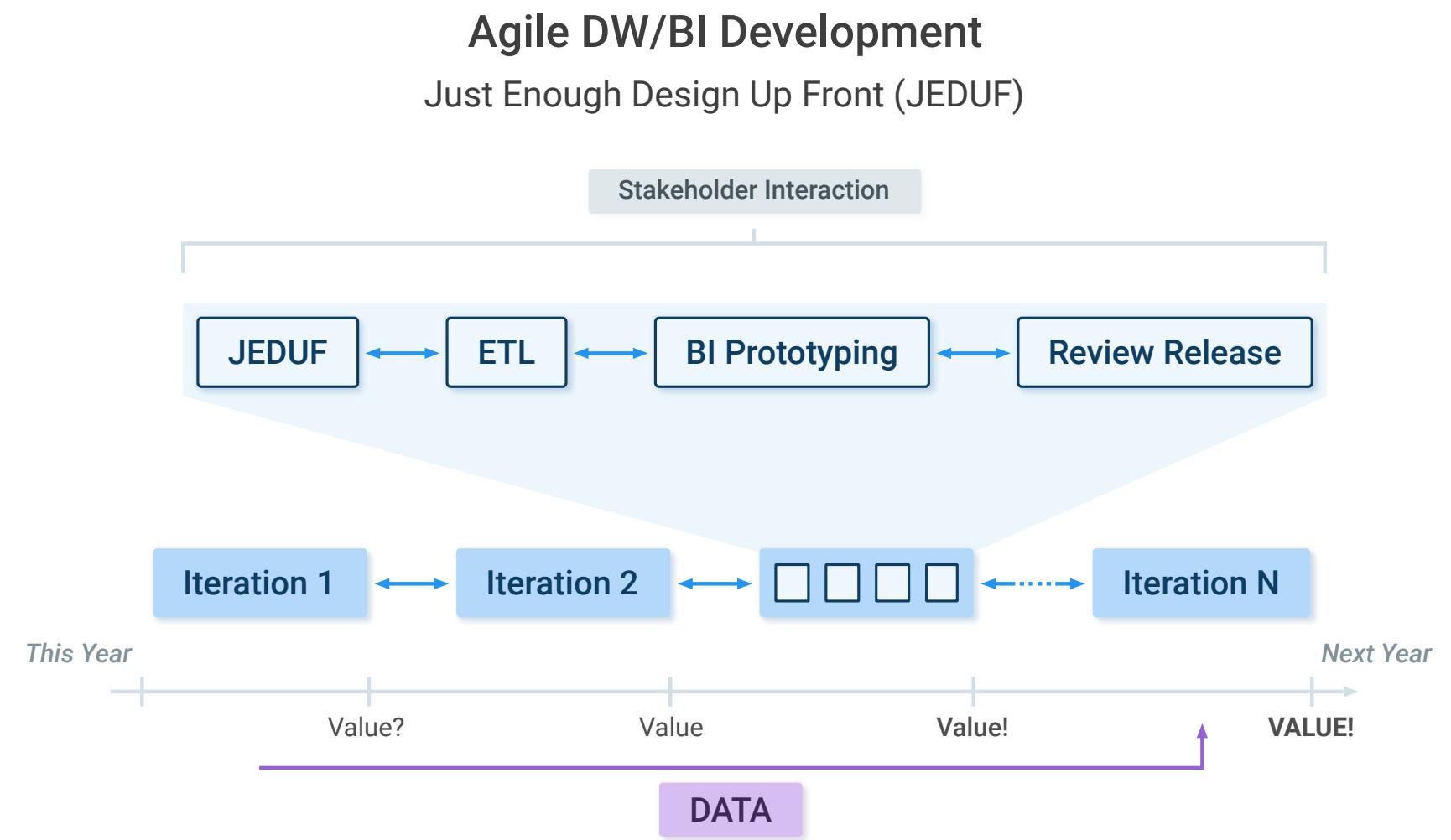


- Big investment upfront
- Slow delivery of value to the business
- Loss of credibility and user adoption

Figure 4a: Big Design Upfront (BDUF), taken from Agile Data Warehouse Design by Lawrence Corr Page 16.

The solution to this is to take a more agile Just Enough Design Upfront (JEDUF) approach to data warehouse development,

illustrated on the right. With this approach development is done with just enough data design to answer the current business questions and the understanding that the design is iterative and will be revisited when the business comes up with additional questions. This quick delivery of business value creates trust between the business and IT and provides momentum for increased user adoption.



- Small investment upfront
- Quick delivery of value to the business
- Increase of credibility and user adoption
- Iterative

Figure 4b: Just Enough Design Upfront (JEDUF), taken from Agile Data Warehouse Design by Lawrence Corr Page 16.

One Without the Other

Earlier we described BEAM and UI/UX design separately. Now imagine what would happen if one was implemented without the other. In the instance of BEAM without UI/UX, we would understand what events the business are interested in measuring, by asking them

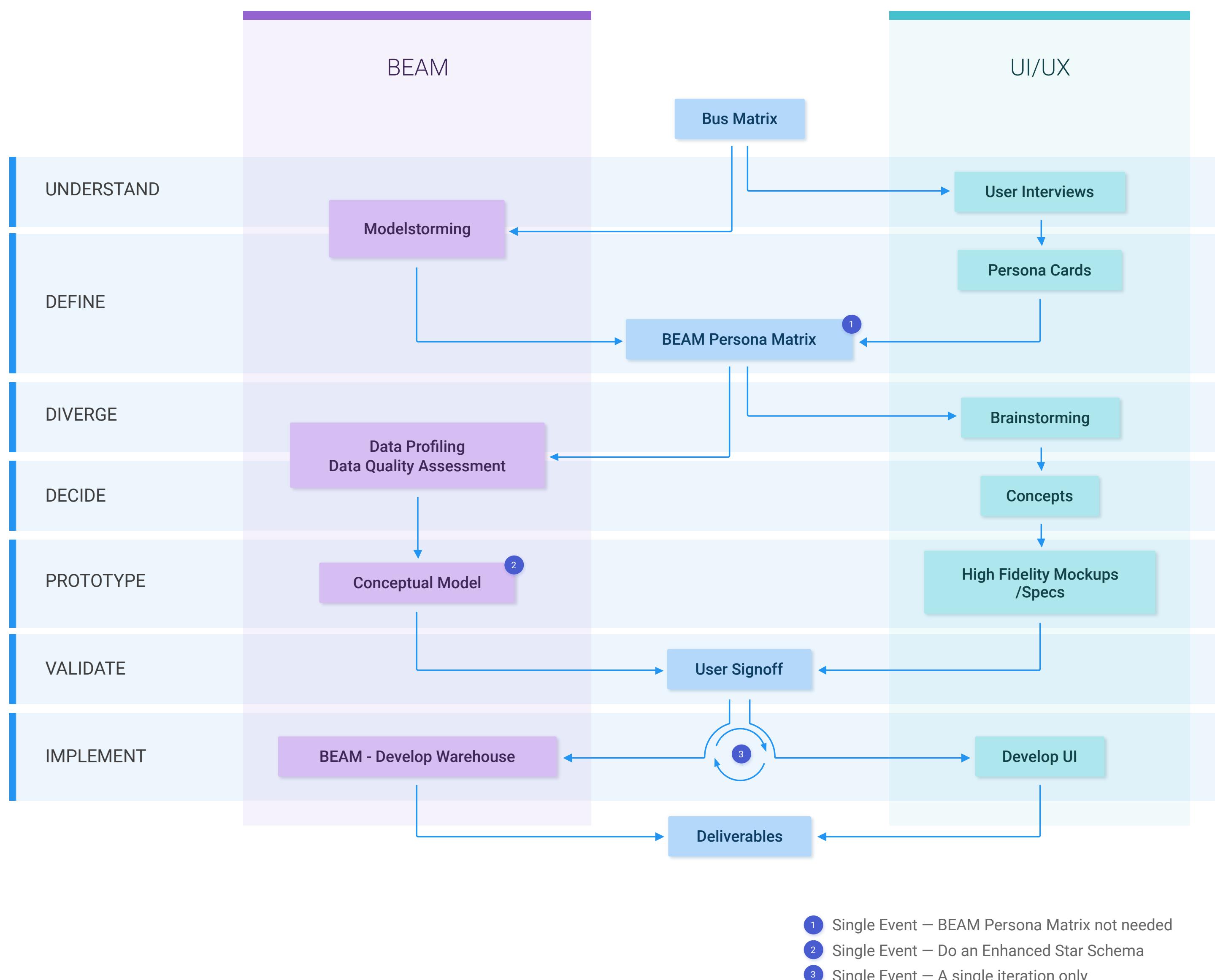
the 7Ws, and we would understand the available data, by doing data profiling, but we will not immediately have a useful report. This will lead to low user adoption and loss of momentum within the IT organization. Conversely, if we implement UI/UX design without doing a BEAM

analysis we can draw up an incredible dashboard but will not be able to deliver on our promises to the business due to a lack of detailed data knowledge to feed the dashboard. We need a solution with the best of both worlds that is implemented in an agile way.

Solution

By combining the UI/UX design process with the BEAM methodology, we get the best of the top-down and bottom-up approaches to BI development.

Figure 5 below provides an overview of how the two methodologies work in parallel, with key steps where they intersect.



The first step is to understand the business problem. We begin by holding an initial scoping exercise with a key sponsor, or primary requestor. The objective of this exercise is to create a preliminary process matrix with the relevant business processes and key dimensions.

	Manufacturing Plans	Procurement	Component Inventory	Manufacturing	Product Inventory	Shipments
Employee		Yes		Yes		
Supplier		Yes		Yes		
Reseller						Yes
Carrier		Yes				Yes
Component		Yes	Yes	Yes		
Product	Yes			Yes	Yes	Yes
Process				Yes		
Test				Yes		
Plant	Yes	Yes	Yes	Yes		
Warehouse					Yes	Yes
Store						Yes
Contract		Yes				Yes
Ship Mode		Yes				Yes

Figure 6: A preliminary process Matrix used to define the scope of the design requirements. This document is only meant to serve as a guideline to direct efforts in the right direction. The details will be clarified and fully documented in the BEAM Event Matrix

Next, we conduct one-on-one interviews with a representative group of users to understand their business goals, activities, and key questions/metrics. Using the responses from interviews, we validate our initial process matrix and conduct a modelstorming session to get users to start thinking about their data dimensionally. If we identified multiple relevant events in the preliminary process matrix in the initial modelstorming session we will begin our session by creating a more in-depth BEAM Event Matrix.

Then we can move onto sketching out the BEAM Event Table and BEAM Dimension Tables (see figure 7). The goal of this session, with multiple events, is to create

guidelines for identifying data sources. We will have an opportunity later to gather example event stories when we implement each event in the implement phase. If the scope is limited to a single event, we go straight to a BEAM Event Table to understand the details of the event by collecting example event stories. In this situation, we use the 7Ws described earlier to fill out the event table and related dimension table(s). We conclude the modelstorming session with questions about additional business processes that are of relevance to the users. This will help identify conformed dimensions in the data warehouse. It also helps users start thinking creatively about additional BI applications, which in turn increases momentum within our IT organization.

Orders		TF						
Customer	Product	orders	on Order Date	from Salesperson	at Sales Location	for Order Quantity	using Revenue	Order ID

Figure 7: When we have multiple events, we need to gather requirements in support of the UI/UX design. Therefore, during the initial modelstorming session our focus should be on identifying the columns necessary. The intent at this stage is to gather enough information to begin data discovery.

Once we have a good understanding of the business requirements it's time to move on to the define phase. As described in the UI/UX Design Overview section, during the define phase the UI/UX designer creates personas and documents them on persona cards (see figure 2). When we have multiple events incorporated into our UI/UX design, it can be helpful to have a couple of meetings before we move onto the diverge phase to focus our efforts and make sure we don't diverge too far.

The first meeting is between the data warehouse designer and the UI/UX designer to discuss the business events and the personas and how they relate. During this session, we create a BEAM Persona Matrix. This document acts as a bridge between the events and dimensions required and the personas and their key questions (see figure 8). Then they present this information to the stakeholders and use it as guide to rank the order in which the business events get implemented in the warehouse. This way we can focus our efforts moving forward.

BUSINESS EVENT	PERSONA		
	District Manager	Multi Store Owner	Sales Manager
Customer orders product	How is the company performing? Are we on track to meet our target? How are we doing vs last year? Is my district performing well? How are we doing vs target? How are we doing vs. last year?	How are stores performing in my district? How are we doing vs target? How are we doing vs. last year?	How are my stores performing? How are we doing vs target? How are we doing vs. last year?
	How are salesmen performing in my district? Which salesmen are underperforming? How are sales trending by month? How does this compare to the previous year?	How are salesmen performing? Which salesmen are under pefroming? How are my stores the busiest? How does this compare to the previous year?	How are salesmen performing? Which salesmen are under pefroming? When are my sales the highest? Is there a gap between this year and last year
	Do I have any loss sales for this year?	How seasonal are my parts? Why are customers buying brakes but not batteries? Which store was responsible for a sale at the SKU level? Which of my countermen performed well this month?	Who are my top and bottom customers? Which customers have stopped buying from me this year? What products is a customer buying?
		What type of returns are coming in? Are they new, core, defective? Are there customers I need to watch out for?	Are my returns too high when compared to my sales? Which customers are returning the most products? How much are they returning when compared to the average?
	Are my stores delivering on time? What's my on time delivery %? What is the average delivery time by route, driver and store? Which stores have less than a 95% on time delivery time?		
		Is my inventory growing or shrinking? What is the total company inventory? What is the core inventory? What is the store level inventory by month? What is the turnover rate by month?	Are items being oversold? Are there discrepancies between parts ordered and received? Do I have enough stock of parts?

Figure 8: The BEAM Persona Matrix illustrates the intersection between personas and business processes. The key questions that are answered at the intersections will help stakeholders prioritize the implementation of certain portions of the data into the warehouse.

Once we have direction from the stakeholders, we can move into the **diverge** phase. During this phase the UI/UX designer brainstorms possible solutions and the data warehouse designer interrogates data sources required to provide the data. In the next phase, we decide on potential solutions. The data warehouse designer and UI/UX designer meet to discuss requirements and data availability to arrive at the best possible solution.

Then we proceed to the **prototype** phase, where the UI/UX designer creates high-fidelity mock-ups of their UI design. Ideally, the UI mock-ups should be done directly in the BI tool using an early BEAM design schema and sample data rather than using a drawing tool to avoid rework in the implementation phase. Meanwhile, if there is only one event, the data warehouse designer creates the enhanced star-schema. If

If multiple events are required, the data warehouse designer should work on creating a conceptual model of how the events should be implemented, including considerations for conformed dimensions.

Next, we **validate** our prototypes with each other ensuring that the data model provides the data to support the identified metrics and attributes, and validate the designs with the business stakeholders to ensure that the UI fulfills their needs. We iterate with the stakeholders until everyone agrees on an appropriate solution. Then we are ready to move to implementation.

When we have only a single event to design, the data warehouse developer should have an enhanced-star schema and the other documentation necessary to implement the solution in the warehouse while the UI

developer will have the mock-ups as a guide to develop the UI. However, when we have multiple events to design, we will implement these in **sprints** based on the ordering that the key stakeholders provided. For each event we will need to have another modelstorming session with stakeholders to complete the BEAM Event tables and BEAM Dimension tables. We will need to do additional data profiling on any new fields that were identified this time around and create the enhanced star-schema. Then we can implement that event into the warehouse and the UI developer will be able to create that portion of the UI.

We then iterate this process until we have implemented the entire application.