Envisioning a New Future for the Enterprise with a Big Data Experience Framework

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Abstract. The enterprise experience is often a fragmented one that spans multiple vendors, devices, and products. Big data has garnered attention as companies attempt to transform it into a competitive advantage. In the enterprise where users generate mountains of data, it is often under-utilized for managing the user experience (UX), or at best used in a limited way to improve an individual product. Those wanting to do more with big data often struggle to derive meaningful insights or relate it to outputs of more traditional UX methods. We present a hybrid analysis approach to bridge the chasm between big data and outputs of UX methods; it allowed us to define an over-arching experience framework that provided actionable insights across the enterprise. We will discuss the underlying methodology and how the work is transforming experience decision making. We will highlight how different roles use the framework and provide key learnings from its use.

Keywords: enterprise transformation, IT strategy, user experience, big data, service design, agile teams, user research, organizational transformation.

1   Introduction

As systems required to keep companies running smoothly grow larger and more complex, enterprise users are faced with increasingly convoluted and fragmented experiences that span multiple platforms, products, and devices. In the course of a normal day, enterprise users typically must jump between disconnected tools, deal with vastly different interfaces, and enter already known data about themselves just to complete their work. Users are left to manually bridge the chasms between tools and make sense of contradictory interfaces. Their experience is seldom satisfying and often bewildering, leaving them frustrated and less effective.

Consumerization is also increasingly impacting user expectations of the enterprise. Once these users leave the confines of the enterprise, they encounter consumer devices and applications that allow them to seamlessly and much more easily accomplish a wide variety of tasks, including some of the very same ones they do with more difficulty within the enterprise. As a result, never in the history of the enterprise has the gap between user expectations and enterprise reality been larger.

Traditional, well-established methods of managing the enterprise abound, but they typically focus on the functioning of the underlying systems and processes. Users are often treated as a system component and expected to comply with enterprise mandates much to their frustration. In response to user dissatisfaction, IT shops are increasingly turning to user-centered approaches as a means of improving user productivity, increasing business velocity, and in general increasing the appeal of enterprise solutions with their target users. However, enterprise UX professionals, like their more traditional IT counterparts, often focus on a specific system. UX success, when it happens, is often siloed within a particular interface or system.

In 2011, after years of siloed UX engagements that failed to significantly improve the overall experience, our large corporate IT shop took an audacious goal to define a One IT enterprise experience that spanned the multitude of products offered by our IT shop. The aim was to develop a holistic understanding of the enterprise experience and provide an experience vision that individual IT teams align their product with. This approach is a fundamental shift in the management of the enterprise experience from the perspective of both IT and UX. Success required UX professionals as well as their IT counterparts to transform their work practices and use the framework as a shared language for discussing the enterprise experience. To make this information easily re-usable, a set of core artifacts and processes were developed along with workshop and training materials to help teams across IT use this experience vision to set their product strategy and identify design opportunities.

In this paper, we will discuss the details of the hybrid analysis approach used to create the framework and bridge the chasm between big data and more traditional UX methods. We will decompose the framework and provide examples of how it is being used within the enterprise. Lastly, we will map the evolution of this effort over the course of the last two years, share learnings from our journey, and discuss the benefits of having a re-usable, over-arching experience vision in guiding IT decision-making.

2   Architecting a Unifying Experience Framework

Like most enterprises, our large corporate IT shop had a wealth of data that could be leveraged to understand the over-arching IT experience. Stored in siloes across the enterprise, the available data included both "big data" by-products of operations (e.g., transactions, support tickets, social data) and outputs of traditional UX methods (e.g. interviews, participatory designs, surveys). Enterprise data provides details about user behavior, but does not help enterprises understand what motivates behavior or its larger context. While UX methods provide rich contextual insights, they rely on small numbers of users and sample sizes that are seldom statistically significant at the enterprise level, which puts their generalizability into question. Taking a hybrid approach that utilizes both data types, however, had the potential to mitigate these inherent risks and would enable us to study both the actual behavior of users along with their attitudes towards their IT experience.

Unfortunately, the nature of these diverse datasets does not lend itself to easy connecting. Enterprises often manage operational data in silos around infrastructure

or applications; this data is often incompatible, incomprehensible, and messy to tie together. The narratives that are the by-product of many UX methods are seldom analyzed to the point where shared, underlying structures are visible which is a significant obstacle to connecting insights from different UX studies [1, 2]. However, by far the most daunting challenge to leveraging the combined intelligence of these datasets was the lack of connections—that is, a way to link these disparate datasets and to connect specific aspects of the experience to the stored mountains of data.

2.1   Connecting the Data

Before we could uncover the underlying patterns that would transform this data into actionable insights, we had to grow connections in the data, which included both operational data and primary UX research. The many gigabyte data set spanned over 100K employees around the world; it included over 700 hours of user narratives, 20K surveys, and 18 million transactions. We put users at the center of our strategy for connecting the data. Each piece of data was linked to a specific user, and all data for an individual user linked together. As our foremost concern was protecting the privacy of employees, prior to making any attempt to integrate the data sets, the raw data was anonymized by replacing all employee identifiers with an encrypted identifier. By organizing the data in terms of individuals, we could more easily discern user patterns and connect new data as it is discovered.

Enterprise Big Data. The operational data set included employee demographics (e.g. role) and by-products of their transactions (e.g., search history). Connecting the vast amounts of data required different technologies and skill-sets outside of traditional UX. Architecting a UX repository that could house the combined data required technical knowledge (e.g. what platforms to use) as well as developing robust data models. Identifying what transactional systems and data entities were important required knowledge of underlying processes. Given the size and degree of decentralization of our IT organization, identifying data owners across the various organizational silos and negotiating access took large amounts of time.

Integrating structured data from the various systems was challenging, due to the wide variety of file formats and capacity limitations of our repository. Sometimes we could use ETL (Extract-Transform-Load) to bring the data into our repository. In other cases, data would be provided in "flat files". When the magnitude of the incoming data exceeded the repository capacity, we would develop summary usage metrics for individual users and connect those measures in lieu of the raw data.

Unstructured data (e.g., contents of social media platforms, web logs, and other unstructured textual information) was rich in insights, but difficult to make sense of. Approaches using Apache Hadoop architectures helped in the management of unstructured data. Using these "big data" tools meant that we had to acquire new skillsets (Unix/Linux, Java coding, data management tools) which we did by training team members and by building partnerships with data architects and developers in the larger IT organization. Using Apache Hadoop has opened the door to text analytics for: pattern recognition, clustering, sentiment analysis, and visualization. It also

allows for predictive analytics which benefit our support organizations and user determined taxonomies which describe issues or increase search relevance.

UX Narratives. The UX narrative data was the result of large-scale user research focused on identifying the real problems and needs of users across the corporation, this included over 250 hours of interviews and observations, 300 participatory design sessions, and 100K support requests. The narratives provided rich, near verbatim accounts of users' enterprise interactions and were treated as a direct representation of experience or a critical part of a user's underlying mental model [1].

We manually coded the narratives using a mix of exploratory and structured coding. Structured coding was limited to the support tickets, with each categorized in terms of the underlying usability issue (e.g., unclear language). For the more free-form narratives, we started with the smallest actionable narrative chunks (e.g. low-level statements) and built the coding structure from the bottom up. While we let the user narrative guide the structure, we made sure to code certain attributes including workflow (e.g., steps, triggers, decision points), critical incidents, environmental factors (e.g., location), social connections, underlying technology (e.g., tools, a process, or device), and individual characteristics (e.g., attitudes, motivators). The resulting coding structure represented the users' over-arching mental model of the enterprise experience [3] and defined the experience that users wanted IT to deliver. Summary measures were defined based on the emergent coding structure and the number of references for each high-level node in the top levels of the structure. Rather than merge the whole narratives into the repository as unstructured data, we used the summary measures to connect the narratives to the operational data.

2.2   Discovering an Underlying Conceptual Architecture

By connecting the outputs of UX methods, with the structured data of transactional systems, along with unstructured data available in logs, discussion forums, and other sources, we had a vast amount of information from which to develop insights about enterprise users. Our search for underlying meta-patterns from which a conceptual experience framework could be defined began with the emergent coding structure derived from the UX narratives. The coding structure mapped meta-patterns of user needs, while served as a concept map of the desired enterprise experience, that included rich levels of detail that allowed the experience to be decomposed to the level of user requirements.

The connected operational data sets in the UX repository were invaluable when it came to refining and testing coding meta-patterns. By looking at the data connected with a specific individual, we could view the user's "footprint" within the enterprise for the previous year. We tested the generalizability of each meta-pattern using these enterprise footprints. For instance, our UX narratives suggested people in certain roles had much broader information interests than other employees. We initially verified this pattern using the footprints of users who had provided related narratives; then fine-tuned the pattern using data from the entire enterprise.

Using a variety of statistical pattern-finding methods including clustering and social network analysis, we could refine our initial set of meta-patterns and increase the granularity of our underlying model. We would also mine the UX narratives to help us explain operational trends that our pattern-finding methods discovered. At times, we had to add additional data to aid our sense-making. Over a period of months, the final meta-patterns emerged and became the building blocks of the experience framework. These patterns are discussed further in the following section.

2.3   Bringing the Framework to Life

We wanted the experience framework to serve as a conceptual architecture that would help IT teams envision a new future for the enterprise and make a structural shift towards the desired experience. While the data patterns were potentially powerful, they did not lend themselves to easy re-use in different contexts. We needed teams to be able to zoom in and understand, at a detailed level, how the framework could help them reframe the experience of a specific product or service. At the same time, we needed teams to be able to zoom out and assess how well their product fit the larger experience. Both required a visible and actionable hierarchy of experience attributes that would facilitate reuse and help us measure to what extent IT products and services were aligning with the envisioned experience.

We introduced large-scale, layered storytelling and a structured vocabulary as a means of bringing the underlying richness of the data to life and making the envisioned enterprise experience sticky to larger IT. Each of the underlying stories focuses on particular piece of the framework and ignores the rest. Strung together they map the desired experience, but individually only tell a piece. Users of the experience framework then take these stories and underlying data to craft their own stories that are grounded in the context of what they are trying to do; many stories are possible from the same data. The stories associated with different pieces provide different insights and follow different models; they are discussed in more detail below.

Themes. They are the core experiences that enterprise users want from IT and define an experience vision that spans the many IT products and services. They help IT teams understand the shared expectations that users have of both the enterprise environment as well as their individual product interactions. To increase the ease of applying an experience theme to a specific product or service, each theme was decomposed into layered components that provide additional levels of granularity around user needs as described here.

- *Qualities* define the essential experience principles needed to bring a specific theme to life include key usage elements and desired functionality. They were packaged as quality "trading cards" and provide tangible artifacts for teams to utilize while setting UX strategy and defining product roadmaps.

- *Elements* specify the key usages that make up a quality, including user scenarios, user requirements, relative importance, illustrative examples, and any user differences. They were packaged in theme vision books and as 8x10 cards to facilitate use in face-to-face design sessions.

Three themes, 12 qualities, 59 elements, and many hundreds of user requirements detail the envisioned experience. Table 1 provides an overview. To aid decision-making, each component had experience objectives defined in terms of user minimum, target, and outstanding expectations of that specific component.

Table 1. The themes and qualities that framed the envisioned enterprise experience

Theme	Qualities
Feed Me I quickly and easily find the information I need to speed my work and my life.	• *Seamless* - Transparent. Integrated but flexible. • *Simple* - Quick and easy. Language I can understand. • *Meaningful* - Points me the right direction, aids me in sense-making of information, and helps me work smarter. • *Proactive* – Push me relevant information, make me aware of changes before they happen, and help me not be surprised.
Connect Me Connect me with the people, resources, and expertise I need to be successful.	• *Purposeful* - Together we do work. • *Easy* - Easy to work together and connect. • *Cooperative* – Larger environment is supportive of me. • *Presence* - Always present or at least I feel like you are near.
Know Me My information is known, protected and used to improve provided services.	• *Recognized* - Know who I am. • *Personalized* - Implicitly know what I need... • *Customized* - Give me choices. • *Private* - My information is under my control. Always protected and secure.

Segments. They are groups of users, with similar usage of enterprise systems, attitudes towards IT, and user needs. Although themes are based on data from thousands of enterprise users and apply to all enterprise products offered by our corporate IT shop, how they apply to individual segments may vary. Some segments were further decomposed into sub-segments based on within segment differences. Table 2 summarizes the major groupings of enterprise users.

Personas put a "face" to enterprise users, with each segment having a persona family that represents it. They provide a common cast of characters for IT teams creating enterprise experiences. They provide summary information on user characteristics, goals and needs, key tasks and behaviors, pain points, use of IT products, and relative priority of different experience qualities. The collateral ranges from persona family posters, individual personas, day-in-the-lifes, and trading cards.

Table 2. Major groupings of enterprise users within our large corporation

Segment	Shared Focus	Sub-segments
Hardware Technologists (36%)	Hardware but at different stages of the product lifecycle	(1) Factory Engineer, (2) Product Engineer, (3) Sales Engineer, (4) IT Engineer
New Employees (19%)	Doing the job while figuring out the corporation (< 18 months)	n/a
Manufacturing Operations (18%)	Meeting production schedules but not always shared language	n/a
Versatile Experts (16%)	Applying their skill sets across the corporation in any organization	(1) Leads, (2) Analysts, (3) Sellers, (4) Corporate Curators
Software Developers (10%)	Software but targeting different audiences	(1) Product Developers, (2) IT Developers
Adminstrators (1%)	Helping others succeed by removing roadblocks and acting on their behalf.	n/a

Influencers. They are core elements of the enterprise environment, whose characteristics impact the user's ability to accomplish work (namely, IT, HR, people, workspaces, and culture). They help assess the relative contribution of core components of the larger enterprise on the use experience. They detail key pain points related to the component and how they interact with other framework pieces,

Activities. They provide IT teams with specifics of how employees use and interact with enterprise products to accomplish shared tasks common to all employees (namely, get information, collaborate, learn, get help, and do), including high-level journey maps, summary transactions related to the activity, and key segment differences relative to the activity. They provide a jumping off point for more specific investigation relative to a particular product or service.

3   Envisioning a New Future for the Enterprise

The experience framework is a representation of the desired future of the enterprise from the user perspective. It provides a thinking model for those who make the day-to-day decisions that define the enterprise. It encourages them to look beyond their immediate challenges, past the boundaries of what they are responsible, and consider the holistic experience from the perspective of enterprise users. It challenges IT professionals to balance the technological and business needs of the enterprise against the needs of its users. Success requires IT adopt not only a shared vision of the future enterprise, but also a shared vocabulary and methods for creating a new future.

3.1   Shifting the IT Mindset

The success of any transformation depends largely on the mindset and commitment of the people who must implement it on a daily basis.   Within our IT shop, UX professionals comprise less than 1% of the workforce. While our IT shop has embraced the idea of leading with UX, we retain a legacy staffing model of traditional IT roles. Many already have a general understanding of UX tools and techniques from long-standing efforts to weave UX into the DNA of the organization, but very limited experience with them.   Our challenge is to create an environment where the value of the framework is agreed upon and it is regularly integrated into working behavior.

Growing Awareness of Value.   In our large IT shop, where we've been given the mandate to Be Bold, and Act Fast, the biggest win offered by the framework was increased velocity. It provided re-usable insights and templates that teams could quickly adapt and insert into existing processes.   By working from a shared understanding of users and design needs, teams could save time across the product lifecycle.   Further by providing common target experiences and shared priorities, it helps create efficiencies across enterprise services and portfolios.

Our approach has been to create broad awareness of the benefits of the enterprise framework and to socialize it thru social media, workshops and training to the target groups shown Table 3. We also encourage use by providing easy-to-use tools. In doing so, we ensure that over 60% of our IT shop – those with the biggest opportunity to influence the experience – are able to take advantage of the framework.

Table 3. Key framework touch points for targeted IT roles

Role	Desired Behaviors
IT Staff	• Adopt a shared vocabulary and strategy for the experience
Service/Product Managers, Enterprise Architects	• Know their role in making the envisioned experience reality • Understand the intersection with their service/products and use that information to drive strategy, roadmaps, and plans • Can evaluate extent to which experience satisfies framework
Business / System Analysts, Solution Architects	• Understand the intersection with their project scope • Utilize framework personas, requirements, and scenarios as the starting point for their work • Can evaluate extent to which experience satisfies framework
Software Developers (de facto designers)	• Utilize design patterns related to the framework • Can evaluate extent to which experience satisfies framework
Quality Assurance	• Can evaluate extent to which experience satisfies framework
UX Professionals	• Think more holistically about the enterprise experience • Leverage insights and share their own UX artifacts

Putting Users at the Center. Segments and personas help offset the technology-centric mindset pervasive in most IT shops by providing an over-arching, landscape of users that spans IT products and services. Of all the framework building blocks, the adoption curve for segments was the shortest, with teams readily seeing the value of knowing the pain points and IT usage patterns of their target audiences. Their use has also spawned multi-year IT programs aimed at improving the overall experience of dissatisfied, business critical segments or sub-segments (e.g. software developers).

3.2   Turning Understanding into Transformation

The framework was intended to seed the envisioned experience into existing processes by providing both a shared vocabulary and shared ways of examining the enterprise. We encouraged teams to selectively apply different pieces of the framework depending on where they were in their existing processes. To help guide IT professionals in incorporating the framework into their processes, we proposed the following iterative approach, with the outputs of the last step feed back into the first.

1. *Evaluate what is.* Use segments to better understand users and theme components to determine how well current reality is meeting user needs.
2. *Ask what if.* Use relevant theme components start the conversation with your users, stakeholders and team and to envision possible new futures.
3. *Prioritize what is most needed.* Uses the experience objectives and the outputs of previous steps to set UX strategy, define roadmaps, and identify gaps.
4. *Define the detail.* Use framework personas, requirements, scenarios, and related design patterns to define what a product or service would do.

We stressed that framework insights were not a replacement for what was already known but instead were additive. We set the expectation that the framework would not answer all their questions, and any gaps in understanding would need to be filled using traditional UX methods. The rest of this section briefly discusses some of the common uses of the framework and its impact on how IT functions.

Shifting IT Strategy. The introduction of themes is shifting how the larger IT shop thinks about UX. IT's multi-year plans now includes horizontal experience services to more efficiently enable the integrated experience that users want. Product owners envision future products based on the most relevant qualities; product roadmaps track alignment to the themes with user functionality prioritization driving roadmap timing. One of the key themes (Know Me) is the focus of an IT pathfinding group that is building out a strategy for enterprise personalization including multiple proof-of-concepts across IT's solutions (e.g., Unified Profile, Recommender Systems) in the hopes of streamlining of tasks and increased filtering of irrelevant information.

Seeding Agility with Presumptive Design. Early project adopters of the framework evolved our original approach by combining use of the framework with elements of presumptive design [4] to speed up agile teams. The framework along with what was

already known about a particular space formulated the starting "presumptions" on which designs were based. Agile teams found segments and an underlying component of experience qualities, namely experience elements, provided the most utility for generating starting presumptions.

On agile projects, the rich detail provided by the framework helps bring focus to team efforts and allows teams to more rapidly move from concept discussions to prototypes. In multiple projects, this information has seeded agile Vision Quest activities and served as a catalyst for creating design hypotheses around core presumptions of what features and capabilities should be included in the solution. From the created design hypotheses, a series of contextual scenarios are written that re-framed element usage scenarios in light of the current project and then were used to storyboard the product vision. Framework examples often inspire many of the designs reflected in the proof-of-concept (POC) prototypes, and the storyboard typically contains a swim lane that the team used to map the themes to the relevant portion of the story.

Providing Evaluation Guardrails. With adoption of the framework, IT needed a way of evaluating how well existing experiences aligned with the experience envisioned by our users. An experience evaluation spreadsheet was developed and by checking off the high-level requirements relative to today's experience, teams can quickly see how well their current solution aligned with the themes. The end-result is a score and color-coded heat map which allows teams to visualize where they should focus more attention in order to improve user experience. It serves as an evaluation tool for vendor selection and as a design foundation for new products and the evolution of existing ones.

4   Conclusions

By aggregating big data and the outputs from more traditional UX together, enterprise UX shops can speed UX within the enterprise. The detailed information within the framework defined interaction norms across enterprise tools and served as design guard rails to help developers create better interfaces. In a world where enterprise IT shops are constantly expected to move faster and do more, an experience framework can help speed up enterprise organizations and become a force for UX transformation.

However, transformation using the framework is possible only when the findings are communicated in way that resonates with the broad base of people who work together to define and develop the enterprise experience. An architect will look at the framework collateral through a different lens than a systems analyst or service owner. Further, transformation is a participatory process—it is not something that can be done by merely throwing the framework over the fence at those outside of UX. For change to happen, all levels of the organization must participate in the conversation and take ownership of how their own role impacts the enterprise experience.

As enterprise IT organizations are increasingly under pressure to blur the lines between internal and consumer experiences, such transformations become critical.

Programs like bring your own device increase the number of platforms to be supported. The need for mobility requires a consistent experience across form factors. Usage of SaaS solutions with native enterprise apps requires deep integration and consistent experiences across tools. Users are more sophisticated, their demands on technology are greater, and the imperatives to deliver solutions quickly have never been greater. Using an approach such as the discussed here can facilitate, and greatly assist, an enterprise IT shop in meeting all the demands placed on them.

The road to transformation that is carved by an enterprise framework isn't necessarily easy, or straight, and is often fraught with ambiguity, but for those who persevere on this journey (and it is most certainly a journey) a framework can help seed a shared experience vision and focus actions to help bring the vision to life.

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