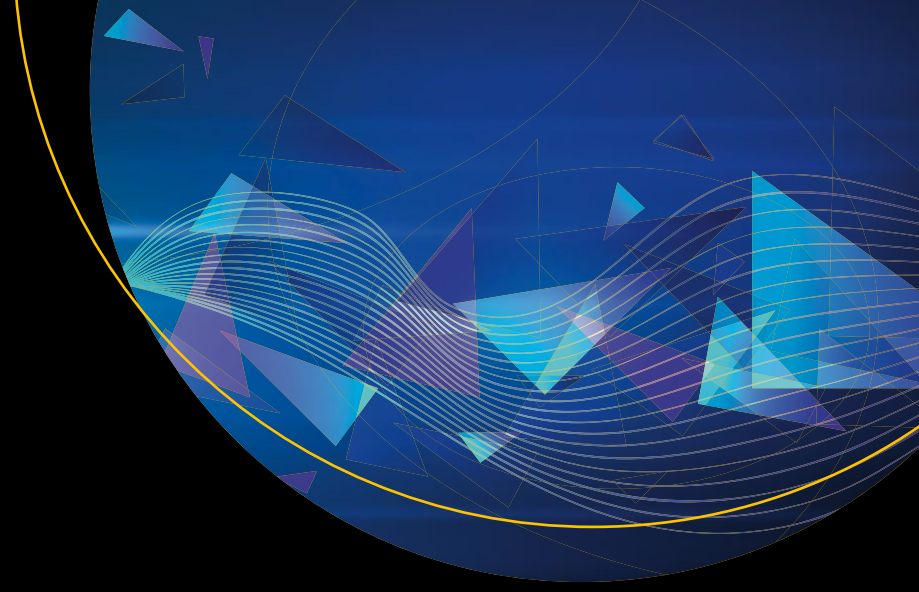

Building Digital Experience Platforms

A Guide to Developing Next-Generation Enterprise Applications

Shailesh Kumar Shivakumar
Sourabhh Sethii

Apress®

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I dedicate this book to . . .

My parents, Shivakumara Setty V and Anasuya T M who blessed me with their love and strength, My wife, Chaitra Prabhudeva and my son Shishir who shared their time and support, My in-laws, Prabhudeva T M and Krishnaveni B who provided help and courage, and to all my school teachers to bestow lots of love and knowledge.

—Shailesh Kumar Shivakumar

To lovers of books . . .
I hope this book aids you to get your work out to a wider audience. I would love nothing more than to see the book in the hands of people everywhere—students in the classroom, researchers, browsers in the bookstore, and professionals.
That's a great challenge, but it is certainly worth an attempt.

—Sourabhh Sethii

Table of Contents

About the Authors

Shailesh Kumar Shivakumar is an author, inventor and working as Practice Lead & Senior Technology Architect at Digital Practice of Infosys Limited. He is an award-winning digital technology practitioner with skills in technology and practice management and has experience in a wide spectrum of digital technologies, including enterprise portals, content systems, enterprise search, and other digital technologies. He has more than 17 years of industry experience and was the chief architect in building a digital platform that won the "Best Web Support Site 2013" global award. His areas of expertise include digital technologies, software engineering, performance engineering, and digital program management. He is a Guinness world record holder of participation for successfully developing a mobile application in a coding marathon.

Shailesh is deeply focused on enterprise architecture, building alliance partnerships with product vendors, and has a proven track record of executing complex, large-scale digital programs. He successfully architected and led many engagements for Fortune 500 clients of Infosys and built globally deployed enterprise applications. He also headed a center-of-excellence for digital practice and developed several digital solutions and intellectual property to accelerate digital solution development. He led multiple thought-leadership and productivity improvement initiatives and was part of special interest groups related to emerging web technologies at his organization.

Shailesh was awarded the prestigious "Albert Nelson Marquis Lifetime Achievement Award 2018" for excellence in technology and has received numerous honors and awards. He has won multiple awards including the prestigious Infosys Awards for Excellence 2013-14 "Multi-talented thought leader" under the "Innovation – Thought leadership" category, "Brand ambassador award" for MFG unit, "Best employee award", delivery excellency award and multiple spot awards, and received honors from executive vice chairman of his organization. He is featured as an "Infy star" in the Infosys Hall of fame and recently led a delivery team that won the "best project team" award at his organization.

Shailesh holds a Bachelor in Engineering in Computer Science and Engineering and is currently pursuing a doctoral degree in Computer Science. Shailesh has completed an executive management program from the Indian Institute of Management, Calcutta. Shailesh holds numerous professional certifications such as TOGAF 9 certification, Oracle Certified Master (OCM) in Java EE5 Enterprise Architect certification, IBM Certified SOA Solution Designer, and IBM Certified Solution Architect Cloud Computing Infrastructure. He is the sole author of four technical books on digital technologies, which were published by reputed publishers, and has published twelve technical white papers related to digital technologies. Shailesh is the sole inventor of two granted US patents (US9613341 and US10108601) and holds two more patent applications, and is a frequent speaker at events such as IEEE conferences and Oracle JavaOne. Shailesh has also published more than 10 research papers in various international journals.

Sourabhh Sethii is a Technology Analyst at Infosys Technologies Limited. His areas of expertise include Blockchain, Internet of things (IoT), machine learning (ML), Java enterprise technology, front-end frameworks, and integration technology. He has hands-on experiences with many technologies like database integration, continuous integration, and security, along with performance analysis and web frameworks like Angular and Node. Sourabhh has worked on multiple domains such as banking, finance, and manufacturing. He has achieved multiple honors like "Most Valuable Player," "Insta Awards," and "Best Employee Award" from the heads of his unit in Infosys. He has published many technical white papers.

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Venkata Kakarlapudi is a Senior Technology Architect at Infosys Limited, with over 15 years of industry experience. His areas of expertise include Java, enterprise portals, and Web content management systems. He has experience of implementing multiple large-scale enterprise applications for Fortune 500 companies across geographies. He previously headed a center of excellence for enterprise portals at the digital experience practice in his organization and is part of the core architecture team. He holds an engineering degree in Mechanical Engineering and has completed an executive management program for IT executives from the Indian Institute of Management, Bangalore.

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Introduction

As enterprises embark on their digital transformation journey, they define the vision, road map, and objectives of the digital transformation programs. Digital transformation involves legacy modernization, reimagining digital experiences, implementing cloud-first and mobile-first models. Such digital transformation involves various challenges and risk factors including but not limited to niche technology stack, unavailability of skilled resources, long time to market, and such. Enterprises need to carefully evaluate technology trends and future outlook, and invest in the technology stack that caters to their current digital transformation goals as well as their long-term digital vision.

Digital experience platforms (DXPs) are an integrated set of technologies and tools that provide best-of-breed modern digital technologies for enterprises. A DXP has a preintegrated set of technology stacks that addresses the risk related to a niche/unproven technology stack and risky integrations. DXPs are designed on the platform philosophy so that they can be easily extended and scaled to meet future demands of scalability and onboard new innovations. A DXP is one of the most popular approaches for building an enterprise grade digital platform. A DXP provides a set of capabilities to quickly develop a personalized, secure, and scalable enterprise platform. DXPs are designed in such a way that they can incorporate modern digital technology to build next-generation enterprise applications.

You can develop your own digital experience platform. The book looks at various open-source tools, technology, and frameworks that can be used for building DXPs. This book covers core concepts to build enterprise grade DXPs. Readers get a holistic view to build DXPs and will be able to transform existing applications to a DXP that is capable of incorporating emerging technologies in near future.

DXPs are not just limited to a few commercial products. Enterprises can build their own experience platforms to meet their needs. This book discusses the methods and technology frameworks across various layers to design a DXP.

We divided this book into five parts: requirements and design, development, security, infrastructure/NFR, and a case study to cover end-to-end DXP lifecycle scenarios. We discuss proven best practices, design methods, and technology frameworks along with contextual real-world case studies for each of the chapters.

In the requirements and design part, we introduce various concepts of DXPs and elaborate on requirements elaboration methods. We also provide an in-depth discussion of various design elements of DXPs such as UI design, integration design, and such. The chapters in this part cover the requirement gathering phases, functional requirements, and sample use case to develop your own DXP application; user experience requirements to develop your own user interface and mobility requirements to develop your own mobile experience; nonfunctional, social and collaboration, security, infrastructure, disaster recovery, and rollout requirements to develop your own digital experiences platform. This is the first step to develop and analyze the requirements to build an enterprise DXP. The design chapter covers the patterns and architectural strategy along with various layers of the DXP. This chapter also briefly discusses the integration of various emerging technologies such as IoT integration design, Blockchain design, big data, and NoSQL design, and AI automation design along with chatbot case studies, enterprise search engine capabilities, and introduction of augmented reality with DXP applications, along with recent trends in CICD (continuous integration and continuous deployment) using application containerization technique.

The development part mainly discusses the detailed design and development of DXP layers such as the user interface layer and integration layer. The chapters in this part cover each and every aspect of developing the user interface using open-source web frameworks, modular UI components and key features, integration of UI components using open source ESB and integration frameworks, UI development lifecycle and best practices, along with a BXP (Banking experience platform) case study.

In the security part, we provide an elaborate discussion of information security and overall security of DXPs. The chapters in this part cover the concepts and best practices while developing an application's security, along with information security policy and principles.

The infrastructure/NFR part discusses various quality and nonfunctional attributes such as performance, infrastructure sizing, and such. The chapters in this part cover the NFR(nonfunctional requirements), that is, scalability, availability, performance, modularity, extensibility, and security of the DXP's application along with quality attributes such as usability, configurability, stability, interoperability, efficiency, flexibility, and maintainability of the platform.

Finally, we wrap up with an elaborate digital transformation case study of a legacy system in the last chapter. The case study chapter provides insights into the digital transformation of a legacy application to a Digital experience platform. It covers concepts

like gamification, predictive analysis, dashboards, and chatbots; and technologies like artificial intelligence, Blockchain, and augmented reality are discussed in brief.

The book can be used as a reference while using any existing DXP tools or for developing a new DXP from the ground up. Digital practitioners, web developers, and digital architects can leverage the best practices, methods, and technology frameworks discussed in this book.

PART I

Requirements and Design

CHAPTER 1

Introduction to Digital Experience Platforms

The digital strategy of all organizations primarily focuses on providing rich and engaging user experience. Customer experience-focused strategy leads to increased customer engagement, which in turn increases key success metrics such as site traffic, repeated visits, conversion rate, and such.

Digital experience platforms (DXPs) provide an integrated set of technologies built on platform philosophy to engage users throughout their journey. DXPs provide seamless user experience across all user touch points. A DXP is a convergence of all customer-centric technologies such as content management systems, portals, analytics, campaigns, targeting, search, mobile apps, and such.

Industries dependent on digital technologies are undergoing rapid disruption mainly fuelled by changing tech-savvy customer expectations, disruption in digital technologies, and due to widespread popularity of mobile devices. Incumbent organizations are undertaking digital transformation exercises to meet the customer expectations and to stay competitive.

Organizations can increase their online revenue through user engagement. User engagement also increases cross-sell and upsell opportunities, and increases user retention and lifetime value of a customer.

S. K. Shivakumar and S. Sethii, *Building Digital Experience Platforms*,
https://doi.org/10.1007/978-1-4842-4303-9_1

Boundaryless Banking Enabled by Digital Technologies

Tech-savvy banking customers expect the banking experience to match or surpass the best experience of social media platforms, hence it is imperative for banks to understand the trends and enhance the banking experience. Digital banks enable a boundaryless and physical branchless experience supporting these features:

- Mobile-first strategy enabled through mobile apps or mobile web platforms
- Omnichannel experience (a seamless user experience on all supported devices and browsers) to provide optimal user experience on all access devices
- Seamless and simplified processes across all touch points throughout the user journey
- Relationship oriented by rewarding loyalty and sustaining long-term partnership with customers
- Responsive to market disruptions, changing customer demands, and other requests
- Digitized business models to foster the innovation
- Rapid innovation in adding digital capabilities

In the subsequent section we will briefly discuss DXPs.

Overview of DXP

DXPs are primarily user-centric engagement platforms that provide a unified view, with rich user interface for enhanced end-user experience. DXPs provide a platform-based approach to enable all the needed digital capabilities. In this book we explore various aspects of a digital experience platform such as user experience design, integration, security, and such. In this regard we will explore the concepts of DXP in understanding the background for using a DXP to build a banking experience platform.

In this section we will provide details of the DXP.

Key Tenets of a DXP

The key tenets of DXPs are defined as follows:

- Platform orientation with an integrated set of technologies that provides capabilities for presentation, content management, commerce, marketing search, analytics, campaigns, and such. The platform model should also support future extensibility.
- Lean and agile platforms with lightweight integration components. A lean model includes lightweight user experience integrated with lightweight service components.
- An integrated and personalized view to provide a holistic view of all customer activities across all touch points. This can be achieved by information aggregation from multiple information sources and delivering personalized experiences.
- Provide software as a service (SaaS) and cloud deployment option to provide the digital experience as a service.
- Provide an integrated experience catering to various business channels such as marketing, sales, and services.
- Self-service for end users and for business stakeholders to improve user experience and productivity.
- Agility in developing new features and implementing changes for responding to changing market demands.

DXP Reference Architecture

The reference architecture provides the core services and components that are used in a typical digital experience platform. The services and components enable the needed business capability for the application using the DXP; we will elaborate each of these components in detail shortly.

DXP reference architecture is shown in Figure 1-1.

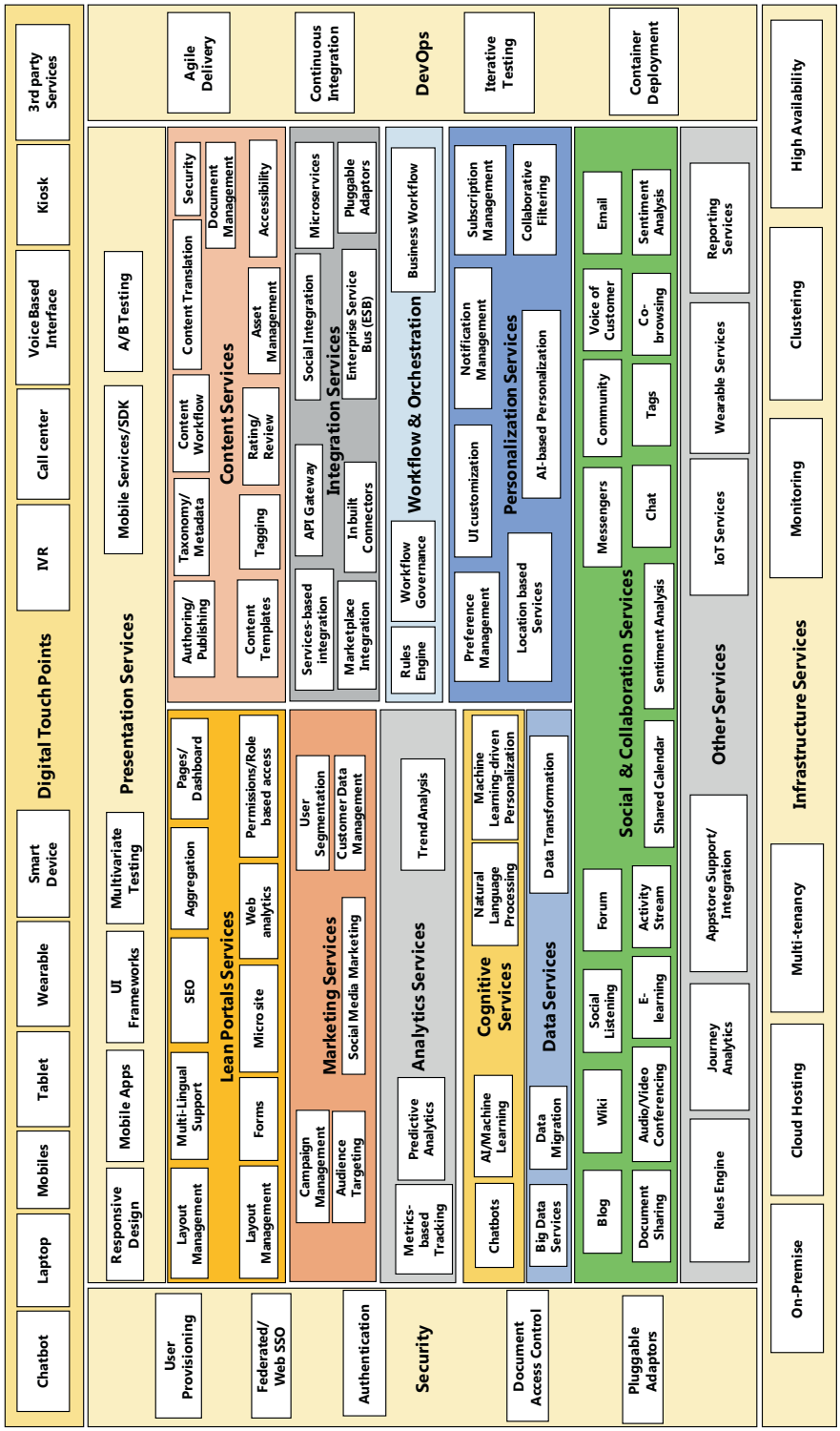

Figure 1-1. *DXP reference architecture*

The core components of a typical DXP platform are as follows. We have identified the core components in each of the layers:

- *User touch points*: This layer consists of various digital touch points the end user uses during the journey. The end user could use smartphones, desktops, tablets, third party services, or wearable and such devices to access the DXP services. Users expect device-optimized, seamless and personalized information access across all digital channels. All user access channels and devices come in this layer.
- *Presentation services*: The DXP provides various presentation services to cater to a wide variety of digital touch points. This includes mobile apps for smartphones, UI frameworks, and responsive design for mobile web applications, web services for third party consumer, and A/B testing for presentation testing. Presentation services are mainly responsible for defining the user interface and user experience. We elaborate presentation services and user touch points in Chapter 4.
- *Lean portal services*: In this category, the portal provides various complementary presentation capabilities such as personalized experience (user experience based on end user preferences and past history), consistent branding, unified view, forms (for user registration, queries, and such), search engine optimization (SEO) (to make web pages more visible), multilingual presentation, and such.
    - Lean portal services provide business-friendly controls to manage pages (page creation, layout, web analytics, navigation) and brands.
    - Lean portal services provide a single-stop-shop view of personalized content by aggregating information from various sources.
    - Web analytics provide vital real-time customer insights, and help in understanding customer activities and interests. These insights can be used for customer segmentation, trend analysis, and targeted content delivery/contextual recommendations.

- *Content services*: In this category, the DXP provides various content management services such as content authoring, content tagging, content publishing, content translation, and such. As the DXP provides an integrated set of features, support for various content types, content administration, content templates, content metadata, and other content related services will also be provided by the DXP. Other complimentary functionality such as document management services, digital asset management (DAM) services, content workflows, and metadata management are also included in this category.
    - Content services provide content lifecycle management features (content creation, content updates, content publishing, content translation) and support a wide variety of content.
    - Content services provide other features such as rich text editor, content workflows, and such.
- *Campaign and marketing services*: One of the core features of a DXP is to enable digital marketing campaigns. To provide this, the DXP includes features such as campaign management (defining, launching, and monitoring campaigns), audience targeting (sending targeted information to the relevant audience), social media marketing, user segmentation (grouping users based on their interests, access patterns, and such), and customer data management (unified management of customer data across all customer touch points).

  A DXP provides campaign management features (campaign creation, campaign targeting) and user segmentation (categorizing end users based on demographics, interests and such) in this category. Customer data management (profile data, preferences data, transaction data, and navigation data) is used for understanding customers and provides targeted content. Customer data is used to provide a single view of customer data (activities, preferences, transactions, feed, etc.) in the dashboard. Other marketing functionality such as social media marketing is included as well.
    - Campaign and marketing services mainly deliver targeted content based on user attributes, preferences, analytics, and such.

- *Analytics services*: This includes web analytics-based tracking using predefined metrics, trend analysis, and predictive analytics.
- *Integration services*: Enterprise integration is the most significant component of a DXP. In order to aggregate information from various information sources to provide a unified view, a DXP should support a variety of integration formats and should provide flexible and extensible integration features. Hence a DXP offers standards-based integration methods such as API support, modular services, services support, and plugin support. Most of the DXPs offer built-in support for microservices, REST (Representational State Transfer) and JSON (JavaScript Object Notation)-based services and adaptors for most popular enterprise interfaces (such as databases, enterprise resource planning [ERP], etc.)
    - The in-built adaptors and integrators improve the productivity of end users and optimize the return on investment (ROI) of the DXP.
    - DXPs provide standards-based integration options (such as REST-based integration, web services, and such), which can be leveraged for integrating with new products and technologies.
- *Social and collaboration services*: In this category, a DXP provides various collaboration features such as forums, blog, wiki, chat, knowledge base, messengers, communities, calendars, email, and such. These features enable end users to share the information and facilitate a self-service model. The social capabilities enable users to collaborate, harness collective intelligence, socialize, and improve productivity.
    - Social and collaboration enable users to collaborate and engage customers at social touch points.
- *Workflow and orchestration*: DXPs enable designing and implementing agile, automated, and dynamic business processes through workflow modeling, a configurable rules engine, and workflow governance.