WHITE PAPER



DIGITAL TRINITY - PAS DE TROIS OF DIGITAL TRANSFORMATION

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Abstract

The present, process centric, architectural patterns are very rigid to allow any changes to incorporate digital technologies. Hence, it's imperative to bring in fundamental change in how organizations realize their futuristic objectives by adoption of digital technologies in their people, process, and technology ecosystem.

The challenges faced in the current situation reveals that process and data are two inseparable components for any business transaction and to build any system which favors one over the other will render the entire system lopsided and skewed resulting in sub-optimal performance. Hence, we must consider process and data as two sides of a coin which must have strong integration to generate desired outcomes. This integration is achievable when Process, Data and their Interactions work together in a seamlessly synchronized way.



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The story so far

Every industry is in the midst of navigating through very diverse and multi-pronged disruption to their enterprise and business processes. They are saddled with technical debt gathered over the years due to use of heterogenous technologies which have now become obsolete, difficult to maintain and are very rigid for interoperability. To meet present day business demands these legacy applications are being enhanced or modernized. To achieve this, project teams end up investing very high effort and face skill set shortage for these grand-fathered technologies. At the same time businesses are being challenged with the introduction of new technologies which claim to offer capabilities to address future needs which also requires change in cultural attitudes. This has led to organizations finding themselves managing a very complex balancing act of maintaining legacy technologies, meeting present day demands and having to keep an eye on latest developments and encourage their teams to adopt new technologies in their enterprise. Another aspect that organizations have to take into account is that there is no silver bullet argument in favor of any of the digital technologies with respect to their suitability and/ or feasibility to business needs in the near to medium term, this has led to organizations juggling between Fear-Of-Missing-Out (FOMO) and Big-Tech-Phobia (BTP).



Figure 1: Story so far...

Motivation and Roadblocks

To overcome these fears and biases, organizations have taken exploratory steps towards certain technologies such as Cloud, AI/ML, Microservices, Mobile etc.

These attempts are confined to a very limited set of business functions to gauge their feasibility in order to avoid any largescale negative impact and ability to quickly roll-back if needed. This again has burdened organization with additional technologies without offloading existing obsolete tech stack. All these efforts have yielded limited and short-term successes, not enough to increase the confidence level for medium to long term adoption.

The fundamental roadblock to realizing significant improvement over existing enterprise capabilities is the in-ability to bring rapid change and large-scale adoption of future proof technologies. To overcome these roadblocks and impediments organizations need a roadmap that helps them in identifying and defining the best fit solution for their individual business needs.

The **Digital Trinity** approach defines a roadmap that organizations can follow to gauge and calibrate the

progress in transforming their business processes and enterprise architecture. It brings in a new paradigm shift about how enterprises need to visualize their business processes. It provides detailed roadmap to change from a "Process-centric model" where legacy monoliths are migrated to n-tier/layer or services-based architecture to "Digital transformation model" where legacy monoliths are transformed into systems of information, the information is used to build systems of knowledge and the knowledge is curated to build systems of intelligence.



Present Scenario

Organizations have built software systems to execute business transactions. These software systems are primarily process centric and use architectural and design patterns aligned to automate business functions. The patterns help in segregating multi-level processes into atomic subsystems and further divide them into functions and methods, it also defines an integration apparatus to get all the subsystems to work synchronously to achieve business requirements. As time passed and businesses automated their core as well as ancillary functions/processes it led to a huge collection of crucial business sensitive data, and soon everyone realized that this data could generate important information to provide inputs for future business growth. The data recorded not only core business operations but also about user affinity, process efficiency, break-down frequency, issue resolution delays etc. A deep mining capability of the data will provide insights to areas of improvement which may help in business forecasting, lowering costs, eliminating redundancies, improving efficiencies, etc. across the enterprise. Digital innovation has brought forth technologies such as AI/ML, Robotics, Biometrics, Quantum Computing, 3D-Printing, IoT, and many more. Any of these or a combination of these will be necessary to enhance business prospects in the near to medium term.

The Challenge

The challenge faced by organizations for adoption of these digital technologies is that their present enterprise systems are process centric and any attempt to enhance existing

systems with digital technologies leads to distortion of the existing architecture. This causes a lot of stress on the existing systems which must support traditional processes as well to maintain business continuity. Leading to increasing costs, skill gap, lower efficiency, and huge technical debt. Also due to untested digital technologies the period of gestation for



Figure 2: Process Centric Layered System



Figure 3: Data Centric System

the people and the processes to adjust and adopt these technologies is longer. Hence organization have taken guarded, calculated, and minimalistic steps towards these technologies. They need a strong, committed, and empathetic direction which gives a high sense of trust in the digital transformation roadmap.

The Way Forward

As already presented above, the present process centric architectural patterns are very rigid to allow any changes to incorporate digital technologies. Hence, it's imperative to bring in fundamental change in how organizations realize their futuristic objectives by adoption of digital technologies in their people, process, and technology ecosystem. The challenges faced in the current situation reveals that process and data are two inseparable components for any business transaction and to build any system which favors one over the other will render the entire system lopsided and skewed resulting in sub-optimal performance. Hence, we must consider process and data as two sides of a coin which must have strong integration to generate desired outcomes.

Digital Transformation:

Integrate Process and Data to generate actionable business intelligence.

Digital Strategy and Solution

Enterprise Digital Transformation comprises of executing the following broad aspects with the objective of fundamental change in mindset in-order to realize the long-term benefits of digital technology adoption.

Digital Strategy

Drivers

The drivers of digital transformation in an enterprise, are the 4-pillars of – People, Processes, Business and Technology.

1. People

- Continuous Learning
- Transformation Mastery
- Cloud Management
- Vendor Management
- Digital Assistant Management
- 2. Process
 - DevOps & Agile Processes
 - Democratized Innovation
 - Process Orchestration
 - Analytical Models of Operation
- 3. Business
 - Adaptive Organization
 - Partnership Ecosystem
 - Digital Value Creation
 - Cross-Domain Synergy
- 4. Technology
 - Cloud Platforming
 - API runtime services
 - Embedded Intelligence
 - Self-Aware Infrastructure
 - Ubiquitous Connectivity

Capabilities

Enterprises need to build next-gen capabilities in the following areas.

- 1. Insight
 - New Business Model Content Monetization
 - Connected Audience
 - 360-degree customer view
 - Al for infrastructure



Figure 4: Digital Strategy - Drivers

- 2. Innovate
 - Digital Strategy
 - Zero touch operations
 - Smart grids
- 3. Accelerate
 - Open APIs
 - Double loop continuous learning
 - RPA for business ops
 - Network spatial optimization

4. Assure

- Environmental and Safety compliance
- Business and IT SLA dashboard
- Asset Compliance
- Peripheral, Outer and Inner Security
- 5. Experience
 - Cognitive Bots
 - Robotics
 - AR/VR based monitoring
 - Mobile first led solutions



Figure 5: Digital Strategy - Capabilities



Figure 6: Digital Twin (Process and Data)

Digital Twin

The business process and data are inseparable and, as mentioned earlier, are the fundamental building blocks for all business transaction or operations. To achieve true digital transformation business process and data need to integrate seamlessly. Here integration means to provide mutual feedback about the quality of the operations being executed. Business data must provide insights on various metrics of business processes in order to help improve them, at the same time business process must provide details of various kinds of data being generated to identify meaningful data to analyze it and build knowledge, insights and intelligence. For any digital transformation to be successful every transaction's process and data need to work together effectively, kind of a synchronized dual dance. The close association of business process and data make them co-joined at birth of any transaction and hence both together become twins and considering that digital nature of the transactions they can be called as Digital-Twins.

Digital Architecture

Every enterprise architecture system, sub-system and components must have a digital version. The digital version of the enterprise architecture components build the digital architecture of the enterprise. The digital architecture forms the core of the enterprise and provides direction to critical architectural choices. The digital architecture is further subdivided into unique capabilities catering to associated enterprise architectural sub-systems.



Figure 7: Enterprise Architecture and Digital Architecture



Figure 8: Digital Transformation Levers

Digital Transformation Levers

A digital architectural sub-system caters to a certain business functionality linked to its associated enterprise architectural component. The business functionality is achieved through a series of transactions, and each transaction is executed through a set of digital twins. Hence each enterprise system is driven by digital sub-systems which in-turn are driven by a set of digital-twins that perform a unique and atomic business function. Generically, the chain of command that is followed is - An enterprise's business is a set of processes, each business process consists of functionalities, each functionality requires to execute a series of transactions and each transaction performs various functions and each function executes a series of steps to generate data.

Digital Trinity – Data, Process, and Interactions

All this while the entire focus of the digital transformation has been around process and data. In all this the third important aspect is the interactions that the various components of an enterprise have with each other. It is then imperative that we identify the various layers of interaction wherein each layer will be a set of digital twins which achieve the objective of that layer including intra-layer communication, in addition there will be specialized digital twins which help in the interactions across layers.





Figure 9



Application of Solution

Digital Twin–Logical View

Digital twins are a self-contained atomic unit of work, and they require a very robust communication medium to achieve business functionality. As mentioned earlier each digital twin is a combination of process and data, now also require handling interactions with other components. This mandates that the process and data functions of a twin be handled as an individual microservice. These micro-services leverage a messaging queue to communicate and integrate with other components. A logical architecture of digital twins is depicted above

- An application has two fundamental aspects Process and Data.
- Future state application leverages microservices based event driven architecture to enable digital transformation for various functional processes.
- For true digital transformation, the data aspect of the application also requires

an independent, loosely coupled data architecture.

- Both the process and data together form the – Digital Twin for the application.
- Digital transformation of data will leverage latest technology platform to ensure that the application is future-ready to imbibe features such as machine learning, analytics, deep insights etc.
- The reporting components will seamlessly integrate with the application architecture.



Figure 10: Logical View - Digital Twins

Serverless Architecture and Digital Twins

One of the implementation patterns which aligns seamlessly with the digital twin architecture is the Serverless architecture model. As per its principle each business action is defined by an atomic Compute Functions or Lambda Functions. A swarm of such functions together can achieve a business functionality over a messaging queue.

Data Transformation Process

- Leverage advanced ETL capabilities of SQL Server Parallel Data Warehouse and SSIS to transform legacy database to future state database.
- There are 5 stages of data transformation
- System of records Identification of legacy data stores which need to be migrated to target future-state database.
- System of integration Typical ETL process of cleaning legacy data, data transformation and loading data into target database
- System of storage (Data Warehouse) Future-state database which will store all OLAP (Online analytical processing) data
- System of reporting and analytics Tools and Technologies that analyze OLAP data and uncover valuable data insights and reports
- System of presentation Different presentation capabilities (tabular, graph, heatmaps etc.) based on business needs
- 6. Reporting & Analytics options
 - SSRS
 - Power BI
 - Tableau
 - Qlik



Figure 11 : Data Transformation Process





Enterprise Digital Platform

Enterprise Digital Platform encompasses the components that enable adoption of key architectural tenets to help mitigate existing challenges and technical debt. The framework to scaffold the digital transformation is called Enterprise Digital Platform. It defines a phase-wise roadmap to achieve the milestones of the digital transformation journey. The following diagram depicts a comprehensive phase wise milestone to achieve the Enterprise Digital Platform



Figure 13 : Digital Transformation Roadmap and Enterprise Digital Platform

Maturity Model

By following these principles and patterns organizations can achieve digital transformation, by graduating from a monolithic system to Systems of Information, leveraging information to build Systems of Knowledge, curating knowledge to build Systems of Intelligence. Thus, providing a well-defined maturity model for digital transformation.



Figure 14 : Digital Transformation Maturity Model

Digital transformation is a journey and the destination is very hazy in the current scenario. Hence it is imperative that organizations test its viability and feasibility using measurable and quantifiable metrics relevant to their specific concerns.

Adopting a platform or following a pattern may result in pseudo-digitalization with miniscule Rol. It is only when the systems deliver actionable business intellgence resulting in improved QoS business parameters that a well directed digital transformation journey begins.

About the Author



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