A PRODUCTIZED APPROACH TO TECHNOLOGY MODERNIZATION IN THE RAILROAD INDUSTRY

Today’s railroads are laden with technology debt – how do we renew and rethink the core?
There is a general consensus among industry leaders on the positive outlook and the wealth of growth opportunities that railroads can capitalize on. While such opportunities remain on paper, the real question is, how are railroads placed to exploit these opportunities and continue their growth agenda?

To convert these potential opportunities into tangible growth, railroad companies need to have disciplined execution, improved velocity, improved dwell times, improved visibility (for e-commerce shipments) and emphasis on safety, leading to overall improvements in efficiencies and effectiveness. This means looking inwards with an inside-out view and ensuring that they are well prepared across key dimensions of physical infrastructure, technology investments and insight which are within their control.

However, not all looks rosy from an inside-out view. Major freight railroads have a huge technology debt in the form of disconnected processes, legacy technology platforms with a non-digital core, platform duplications, and siloed databases. It has led to several business challenges such as inefficient supply-demand planning, higher turnaround times for assets, and inability to perform predictive scheduling. The infographic below summarizes these challenges.

Tackling such challenges at scale involves renewing and rethinking existing systems to improve and get more value out of them, and make them more relevant to the changing business environment, and support a digital-first approach.

From ensuring better utilization of cost-intensive assets to leveraging big data for predictive scheduling, from implementing regulatory mandates to keeping capital costs low, and from improving network velocity to efficiently managing workforce allocations, nothing can be achieved without a modernized, scalable, and intelligent IT infrastructure that is flexible enough to embrace future innovations and data analysis needs.

In this point of view, we explore renewing and rethinking the core through a productized approach to technology modernization.

The biggest challenges railroads face today

- Workforce management
  - Duplication of workforce management capabilities, poor work allocation
- Asset utilization
  - Low asset utilization, inefficient supply-demand planning
- Automation & data analysis
  - Need for big data to make big solution decisions and improve overall efficiency
- Regulatory mandates
  - Complexities in positive train control (PTC) implementation, event handling, IoT integration
- Capital & operational costs
  - Automated processing of Inspection / damage reports to reduce costs and turnaround time
- Network velocity
  - Need for predictive scheduling, automated consist building decisions

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Current state of legacy modernization in the railroad industry

Some major railroads have already taken steps to undertake this transformation journey while shedding legacy technologies and adopting a modern data and application architecture:

**White-box modernization**
- The focus is on reverse-engineering internal operations
- The goal is to develop an abstract model of the old system to streamline and restructure it into a more modern data and application architecture
- A significant amount of time and effort is involved as it is intrusive. It needs a well thought out approach to tackle the modernization journey
- It is typically carried out to address issues with underlying code, as an opportunity to improve functionality, reliability, and technology relevance

**Black-box modernization**
- The focus is on inputs and outputs for the existing system
- The goal is to develop a layer of software which will wrap the old system to conceal it under a new, modern user interface

Prevailing approaches to legacy modernization

While transforming legacy systems, railroads adopt one of three approaches:
- Maintain
- Replace
- Modernize

clearly Modernization is a better approach, as maintaining the status quo is safe in the short term while risky in the long run, and replacement is disruptive and resource-intensive.

**Reduce risk**
- Technological relevance - Replace homegrown, redundant technology, access enabling technologies
- Data visibility - Make data more meaningful to derive insights
- Human capital - Availability of intellectual capital, knowledge retention

**Advanced functionality**
- Services enablement - Leverage IoT, enhanced UX, next-gen tech for efficient business operations
- Data analytics – Data-driven decisions to ensure rail velocity, safety, and on time performance
- Automation – Automation-first culture, cut manual intervention

**Reduce costs**
- Legacy systems - High cost of operating 30-year-old mainframe and other legacy systems
- Quality of systems - Reduce functionality duplication, improve service levels and standards
- Data management - Data storage, processing, usage, retrieval costs

Dealing with legacy systems

Maintain
- Safe in the short term, risky in the long term

Modernize
- Middle ground

Replace
- Resource-intensive

Costs are lower compared to the more intrusive white-box approach
- It is typically carried out to improve the UX, for example rolling out existing legacy functionality like workforce assignment, notification, and logging on a mobile app for 24/7 easy access

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Having seen and executed technology modernization from close quarters, our recommendation is to go with a productized approach. This approach helps define a global template – which is a mechanism for standardizing business processes, data, documentation, technology, and application configuration across organizations, business domains, and geographies while supporting local variations that create a competitive advantage or are required for adhering to regulatory and compliance requirements. Creation of a global template is a critical part of the strategy towards modernization and outcomes are best achieved by following our four-step approach. It is also essential to note that while defining and designing such a global template, a set of six principles needs to be adhered to for maximizing outcomes.

**Key principles for product approach**

- **Define global:** Develop a common set of requirements and processes that can be leveraged globally or across business domains. Any deviations to the common requirements or processes need to be driven based on statutory or legal requirements or value justification.
- **Realize local:** Develop an application platform where a collection of services can be easily leveraged by other business domains; tenant-specific requirements can be realized at extension layer.
- **Product mindset:** Define a product management organization (PMO) to develop a product strategy roadmap. The PMO needs to vet all new requirements from different domains and decide which ones to incorporate into the global template and when.
- **Think agile:** Create rapid application development methodology to reduce development cycles and standardize on organization-wide processes to enable faster go-to-market.
- **Integration:** Develop standardized interface adapters to reduce integration time and ease integration requirements.
- **Training:** Develop platform training guides to educate and accelerate adoption.
### Our four-step approach to productization

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<th>Step</th>
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| **Catalog** | Capabilities catalog  
- Leverage Infosys railroad business process repository  
- Gather as-is business process view for various applications  
- Identify L2, L3 process for each domain or application and catalog them for assessment |
| **Assess** | Analyze & classify  
- Assess capabilities across domain for commonality/similarity  
- Identify key differences in capabilities across domains  
- Define a standard product reference model |
| **Harmonize** | Evaluate variations  
- Document deviations  
- Cost benefit analysis  
- Product governance/gating  
- Normalize to the standard  
- Allow variance between domains due to legal, regulatory & tax reasons |
| **Finalize** | Justify variations  
- Impact within threshold  
- Yes: Allow Variation for Local Rqmts  
- No: Reject Variation & Use Standard  
- Finalize product standard capabilities  
- Finalize domain-specific variants |
Product approach in action: Examples

The product approach can be applied to many domains within the railroad industry. To illustrate the transformation that this approach can bring about, we evaluate the following examples:

A. Workforce management (WFM): This area has immense scope for process standardization. In most railroads built on legacy code, the same business processes or workflows are usually duplicated across various domains such as crew management, operations & non-operations planning / staffing. For example, assignment creation, bidding and award process can be similar between operational and non-operational jobs. Similarly, leave management can be standardized across the enterprise, while job scheduling can be optimized with domain-specific exceptions as needed.

B. Asset and operations management: This area provides opportunities for technology consolidation. Due to evolution of tracking technologies, multiple applications and interfaces to capture events co-exist. This has led to varied problems including maintenance and support of a varied tool set (performing same function) leading to higher TCO and multiple sources of truth causing complex integrations for back and forth sync.

Based on our experience, we analyzed various processes and capabilities across domains and grouped them as Closely Common, Fairly Common, and Unique. This classification was used to derive the Global Product and Domain Specific Capabilities.
A well thought out and well designed (leading to improved efficiencies), robust product template and a flexible framework for realizing delivers multiple benefits such as higher rapid customizations / configurations levels of business capability fitment through industrialized deployments to (close to 70-80% ensuring broader meet any domain-specific capabilities, applicability), streamlined processes legal, regulatory, tax and compliance requirements. In effect, such an approach ensures faster time to market for onboarding new domains, lower overall TCO as IT teams manage a single code base, and also positions the organization on the path for faster product capability upgrades.

**Summary of benefits**

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<td><strong>Reduce TCO</strong></td>
<td>Single IT budget, unified road map for platform enhancement and future feature set deployment</td>
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<td><strong>Improve business agility</strong></td>
<td>Opportunity to achieve more rapid deployment of integrated global capabilities using parallel agile teams / proxy POs</td>
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<td><strong>Industrialize deployment</strong></td>
<td>Global product template after extensive normalization means easy industrialization of deployment processes</td>
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<td><strong>Process excellence</strong></td>
<td>Standardized performance measures allow comparisons, ease adoption and course correction at enterprise</td>
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<td><strong>Preserve upgrade path</strong></td>
<td>Productization helps handle conflicting requirements and priorities through feature-based versioning, thus speeding up custom domain development</td>
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**Key components of Infosys modernization framework**

- Defining a global template is only the first step in enabling the transformation. Several other pieces of the puzzle such as superior future-proof architecture, the right technology selections, process changes, agile technology teams and change management need to come together to make this transformation a success. Infosys has a robust framework and tools to solve your modernization puzzle. We simplify your transformation journey through our strategic approach, domain expertise and a minimal disruption implementation plan.

- **Unlock value**
  - Empathy sessions and rapid prototyping leveraging design thinking
  - Proxy product owners with domain expertise
  - Strategic product approach

- **Rapidly at scale through distributed agile**
  - CI/CD/CD leveraging Infosys DevOps platform, test automation
  - Amplifying through distributed agile

- **Organizational change management**
- **Training need analysis**
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