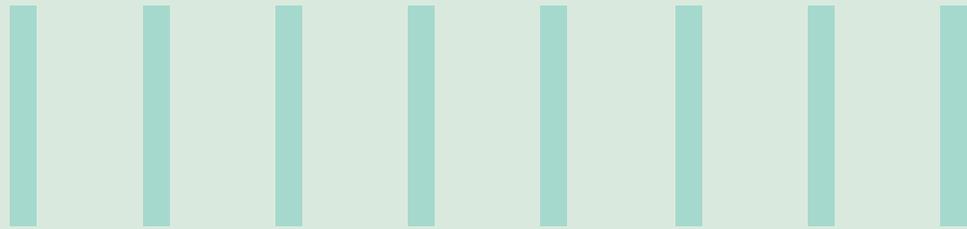


A PRODUCTIZED APPROACH TO TECHNOLOGY MODERNIZATION IN THE RAILROAD INDUSTRY

Today's railroads are laden with technology debt – how do we renew and rethink the core?



- US railroads to benefit from e-commerce growth (DC-DC freight movement) - 2017
- Intermodal business to drive growth for railroads as trucking capacity tightens - Outlook for 2018, BNSF
- Coal, forest products and metals continue to remain a strong growth driver for railroads - Outlook for 2019, CSX
- Energy and chemicals market is gaining momentum - Outlook for 2018, Canadian Pacific

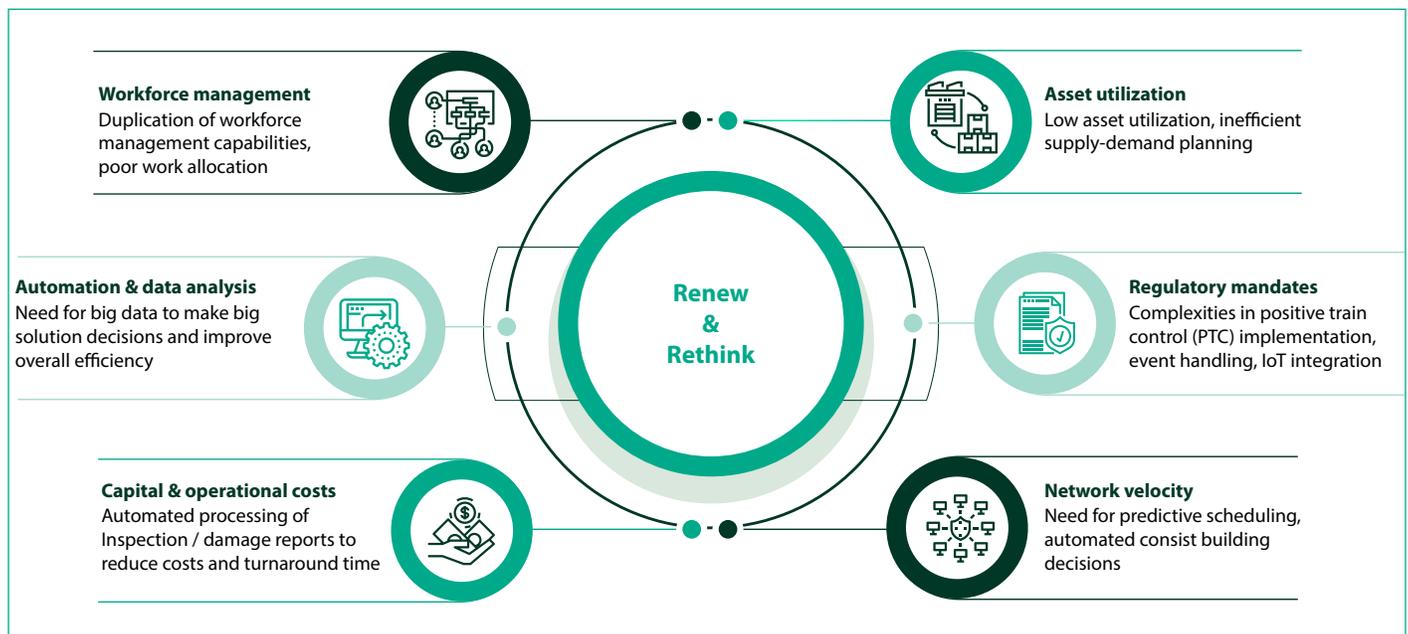
There is a general consensus among industry leaders on the positive outlook and the wealth of growth opportunities that railroads can capitalize on. While such opportunities remain on paper, the real question is, how are railroads placed to exploit these opportunities and continue their growth agenda?

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.

The biggest challenges railroads face today



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-

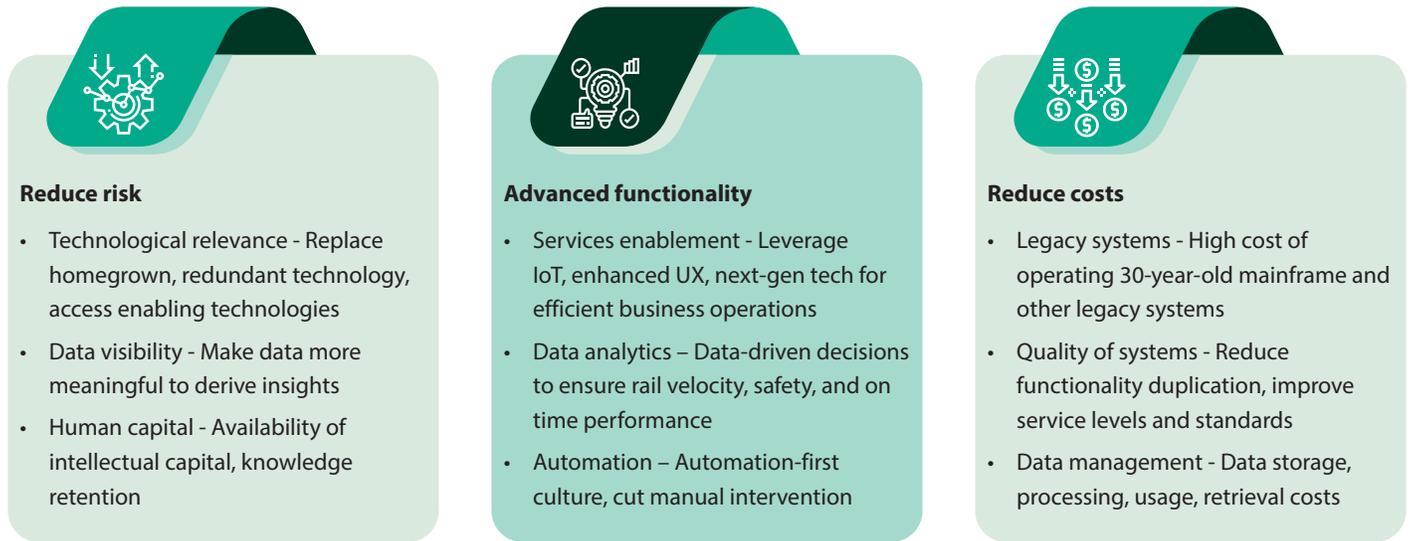
intensive assets to leveraging big data for predictive scheduling, from implementing regulatory mandates to keeping capital costs low, and from improving network velocity to efficiently managing workforce allocations, nothing can be achieved without a modernized, scalable,

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.

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.:



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.

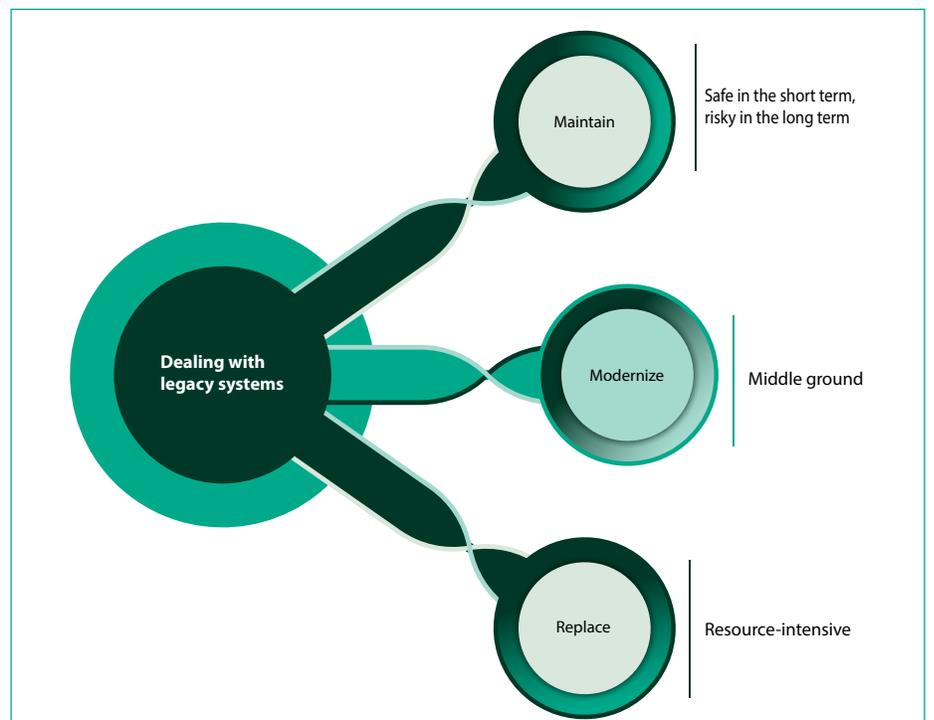
White-box modernization

- 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 invasive. 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

- 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



Transformation requires a strategic view, ours is a product approach

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

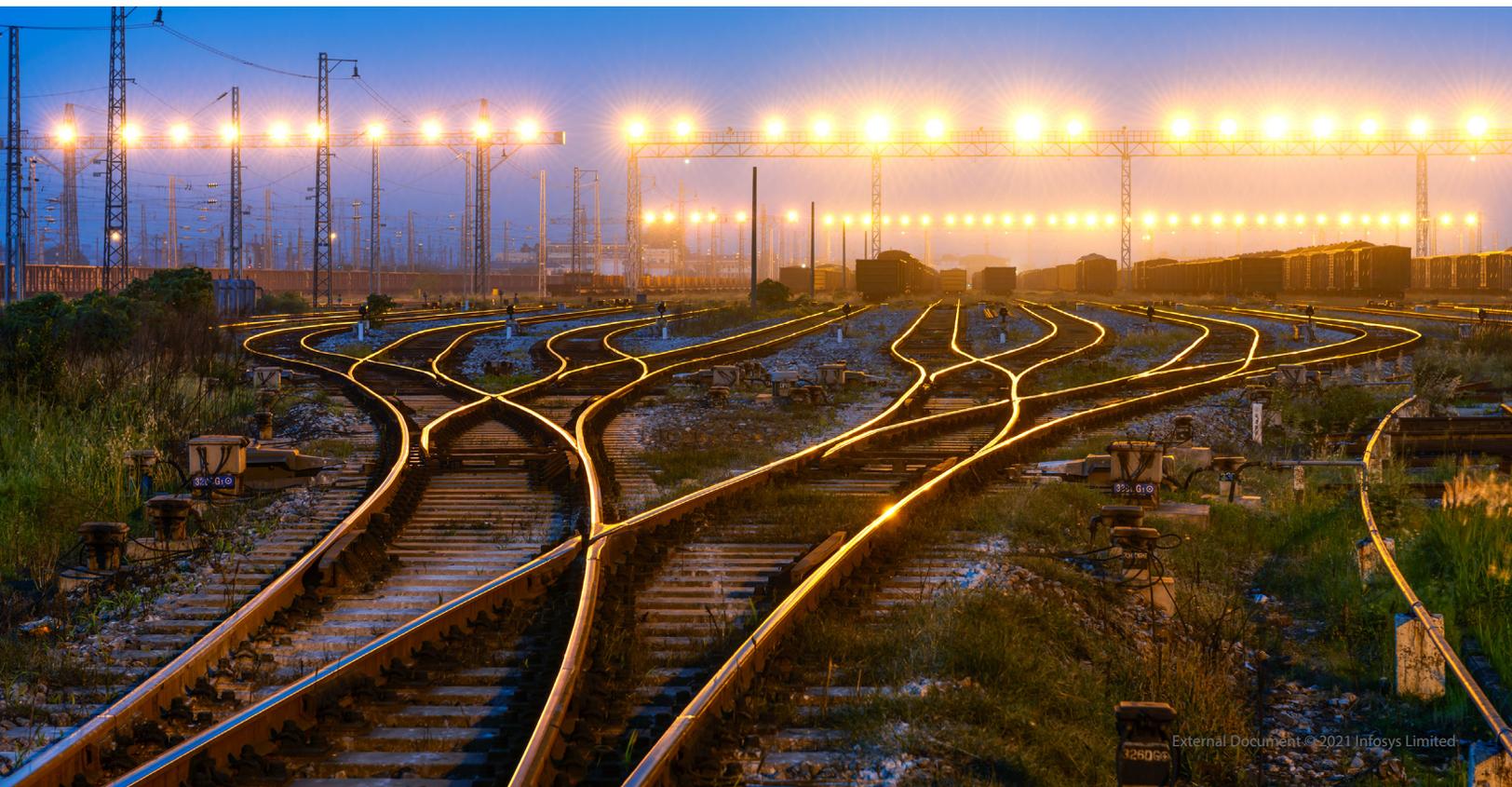
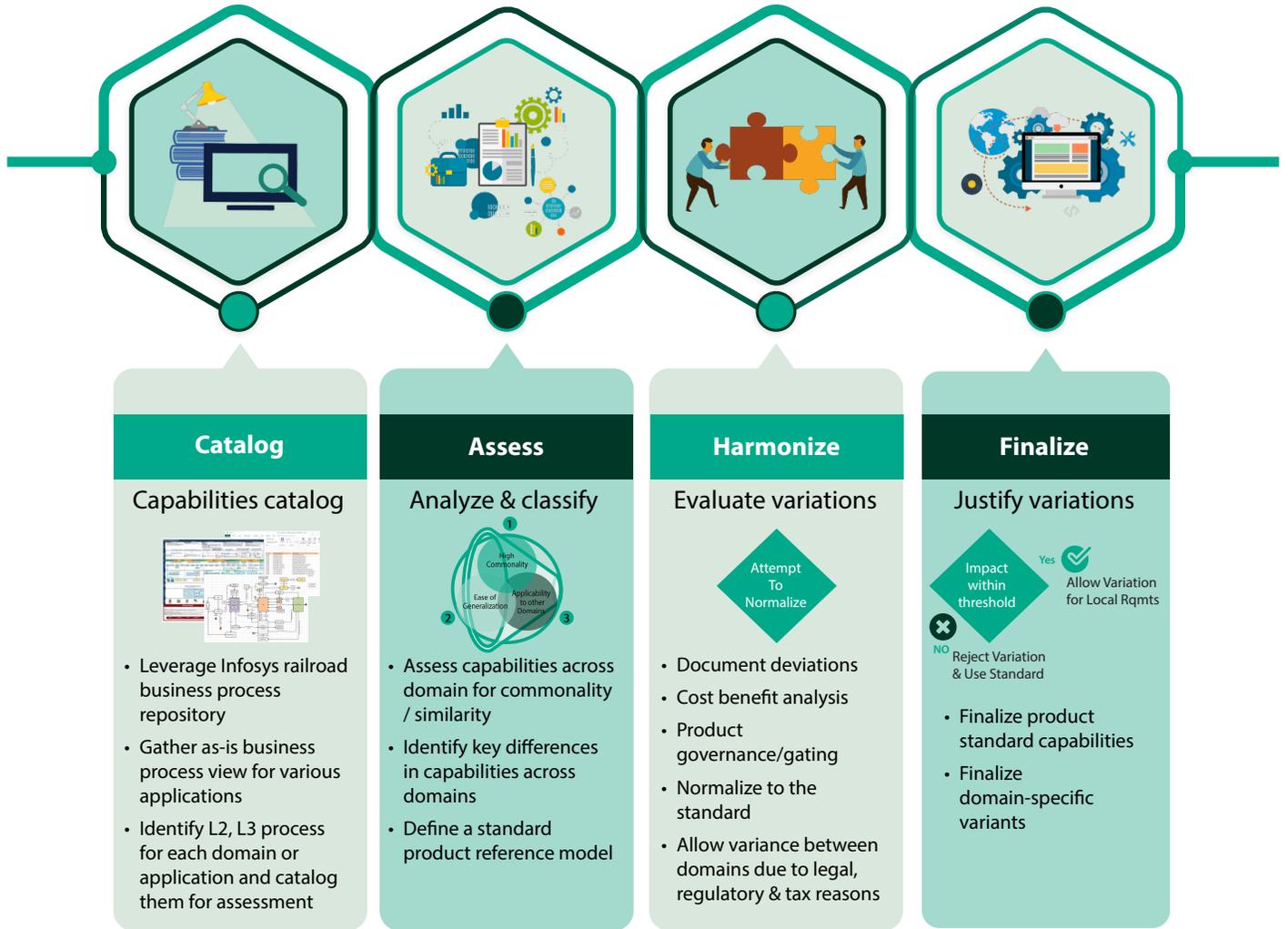
modernization and outcomes are best achieved by following our four-step approach. It is also essential to note that while defining and designing such a global template, a set of six principles needs to be adhered to for maximizing outcomes.

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 road map. 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



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,

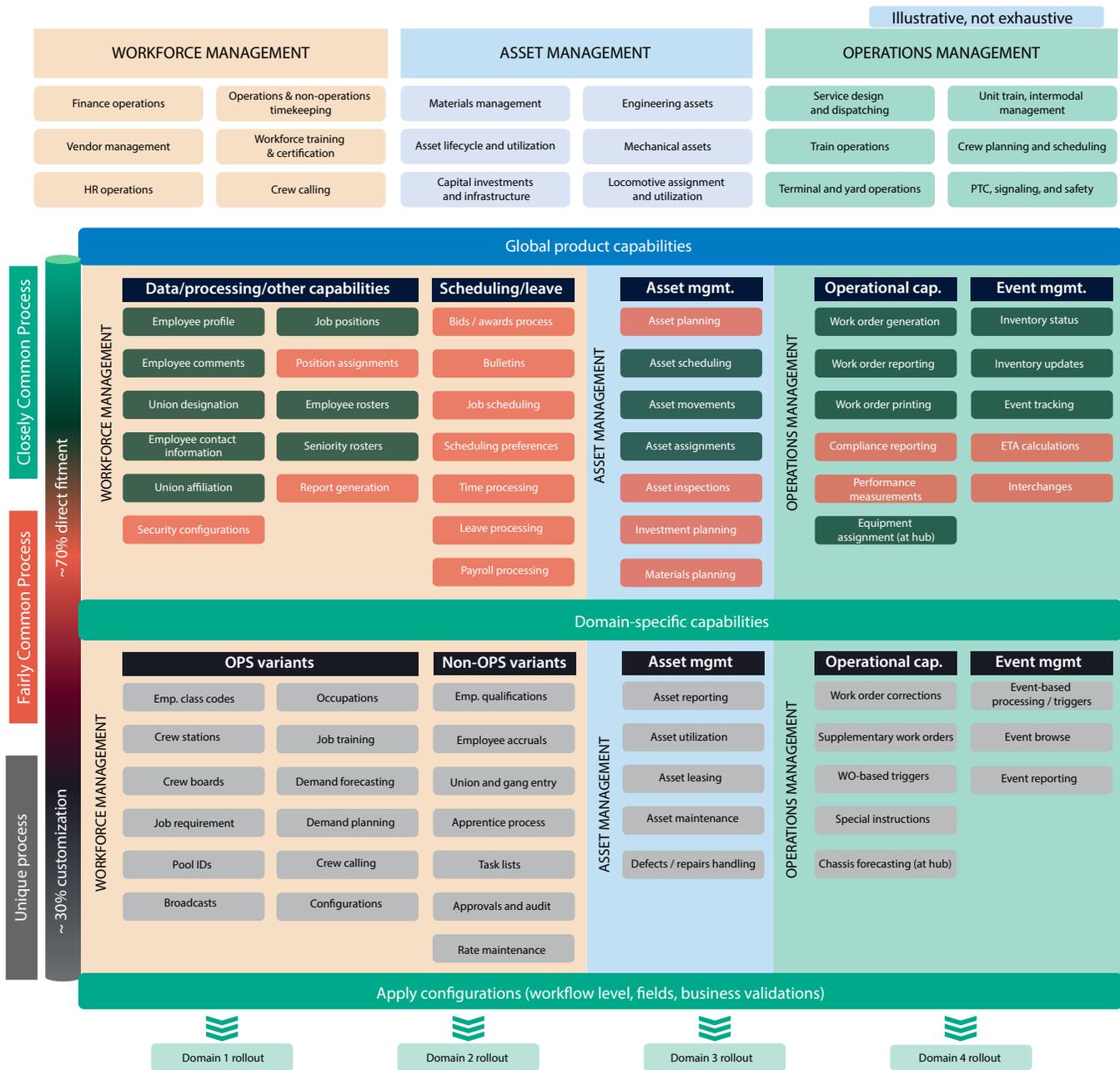
assignment creation, bidding and award process can be similar between operational and non-operational jobs. Similarly, leave management can

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.



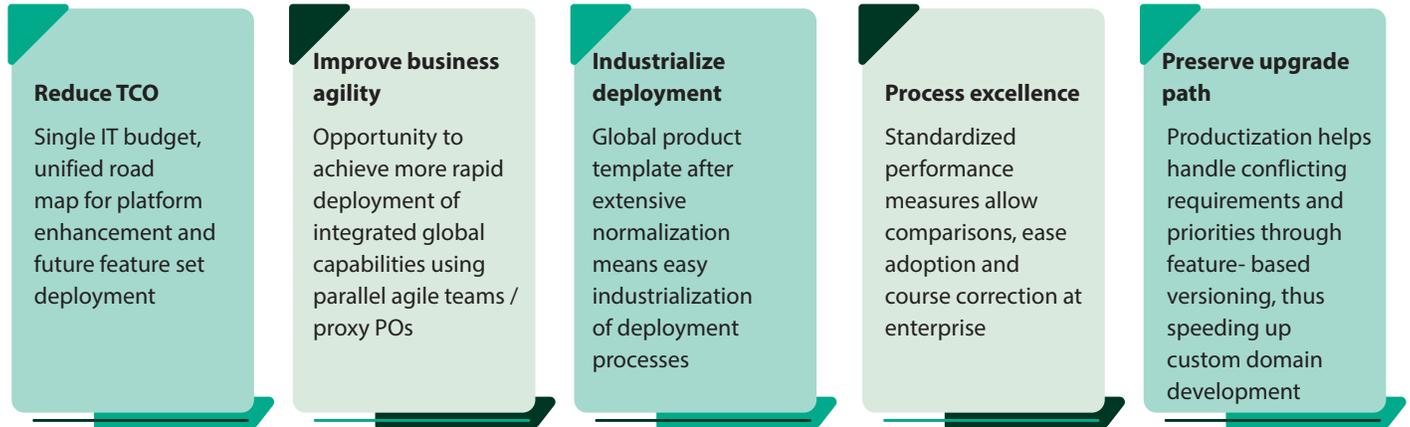
Product Approach: Benefits & Key Design Principles to consider

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

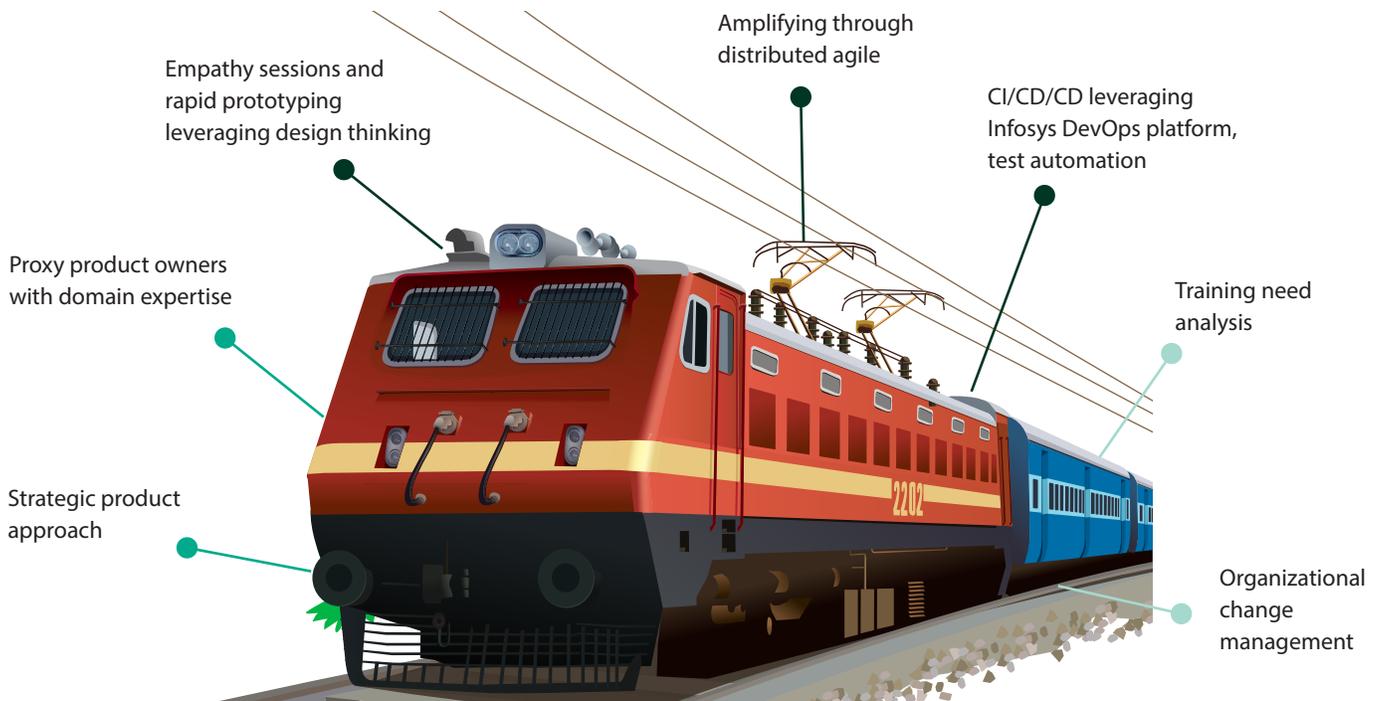


Key components of Infosys modernization framework

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.



About the Authors



Sathyanarayanan Varadan – *Sr. Principal, Retail, Consumer Goods & Logistics Practice*

Sathya is a senior principal in our Retail, CPG and Logistics Practice with more than 15 years of advisory experience. He has developed omni-channel strategies and managed large transformation programs for global companies. Sathya has worked across a diverse set of roles, including functional lead, product manager, business architect and program management.



Karthik Ravichandran – *Senior Consultant, Retail, Consumer Goods & Logistics Practice*

Karthik is a senior consultant with more than 13 years of experience in technology, functional, product management, and advisory roles. He has played key roles in many critical engagements within our industry practice and has specialized experience in transportation management systems, railroad operations, route optimization, asset utilization, and digital commerce.

About Infosys Consulting

We are a global advisor enabling organizations to reimagine their future and create sustainable value leveraging disruptive technologies. And as part of technology leader Infosys, we have access to a global network and delivery capability of 200,000 professionals that help our consultants implement at scale. To see our ideas in action, please visit InfosysConsultingInsights.com.

For more information, contact askus@infosys.com



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